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Translation

IN THE FOCUS OF TIME

By

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Leningrad V FOCUSE VREMENI in Russian 1976 (signed to press 7 Dec 76) pp 1-210

[Book "In the Focus of Time" by Abikoam Samuylovich Istigin, Izdatel'stvo Lenizdat, 2,500 copies, 210 pages]

Contents

ANNOTATION

The world's largest and most improved optical telescope that permits Soviet scientists to look into the far stellar worlds of the universe became operational on the eve of the 25th CPSU Congress in Stavropol'skiy Kray, not far from Stanitsa Zelenchuk. This unusual astrophysical complex was developed with the assistance of the collective of the Leningrad Optical-Mechanical Association imeni V. I. Lenin.

Telescopes are only one of the types of products produced by LOMO. Optical equipment with the mark of this association is widely known in our country and abroad.

The book of Leningrad journalist A. S. Istigin "In the Focus of Time" is devoted to the collective of Leningrad optical specialists--its workers and foremen, scientists and designers, organizers and production managers.

The new labor advance of the collective of Leningrad optical specialists to implement the historical decisions of the 25th CPSU Congress and to fulfill the tasks of the 10th Five-Year Plan--a five-year plan of efficiency and quality--ahead of schedule is shown in the book, consisting of document excerpts written clearly and convincingly.

The book is intended for the mass reader.

WHAT IS LOMO?

Leningrad V FOCUSE VREMENI in Russian 1976 (signed to press 7 Dec 76) pp 1-210

[Book "In the Focus of Time", by Abikoam Samuylovich Istigin, Izdatel'stvo Lenizdat, 2,500 copies, 210 pages]

[Text] During the days when this book was being prepared for press, far from Leningrad in Stavropol'skiy Kray, there occurred an event which was judged to become an extraordinary benchmark in the knowledge of the universe. On a mountain overgrown with trees, 2,000 or more meters above sea level, not far from Stanitsa Zelenchukskaya, a gigantic thousand-ton dome seemingly light-transparent and weightless from afar, flashed with silver. This was the tower of the world's largest and most modern optical telescope BTA. People aimed its "eye" at one of the stars which no other telescope was capable of looking at.

Here at the astrophysical observatory scientists have already been able to obtain the first pictures of stars 10 million times weaker than those that the human eye is capable of seeing. Moreover, this new telescope permitted people, due to its special optical devices, to look at stars right side up rather than upside down. The light collected in the abyss of the universe by the bowl of the main six-meter mirror, is directed toward the observer and a distant mysterious star floating in the cosmic ocean suddenly becomes quite close.

In February 1976, on the eve of the 25th CPSU Congress, the BTA telescope was turned over for operation after intensive and careful testing. Soviet science was armed with an unusual astrophysical complex that carries an information flow about the universe.

Four letters--LOMO--are clearly visible on the telescope--the result of the enormous labor of scientists, designers and foremen. These letters are the Leningrad Optical-Mechanical Association imeni V. I. Lenin.

It was here that the BTA was developed.

The joyful news arrived at LOMO. General Secretary of the CPSU Central Committee Comrade Leonid Il'ich Brezhnev heartily congratulated all the workers of the firm with their important labor achievement.

"Scientists, designers, engineers, technicians and workers, collectives and organizations that participated in development and putting into operation the world's largest astronomical telescope:

Dear Comrades!

I heartily congratulate you with your remarkable labor success--with putting the world's largest optical telescope into operation with main mirror six meters in diameter at the Astrophysical Observatory, USSR Academy of Sciences.

Development of the unique telescope is an important advance of Soviet science and technology. Soviet scientists have now gained the opportunity of developing their scientific search even more widely and of penetrating more deeply into the secrets of the universe and of making a new contribution to the human storehouse of knowledge.

Putting the largest astrophysical complex into operation is the result of the joint creative activity of many scientists and design collectives, industrial enterprises and organizational and political work of party, trade-union and Komsomol organizations. This is a good example of successful implementation of the plans of the communist party and the Soviet government for development of science and new convincing proof of the scientific and technical progress of our motherland, the creative enthusiasm of the Soviet people and the labor successes that greet the 25th CPSU Congress.

I wish you dear comrades new achievements in the glory of our great socialist motherland."

Several days passed and the joyful excitement still persisted with regard to such a high evaluation of the labor of the creators of the unusual telescope, as it was newly discussed from the tribunal of the 25th CPSU Congress. In his concluding speech at the Congress, Leonid Il'ich Brezhnev proudly enumerated the high points of the victory of Soviet science, technology and industry, also named the BTA telescope with the mark LOMO.

LOMO is one of the production associations created in 1962 in the city on the Neva River at the initiative of the Leningrad Oblast and municipal committees of the CPSU that laid the basis for concentration and specialization of Leningrad industry.

Tens of Leningrad companies have been organized since then, without even talking about the hundreds of associations that have arisen throughout the country. Their successful work again and again confirms the correctness and fruitfulness of the course taken by the party to create production and industrial associations.

This idea was also emphasized at the 25th Party Congress in the official report of General Secretary of the CPSU Central Committee Comrade Leonid Il'ich Brezhnev: "Now when extensive experience has been accumulated and when the directions in which we must move forward have been better denoted, we can and should accelerate readjustment of the economic mechanism."

*Brezhnev, L. I., "Otchet Tsentral'nogo Komiteta KPSS i ocherednyye zadachi partii v oblasti vnutrenney i vneshney politiki" [Official Report of the CPSU Central Committee and Routine Tasks of the Party in the Field of Internal and Foreign Policy], Moscow, Politizdat, 1976, 70 pages.

The word "LOMO" can now be read on thousands and thousands of different optical devices and apparatus that meet modern requirements of the scientific and technical revolution.

The mark "LOMO" is on the fluorescent biological microscope that makes it possible to look at the finest details of a living cell, to discover its secret and thus to supplement the arsenal of scientists with a new weapon in the struggle for human health.

The mark "LOMO" is on the first Soviet telephoto lenses for color television equipment, on movie cameras and movie projectors and on black-white and color cameras.

The mark "LOMO" is on modern studio and portable tape recorders and a number of devices for the most rapid spectral analyses of metals, alloys and oils.

The mark "LOMO" is on miracle machines capable of renewing into new form old, but valuable movie films on which it would seem time has left an irreversible impression: warped film and scratches.

It was these machines made at the company that helped to restore to life the legendary film "The Battleship 'Potemkin'," which is now again making victorious voyages on the screens of many of the world's countries. Timeless movie documents that recorded the exploits of heroes of five-year plans and World War II, have been regenerated for future generations.

The mark "LOMO" is on miniature devices which weigh grams and which can be placed in a matchbox and on those which weigh many hundreds of tons.

The company now produces more than 600 names of the most complex devices. It has approximately 20,000 customers. LOMO has participated with unfailing success in many international exhibitions and fairs. LOMO now delivers products to more than 100 countries of the world.

The most prominent scientists from the most diverse institutes--the State Optical Institute, the Botanical Institute, the Scientific Research Institute of Polymerization Plastics, the Physicotechnical Institute, the Main Astronomical Observatory and many others--cooperate closely with the firm.

There is nothing remarkable in this. The products of LOMO themselves are designed to advance science and technology in the most diverse fields. And it is now not simply a production association. The firm has become a unique school of experience in modern organization of socialist production and management and a laboratory of scientific and technical progress in an entire sector of industry. LOMO, having joined thousands of communists, is a school of universal and mass education of leading, widely educated and ideologically hardened workers. The Leningrad Optical-Mechanical Association was awarded the rank of collective of communist labor in 1971, the first in Leningrad. It bears three Orders of Lenin on its banner.

At the end of December 1971 the Leningrad Optical-Mechanical Association was visited by General Secretary of the CPSU Central Committee L. I. Brezhnev. Leonid Il'ich became acquainted with the experience of organization of labor and

production management. He viewed the products which the association produces. He talked with workers and engineers. He was interested in how the complex plans for economic and social development are being fulfilled here and how the everday and living conditions of the workers and specialists are and what their wages are and what is being done to develop new recreation areas and sanitorium-resort treatment of the firm's workers.

In thinking about this book, the author did not pose the task of relating the firm's history. He was interested primarily in how it is today. The affairs of a multi-thousand collective, its concerns, dreams and ideas, the good changes in the fate of the firm's workers during the 10th Five-Year Plan and the conditions under which they live and work now.

This book is the result of direct impressions from "travelling" through the firm and from meetings with its people--from rank and file workers, engineers, researchers and designers up to the managers of the association. The impressions, reports and interviews made up the contents of this book.

FIRST INTERVIEW, WITH DIGRESSIONS

One can see buildings on different streets of Vyborg that are crowned with the same luminous emblem: a spire with a small ship on the point and letters near its base. If one looks a little more closely, one can easily note that the spire with the small ship on the point is nothing more than the letter L and together with the letters below you can easily recognize the familiar word "LOMO."

Regardless of what the enterprises that became part of the firm were called before, they all bear the name of the association itself. Unlike other associations, there is no main enterprise here. The Leningrad Optical-Mechanical Association is a unified and inseparable economic organism. It short, it is a company!

My first interview is with the general director of LOMO, Hero of Socialist Labor Mikhail Panfilovich Panfilov. To meet him, I head for old Chugunnaya Ulitsa where my eye is immediately caught by a remarkably light and airy building similar to a gigantic bird that has spread its flexible white wings for vigorous flight.

All the management services of the firm, including the office of the general director, are located here.

The director is sparing in his words. His time is calculated in minutes and not only is he an important economic manager. Many of his responsibilities are along social and party lines, not even mentioning the fact that Mikhail Panfilovich is a deputy to the USSR Supreme Soviet and was elected a delegate to the 23rd and 25th Party Congresses. He has been awarded the state prize for participation in development of the first Soviet firms.

Preparing for the first interview, I wanted to find out a little more about the man who has been constantly on the captain's bridge of LOMO for almost 25 years. Mikhayl Panfilovich himself does not like to talk about himself. But if one can express it so, the main years of his life have passed here at this enterprise and they have an excellent knowledge of his biography here.

And the biography is a simple one: in the 1930s he was a lathe operator at a Baltic plant. At the same time he was a student at the workers' high school. He was later a technician-machine tool builder. But he was soon attracted by a sector only beginning to make its first serious steps. Optics!

And Panfilov crossed the threshold of GOMZ--the State Optical-Mechanical Plant. Binoculars, movie cameras and eyeglasses were made at this enterprise after the

Great October Socialist Revolution. They took up making cameras. People of the older generation remember them--black cones of accordians with the inscription "Fotokor."

During the years of the First Five-Year Plan the enthusiasts of GOMZ overtook the renown German company Zeis only in their most daring dreams. It would still be a long time until this happened in practice. They did not have enough specialists. The Zeis Company demanded gold for the most inconsequential consultations. The GOMZ workers then decided to organize manufacture of the products independently.

At the same time, at the end of the 1930s, M. P. Panfilov also came to GOMZ. He worked in the department of the chief technician. At the same time he studied at the Leningrad Institute of Precision Mechanics and Optics. The young technician participated in development of new optical devices created by prominent scientists: S. I. Vavilov, V. P. Linnik, I. V. Grebenshchikov and N. N. Kachalov. GOMZ had already organized manufacture not only of still cameras, but of portable film projectors and soon began to develop telescopes.

The young engineer was full of daring plans and thoughts.

When Panfilov was designated the chief technician of GOMZ, the plant was working in an enemy-besieged city. He was soon elected secretary of the party committee. The enterprise collective had to resolve a difficult problem--production of weapons for the front had to be organized quickly in the destroyed workshops, on the remains of equipment, without experienced specialists who had been evacuated to the rear. And they did organize it!

But in the 1944 war year, a group of GOMZ engineers, including Mikhail Panfilovich, unexpectedly presented to the Main Board of Weights and Measures an unusual model of a clearly peacetime product--optical calipers that permit one to make measurements with precision up to a tenth of a micron.

Soon Panfilov, a man of solid and decisive character who lived through all the grief, joy and tests of the war years together with the plant collective, became the chief engineer and then the director of the enterprise.

Director's experience made it possible for him to gain a wider view of many problems of organization of labor and production management. He carefully studied problems of economics and began to think about a number of phenomena which it had been a custom at that time to regard as "natural" phenomena. Why, let us say, does some washer or bolt made at one plant cost a kopeck and that made at another cost 10 or 20 times as much? Why must the same articles be made at different plants? Why are they satisfied with long obsolescent equipment at many enterprises in the age of automation and electronics? Why is everything "our own" at plants of the same type producing products of the same type: our own design office, our own casting, stamping, repair and tool shops?

Lots of money was wasted because of the fact that each manager wanted to have "his own garden," be it small or be it poor. But still it was his.

And one got the idea how many people, devices and equipment could be freed up if enterprises of the same type were combined and were specialized and if production was placed on a wide base and the freed resources were used to improve the efficiency and profitability of production.

Thus the idea gradually ripened of creating a production association, for example, optical-mechanical firms in which enterprises of the same type would be combined.

Of course, the idea of creating production associations at that time, the very beginning of the 1960s, excited many managers, scientists and party workers. It was born in time by the need to solve those problems for which the framework of previous methods of organization and management of production became even more closely related. This was especially true at those large industrial centers such as Leningrad.

And of course, this problem whose time had come was discussed thoroughly and repeatedly in the Leningrad party obkom. The party obkom carried out important work, attempting primarily to convince managers of the need to restructure production management according to the modern level and to prove the prospects which would be opened up for production associations.

On the instructions of the CPSU obkom, Panfilov prepared a report to assemble the most active members of the Leningrad party organization.

He sat for long hours behind his desk on which lay the plans, layouts and economic analyses. These were convincing, thoroughly thought-out substantiations and arguments in favor of creating associations which should become the most important direction for development, concentration and specialization of production.

Panfilov's report at the meeting of the most active members was heard with interest and aroused many conversations and debates. But the most important thing: the ideas and specific proposals on organization of firms was warmly approved.

It was decided as a result, at the suggestion of the Leningrad obkom of the CPSU and economic bodies, to create nine sector production associations. This was in October 1962. They contained 43 industrial enterprises and 14 scientific research-planning-design and production organizations. The main criterion for association of enterprises was the homogeneity of the product produced and the technological identity of production.

There were already approximately 100 production and scientific-production associations in Leningrad by the beginning of the 10th Five-Year Plan. But LOMO was one of the first. And Mikhail Panfilovich Panfilov headed it.

And now, after this necessary digression, let us return to his office. It is late in the day. It is unusually quiet after the working day. Unwillingly recalling those distant "first steps" of the firm, Mikhail Panfilovich says:

"This was a very difficult time and very complex in all respects. Restructuring was begun in all aspects. The restructuring was both organizational and psychological. Where was it simplest, let us say, to break down old walls and to build in

their place new ones and where was it best to break obsolete habits, traditions and concepts and to change the views of man toward his position and role under new conditions."

"What we didn't encounter at the beginning of the trip, not even mentioning the difficulties which arose in solving fundamental problems related to the birth of the firm: changing the management structure, reconstruction which would premit rapid specialization of shops and sections, complex mechanization and automation of production processes, introduction of progressive forms of organization of labor and much more."

"Inevitably 'conflict situations' arose here and there--after all we were dealing primarily with people and their characters and attitudes had to be dealt with."

"Many questions had to be resolved urgently. They had to be solved together with the party organization that combined many hundreds of communists."

"The party organizations helped to work out a management structure which would permit the most efficient use of the creative capabilities of each worker, having clearly defined his position under the new production conditions. The party committee thoughtfully assisted the management of the firm in selection and placing of personnel in all the decisive sections. An entire army of agitators and propagandists explained the prospects and advantages of association in the shops, sections and in all subdivisions. They did everything so that people would rapidly feel themselves members of one large family--the name of which was LOMO."

"And of course, matters were not limited only to 'discussions about the future.' The party committee and trade-union organization helped to solve the most essential problems related to significant improvement of living conditions from the first days of creation of the firm. For example, a cafeteria with large dining hall was constructed on the territory of the former Kinap organization. A branch of a polyclinic and a library were opened and a comfortable movie hall was equipped."

"All this was very important. And people became convinced--the firm had no 'suckers' and what an individual plant was incapable of, the association was quite capable of."

"Moving forward, it should be said that the first steps in this direction were the beginning of an extremely important campaign prompted by the party organization of the firm, which largely determined the future of the firm: develop complex plans for socioeconomic development for each five-year plan, compiled with the participation of thousands of association workers. These plans encompassed all aspects of the firm's activity, including economic, engineering, technology, improvement of production and management, personnel training and improvement of working conditions, everyday life, recreation and wages."

"The firm's cost-accounting funds formed with regard to conversion to the new system of planning and economic stimulation of production, became the firm base of this planning. We are still talking about plans for the social development of LOMO. The main topic of our conversation is now methods of production efficiency and quality and everything to which special significance was given at the 25th Party Congress. And much of the firm's experience is especially instructive today."

"Efficiency," Panfilov formulates his idea, "is the ratio of a useful result to the expenditures for achieving it if one talks in general terms. Efficiency is always concrete. We reconstructed production which made it possible not only to improve working conditions to the maximum but to introduce specialization on wide scales. The result is that two rubles of additional output of commercial products are achieved for each ruble of capital investments."

"Yes, production efficiency became the firm's slogan from the very beginning of its creation. And then its most important source became specialization and concentration."

"This was not as simple to accomplish. Specialists carefully worked out numerous versions of the future plan of specialization and cooperation. Detailed calculations and analyses of each version were made. Only those which firmly supported the economic effect and increased product quality and production volumes were adopted. One link pulled another behind. Specialization made it possible to concentrate manufacture of homogeneous parts, assemblies and articles in the shops and to concentrate homogeneous or similar production processes."

"Here are the materials of different reports. Figures, figures. What do they say? Imagine an enormous, multicomplex plant, from month to month, from year to year, an increasing volume of output which becomes ever more complex on which ever higher requirements are placed. And you will learn that an enterprise, coping successfully with all these problems, reduces by one third the nomenclature of scare materials consumed. It requires one-half or less fewer tools and accessories. This saved it four million rubles during one year alone."

"How did everything begin? From the rear."

"Every army commander knows that the beginning of victory is to support the reliability of the rear forces."

"We began with this prerequisite at LOMO. The rear forces were the auxiliary services. The repair and machine shops were the first to be reorganized. They exist at every plant. It seemed that you couldn't get along without them. And now they have disappeared. But a single large major metal cutting equipment repair shop was created. Specialization was introduced in the sections. And again the suffocating figures: old, uncoordinated shops could repair 250-270 machine tools during a year. But a single new shop could repair 450 machine tools! It could be even greater but there is as yet no need for it."

"Imagine: one repair service alone after reorganization freed 1,500 square meters of production area and hundreds of machine tools. It was possible to use immediately with the highest output 100 qualified workers and approximately 20 engineers.

"And one more detail: the concentration of equipment of the same type and introduction of mass production technology reduced the total cost of repair by more than one third. Three tool shops were made into one. But whereas 'a little bit of everything' was done in each one previously, each one has its own, strictly defined profile: one produces only dies, the other produces molds and press molds exclusively and the third produces measuring cutting tools.

"Large shops appeared on the freed areas. For example a tool and die or an automaton or let us say a plastics shop. They were all supplied to the maximum with modern equipment.

"And as many optical shops remained as there were before. But these are quite different shops with new planning and new, modern equipment and the main thing, with their own specialization.

"The galvanic coating shop was renovated. The workers said that they previously had to unload the alkali baths by hand. The workers show me with satisfaction how seven automatic lines with program control now operate here that have replaced people in dangerous operations. One person controls all the galvanic processes from a special console.

"It is curious to look at the work logs of many LOMO workers who control complex machinery. For many the word operator, engineer and adjuster has been placed after the words multiskilled worker, rigger, loader or farmer."

"The higher the degree of mechanization and automation, the fewer the needs for people engaged in heavy physical labor. Approximately 2,000 workers in the association have been released from heavy labor. They have been trained at the training kombinat and have attained new specialities which the firm now needs.

"The first decade of operation of LOMO convincingly demonstrated the correctness of the main direction toward which the Leningrad obkom of the CPSU oriented the firm: concentration, specialization and complex mechanization. However, this is insufficient for production efficiency. A principally new system of centralized management is required.

"Former plants were converted anew into territorial plants headed by a chief involved in current operational management. But soon, as specialization was developed, cooperation between territorial plants increased sharply and contacts became more complicated. A natural need developed in the new restructuring of management, but not by the principle of territorial disposition but by production "occupations": optical, sound engineering equipment, optoelectronic devices, optical preparation and tool.

"The plant chiefs are involved only in operational supervision of individual groups of shops similar in profile by means of dispatcher equipment.

"The general director manages the association. Functional directors and assistants to the general director carry out management work. The following duties are distributed among them: director for production and economics, technical director, director for construction and reconstruction and so on.

The main accounts department and the department of technical control and the department of scientific organization of production, labor and management are directly subordinate to the general director. In cooperation with scientific research institutes and higher educational institutions, this department works out scientifically based forms of organizing production and management and is involved in methodical problems of production planning and accounting.

A council of directors, which exercises activity under the supervision of the general director, has also been created in the association. It includes the functional directors, managers of leading departments and representatives of party and trade-union organizations. The council discusses problems of production and technical activity.

The principles of unanimity with broad participation of the community and thus combined in discussion of fundamental problems of the economic life of the association and production management. Colleageal discussion of the most important problems makes it possible to work out solutions with regard to collective experience.

This structure helped to overcome parallellism and duplication in work, to eliminate approximately 30 departments of form plant administrations and to free a significant number of highly qualified workers. Part of them was transferred directly to production and part was transferred to new departments, without which development of future problems of LOMO and problems of scientific organization of production, labor and management is now impossible.

Thus, without increasing the total number of personnel, a department of specialization and reconstruction, a department of automation and mechanization, a computer center, a department of scientific organization of production, labor and management and a department for planning technical preparation of production were created. A special, permanently acting department where architects, planners and artists work, was organized. Psychologists, physiologists and medical workers were recruited to improve production. Everything was done to create the most favorable working conditions for people in the shops, laboratories and departments.

The style of efficiency penetrates all spheres of production life. Only strict and substantiated calculation is taken into account.

And although the firm has grown rich rapidly and has gained control of millions, accounting is still done in rubles and kopecks. True, once the financial bodies almost accuse the general director of being wasteful.

And here I should again make a deviation. Here is a brief episode related to me in the central design office.

Once the firm turned over several expensive cameras to the photoamateur section of the Palace of Culture. And then began: from what, why and from whom did this generosity come? This was no one's personal property.

But there was a calculation here and a long-range aim. The fact is that that at one time one of the new cameras, regardless of how the designers worked on it, did not find the expected demand among buyers. For some reason they didn't like it and for some reason it didn't suit them, despite a number of advantages over previous models. The firm experienced specific losses.

It was then decided to turn over several cameras to experienced amateurs. To turn them over, but only with the condition that they send in their comments: what didn't they like in these cameras and how should they be improved? After all, even the most talented designer cannot always foresee and take into account

everything that an amateur photographer would like and what he notices when working with the camera every day under the most different conditions.

The hopes were justified. The amateur photographers sent detailed letters to the firm. They contained many sensible remarks and valuable suggestions and advice. Results were felt very rapidly. The designers and technicians studied and learned from the remarks and suggestions of the amateur photographers. And quite recently the unprofitable camera gained popularity and brought small profits to the firm. They taught and learned to manage skills at all levels. They learned to economize both great and small. Take, for example, redesign. Everyone understands that you can't get along without considerable capital investments when shops must be rearranged, equipment must be rearranged or changed and new continuous-flow conveyor lines must be developed.

But expenditures differ. Of course, it was simplest to turn the order to contractors. But they demanded too much money. And also they did not promise to do it rapidly.

They decided it was expensive and disadvantageous. They had to get along through their own efforts.

Yes, this cost collosal efforts and stress to the entire collective. Moreover, they were able to carry out an unprecedented reconstruction. And current work was not stopped in a single shop or in a single section. Production output continued at the former rate, strictly according to plan.

This was not easy. The party, trade-union and Komsomol organizations managed to mobilize people and to explain to them the importance and urgency of the problem and the significance of reconstruction for the fate of the entire collective of the firm. All work on reconstruction proceeded strictly according to schedule. When necessary, construction workers willingly assisted production workers. Much was done on days of mass subbotniks.

The firm was transformed and became a modern enterprise meeting all requirements of technical progress as a result of reconstruction. Automatics, mechanization and introduction of advance technology opened new horizons for an increase of production efficiency. It was made even more profitable.

Profits increased continuously due to the rapid growth of labor productivity and the quality of articles, the demand for which increased every day. The LOMO mark became ever more popular both in the Soviet Union and abroad.

Creation of a central design office where first-class specialists were assembled primarily assisted in this. They had at their disposal an experimental and production base equipped with the latest technology and their own experimental shop in the engineering building. Each designer began to be responsible for development of a device, beginning from the idea and draft to serial production.

More and more optical devices were produced at the worldwide engineering level. More and more foreign countries expressed the intention of purchasing LOMO products.

Once, during the first years when the firm was established, D. Rockefeller came to LOMO while a guest in our country.

Panfilov was showing the famed multimillionaire around the enterprise. They were walking along the carefully washed asphalt of the plant yard, buried in flowers and greenery, beside well-dressed glass and concrete buildings. They looked into the shops where machine tools, automatic and conveyor lines and electronic devices were reflected in the polished floors exactly as in a mirror. People were working quietly, without concentration, without the least fuss.

Panfilov proudly noted that the firm made an impression on the guest. When they returned to Mikhayl Panfilovhch's office, Rockefeller said:

"Mr. Panvilov, I am prepared to invest money in such a business. I can offer credit."

"You are very kind," answered Panfilov. And with a smile he asked: "And under what conditions?"

"As is customary in the United States: 8-10 percent of annual profits. Incidentally, we could concede somewhat to your firm."

And he heard this answer:

"Thank you. But the state takes only 3 percent from us. So that you understand yourself."

"What then," said the multimillionaire, "I was happy to make the acquaintance of a business person. Think it over. About the profits."

When I reminded him of this, Panfilov laughed.

"Yes, profit is an important indicator under our conditions," says M. P. Panfilov. "These are new millions from our own fund for technical re-equipping of production. Moreover, this is also a realistic base for us so as to force out universally and finally laborious manual operations. The profits were spent on apartments for workers, on preservation of health and on services for the firm's employees. And all this is an important weapon against such a scourge as personnel turnover."

The problem of turnover here at LOMO long ceased to be an acute problem. It is remarkable what a normal life, good working conditions and excellent prospects for creative growth of all workers and especially for advancement of youth will accomplish.

It is no accident that almost all engineering and technical personnel in the association were quite recently machine tool operators, installers, grinders and metal workers.

Who better than they can know the specifics of production? Therefore, the general director together with the party committee advances to management positions primarily those within the firm, that is those who have grown up at LOMO and who know

the fine points of their duties, who are concerned about the firm and who use their experience and theoretical knowledge skillfully. The possibility of conducting such a personnel policy specifically determines the long term aspects of socio-economic planning. Hundreds of workers attain secondary engineering and higher education, besides general education, without leaving the pay of the firm.

A valuable beginning, universally supported by the party and trade-union organizations of LOMO--brigades that service a single piece of equipment but on different shifts are paid at the same rate--was widely developed during the Ninth Five-Year plan. These brigades turn over machine tools "on the run" to each other without readjustment. And the result is 30 minutes saved by each worker during a single shift alone. And there is collective responsibility for the quality of each article.

The nature and content of the labor of workers outside the brigades were also changed.

Joining occupations were developed both main and auxiliary workers. For example, the functions of lubricators and saddle makers were turned over to equipment repair and servicing metal workers and many loaders mastered the occupation of electric-arc welder.

"When you write about the internal affairs of the firm," noted Panfilov, "do not embellish anything. We still have many difficulties and many unresolved problems. For example, take equipment. There is still not enough new equipment for all enterprises. Here is just one example. A small plant that manufactures dividing heads was attached to us. We converted this plant to a shop but equipped it with new unit machine tools and organized a production line. And the shop immediately began to produce 2.5 times more products than when it was a plant. How many people were released! Generally, in one way or another, our firm, like others, lives and operates and increases capacity. There can now be no doubt of any kind: a production association completely justifies itself and the future of our entire industry is in such firms. Their development is in the interests of the state."

One cannot enumerate nor retail all the terms which ensured the success of the firm during the Ninth Five-Year Plan and the confident entry into the 10th Five-Year Plan in a single interview, even the most extensive interview.

But as a popular saying goes, "It is better to see once than to hear it a hundred times."

So let us complete our "journey" through LOMO. Let us visit together in the shops, laboratories and design offices, everywhere where a continuous, constant struggle is underway to solve the main task of the 10th Five-Year Plan--a five-year plan of high labor efficiency and a five-year plan of quality.

A TOUR THROUGH THE ENGINEERING BUILDING

When the construction materials almost a kilometer long appeared on Chugunnaya Ulitsa and when the tower cranes appeared above them, many thought and guessed: what will be built here? New shops? This is something unfamiliar.

Moreover, an enormous, long building four stories high with reflecting windows from floor to ceiling soon began to sparkle with the whiteness of walls and became filled with sunlight, while fluorescent lamps could be seen inside at dusk, with an even, soft bluish glow. New residents--scientists, engineers, designers and researchers from the different plants that had become part of the firm joined together for the first time joined together under a single roof--appeared in it. They looked with amazement at the enormous light rooms where everything was ready for them: from well-appointed furniture to portable computers, special transparent grids for drawing printed-circuit cards and hundreds of other necessary accessories which will be required in calculations, research and design.

If a large meeting must be held, a complex design must be discussed or opinions must be exchanged, there is a vast conference hall.

The new engineering building contains modern apparatus and the latest equipment: domestic, imported and "our own" made at the firm itself. And alongside is a special experimental shop. Here they can embody in metal any idea of a designer. They can make an existing mockup of any assembly or of an entire device and can check the value of an idea or the accuracy of calculation in practice rather than theoretically.

All the design services of formerly separately existing enterprises were included in the TsKB [Central design office]. But the work is now arranged by a new principle--clear specialization. Specialization in each direction of instrument building. Specialization in general engineering problems. Maximum elimination of any intermediate links in management.

A vertical structure has been developed here. It appears thusly: engineer-researcher--designer--chief of specialized design office--chief of central design office. And immediately the number of managers in this subdivision was reduced by almost one half! And one can say that operativeness in solution of many problems was doubled.

Every design office specialized by direction is totally responsible from beginning to end for a high technical level of a future device. Whether it is the design office of astronomical instruments or spectral devices, movie equipment or measuring equipment, video recording and so on, it contains not only design groups but specialized laboratories required for complex engineering solutions.

Incidentally, the number of design groups contained in special design offices is in no way constant. It may also vary if the nature of devices which are being developed at a given time varies.

With all the narrow specialization of these instrument SKB [Specialized design office], they also have common engineering problems: engineering calculations, calculations of optical systems, reliability, esthetics, packaging and packing. Specialized general engineering subdivisions also solve these problems. For example, the engineering calculation design office, the artistic design office, reliability laboratory and packaging and packing design office. Moreover, although the name of the latter design office sounds very dull and prosaic, it performs the most important work. It develops beautiful, elegant packing and packaging for all the association's products according to the specifications of the instrument SKB.

Development of this design office made it possible to standardize packing crates, packaging and even individual components of their preparation--to introduce a unified system of drawings and to introduce new, inexpensive and reliable materials for manufacture of packaging: cardboard, styrofoam and plastics. As a result cases of breakage of instruments were reduced sharply and labor productivity in design of packaging and manufacture of it was greatly increased.

A department appeared which services designers with all auxiliary work in technical documentation. Photostats are manufactured here and an engineering archive is maintained. Electrography is used here for rapid copying of any drawings and documents are microfilmed here.

All these and other auxiliary subdivisions have one goal--to free to the maximum the time of designers directly involved in development of devices for creativity.

Before starting our voyage through the firm's design offices, I came to the chief engineer of the TsKB Viktor Alekseyevich Zverev--a young scientist. In the recent past he was a graduate of the Leningrad Institute of Precision Mechanics and Optics and is now a candidate of technical sciences. Zverev and the TsKB are responsible for the technical level of products produced by the firm in all directions of development of instrument building and they determine the main direction of scientific research work at the firm.

Viktor Alekseyevich is enthusiastic about his work and recruits knowledgeable people and specialists in many fields of science and technology who are related or can be related to development of modern optics.

"We are convinced," says Zverev, "that the most qualified specialists and scientists should create new equipment primarily there where it is being directly developed. The development of science is dependent to a large degree even more so on

the equipment which our firm develops. The 25th CPSU Congress," he continued, "emphasized with special force the importance of rapid introduction of the advances of scientific and technical progress into production. And we at LOMO have already felt the contradictions when one organization is responsible only for working out drawings or developing a prototype of an article and another is responsible only for industrial production of them. As a result soil is created for irresponsibility and lack of accountability."

Under conditions of the firm, it is immediately important that all designers be responsible for the quality of any device with the LOMO mark at literally all stages of development.

This principle is especially important now when we have entered a five-year plan of quality and our main task is to bring the firm's entire production up to the level of the best foreign models. This is a difficult task but we are now up to it.

The 10th Five-Year Plan opens up the broadest field for creativity: one labors, takes risks, tests and looks bravely into the future.

I saw how this slogan is accomplished in practice, having visited many design offices and research laboratories of the firm.

The Birth of Unique Telescopes

I cross the threshold of the design office. Externally this looks like any design office. It is quiet and there are people at their desks. The most complex instruments such as a giant reflector telescope are born here.

The firm did not let down the expectations of astronomers who believed that "they can do everything" at LOMO. Scientists at the Byurakansk, Crimean, Zelenchuk and other observatories have already received unique telescopes. And a number of the most valuable discoveries have already been made with them.

The Soviet interplanetary station Venera-7 was launched into the universe and rushed toward the stars and it was recorded by the Crimean telescope when it was a distance of 160,000-170,000 kilometers from the earth. The positions of the station itself were precisely and sequentially recorded on film.

The Crimean telescope has a "brother" at Byurakan. It turns out that the "brothers" are in no way twins. This is the tradition at LOMO: the next instrument of the same type should be improved.

And now the Byurakan telescope already has considerable advantages: the optical circuit was modified and the capability of simultaneous setting of three different light-detecting devices was provided if necessary. This is very important in research. For example, replacing the spectrograph with a camera requires 30-40 minutes in the Crimean telescope. In the Byurakan telescope it is sufficient only to rotate a diagonal mirror. This requires 2-3 minutes.

Both telescopes have photoguides (an automatic star-tracking system). But the Byurakan telescope has a remote device that permits one to see a celestial object

on a screen, to control all systems from a single central station and moreover, guiding accuracy is considerably higher.

And, finally, there is the well-known BTA with six-meter mirror which was discussed at the 25th CPSU Congress.

Putting these devices into operation has alone advanced the USSR to first place in Europe in the number of operating telescopes that meet the most modern requirements of science and technology.

Chief designer Bagrat Konstantinovich Ioannisiani was awarded the Lenin Prize for development of domestic telescopes and a number of other astrophysical devices.

I am talking with Bagrat Konstantinovich at his desk. The idea of developing the largest telescope with which astronomer scientists obtained much of the most valuable data and made unique investigations of distant stellar systems and intergallactic nebula which could not be "reached" previously because no one had a detailed astronomical instrument to cover the distance of millions of light years, was first born here. And now it exists and was developed at LOMO. This is the largest, most powerful and most all-seeing eye on the planet. This unique telescope was constructed over a period of 15 years under the direct supervision and with the participation of general director of LOMO M. P. Panfilov.

Bagrat Konstantinovich talks simply about things of enormous significance and is slightly ironic about himself.

"How and why did I become a designer? Simply because there was nothing else I could do."

His life's path began at Leningrad many years ago even before the First Five-Year Plan at the Ravenstvo plant. He was a transmission lubricator in a shop and then a draftsman at KRASNAYA ZARYA. And later he dreamed at one time of becoming a musician.

He did not become a musician but the harmony inherent to music and inspiration can all be followed in his amazing creativity when he develops telescopes. A fusion of beauty and power. And always the most optimum solution of the most complex problem.

He began with the design of a school telescope. He developed a meniscus telescope --the world's first--a telescope with mirror diameter of 2.6 meters. And finally he developed the BTA.

"The main problem? There were many main problems," smiles Ioannisiani. "One of the most unpleasant was the rigidity of design. This has always been a problem for telescopes. The dimensions increase and the tubes increase and everything becomes many times heavier. And the law of deformation comes into effect. Finally, the telescope tube bends and becomes distorted by its own weight. Finally, there is a misalignment of some tenths of a millimeter. But this would have a harmful effect on the quality of optical images. Ways must be found to compensate for this."

One looks and looks!

How much design and production research development of the mirror required.

One can ideally pour a gigantic piece of glass for a telescope but it still does not become a mirror. The inevitable internal stresses occurring during casting must still be removed. Otherwise the mirror "walks" or rather "creeps" and becomes practically unsuitable for astronomical observations. Internal stresses were removed by annealing which continued for 738 days! The most careful polishing of it continued for about 2 years and then the six-meter "eye" had to be covered with the thinnest aluminum layer no more than one thousandth of a millimeter thick in a vacuum. This operation with a part weighing 42 tons has never before been done in the world.

Or take the telescope supports. One hears simply "supports." And each is three stories high. It contains laboratories and auxiliary rooms. Elevators move inside the supports.

"Yes, we developed the world's most powerful telescope with great light-gathering capability or, as journalists now love to write, the earth's big eye. This permits investigation of processes occurring in the most remote sections of cosmic space. These investigations are inaccessible to other telescopes."

Bagrat Konstantinovich related in detail about installation of the gigantic BTA, about its capabilities and presented figures, technological data and calculations. Ioannisiani took a pencil and began to calculate. He thought, knitting his thick, black eyebrows on the bridge of his nose.

"Well, if one eliminates atmospheric interference and does not take the earth's sphericity into account, our telescope is capable of recording the light of a candle ignited at a distance of 25,000 kilometers!"

This is what the prominent English astronomer Redish wrote to the chief designer: "Dear Doctor Ioannisiani! Doctor Davis and I are exceptionally grateful to you for useful consulatiion on the altazimuth telescope design. Your report on this was favorably received. We here have good hopes for the future."

The gigantic telescope constructed by LOMO has advanced worldwide science and engineering practice.

Chief designer of the telescope. In the given case are not so much a designation of an official position. They contain the very essence of the matter in which Ioannisiani has been involved his entire life. After all, one can simply designate a chief by position and he can be replaced, but to be the chief in such an extensive sive, important and crucial matter due to his own talent, unlimited creative interest and to have the skill to ignite it in others--not everyone can become such a person.

Chief designer Ioannisiani has extensive experience: he designed the telescope for the Alma-Ata observatory, a meniscus telescope for the Abastumani observatory and 2.6-meter reflector telescopes for the Crimean and Byurakan observatories.

When he was developing the 2.6-meter telescope, Bagrat Konstantinovich suggested an essentially new device, simpler and more improved, instead of the long and universally accepted yokes that support the tube. There were also many proponents and many opponents. Bagrat Konstantinovich listened to one and the other with identical attention. Both versions were sent for confirmation. Ioannasiani's version was given preference. The advantages are more than convincing: the compactness of the design and mainly the complete guarantee of high observation accuracy.

And here is the new building of the USSR Academy of Sciences, already comparably more complex with a gigantic reflector with six-meter mirror.

Up to this time only in the United States did they know how to develop a reflector telescope with mirror diameter of five meters. The telescope mirror, as already noted, is exceptionally complicated to manufacture, machine and relieve the stress. The precision of the mirror working surface is determined in fractions of a micron and itself weighs approximately 42 tons with an area of approximately 27 square meters. And this mirror must be firmly held and rotated. That means a movable support that excludes deformation of the mirror reflecting surface must also be developed. And then one must decide from what material to make the mirror itself and with what and how to machine it. This technology did not exist previously.

At today's level of science and technology with the endless variety of fields related to each other, it is impossible to image a designer of such a multicomplex instrument as a modern telescope in isolation even one who is supertalented.

These problems can be solved only through the efforts of a large, friendly collective of scientists, designers and investigators joined together at the firm. That is why Bagrat Konstantinovich talks with great warmth about his own numerous colleagues at the design office and about such prominent specialists in this field as N. S. Samofal, V. V. Bobashov, V. A. Kovalev, I. K. Pavlov, L. P. Karabutova, M. V. Lobachev, V. N. Pavlov and others who headed the group which made complex calculations with unprecedented accuracy of special relieving of the unique mirror on the support, preventing deformation of it.

To aim such a gigantic telescope more accurately and more rapidly, a complex telescope control system had to be developed which includes a digital control computer. And they developed this system and the control computer at the firm itself in one of the laboratories which is managed by candidate of technical sciences Ye. N. Neplokhov. Bagrat Konstantinovich also notes many other names of scientists, engineers and technicians from the astronomical office itself and the workers and people of unprecedented skill and inexhaustible creative thought intimately associated with them. These are engineers V. B. Labinskiy and B. G. Kovalev, engineers-assemblers I. M. Varvarkin, A. A. Nekrasov and F. M. Barkovskiy, young engineer G. I. Amur who managed the machining of the unique mirror and these are experienced "celestial optics" technician V. V. Oshurko, a researcher, and many others.

An now a few words about similar BTA telescopes developed at LOMO, also unique in their type.

"We made three telescopes quite recently," relates the chief of the design office and chief designer of these telescopes V. V. Demidov, "which indicated the beginning of a new phase in astronomical instrument building."

For example, take the AZT-12 telescope. This is a 1.5-meter mirror reflector. It has three optical systems. The first of them is a so-called primary focus system with quartz corrector designed to photograph elongated sections of the sky. The second system is used for observations by photographic, photometric and spectographic methods. And the third system is needed to conduct spectral investigations.

Transition from one optical system to the other is accomplished by simple replacement of individual optical components. This is carried out automatically.

There is also the AZT-11 telescope. It is totally automated. It is designed for photometry of the luminous fluxes from stars. The main mirror has a light diameter of 1,250 millimeters. Aiming, tracking and control of the observation process, input and output of filters, references and diaphragms, photographing the results and making corrections--all these many operations are completely automatic. And a special cybernetic machine controls the telescope. The memory of this machine is such that it permits an observation cycle of several hundred stars to be programmed and to make photometric measurements of them during a single night! But this is already behind.

"And what is in the near future?"

"In the very near future there is a solar telescope for the new solar 'service.' There is also a series of chromospheric telescopes. There is also a meridian disk for astronomical measurements."

"What things new are being done at TsKB to accelerate the development of astronomical instruments?"

"That is a valid question," says Demidov, "especially if one takes into account that the number and complexity of problems in this field will increase sharply even during the current decade."

Development of a single medium telescope 1.5 meters in diameter alone required 4-6 years in the past. If one takes into account the growing rates of "moral" aging of equipment, the problem of acceleration of development and introduction becomes one of the main conditions of technical progress. We are faced with the problem of reducing the cycle of developing astronomical instruments to 1.5 to 3 years. And with the same if not fewer forces since a reduction in the development cycle should be "won" by skill rather than numbers. And we have concluded that standardization (even under conditions of individual production) becomes one of the levers with which the periods of development and preparation of production and expenditures cannot only be reduced, but labor productivity and the quality of our instruments and their reliability can also be increased. This is the main task in development of new instruments that are at the level of the best worldwide models and that sometimes exceed this level. And the efforts of the astronomical instrument builders have been directed toward this task.

However, we must knock on another door.

Interview at the Special Design Office of Microscopy

The first microscopes were developed at Nurnberg more than 200 years ago. Many of these old-timers have been exhibited in Moscow at the Polytechnical Museum alongside modern microscopes. The tourguide, showing you their collection, says with a smile: "The difference between them is like that between a postal carriage and a spacecraft."

A modern microscope is a most complicated device where electronics and automatics serve optics and this makes the microscope an irreplaceable instrument of investigators in the most diverse fields of science, engineering, medicine and industry.

To the question what sections of physical optics does the work of the office encompass, they answered me: all sections.

The SKB of Microscopy produces the most diverse microscopes: biological, luminescent, ultraviolet, infrared, polarization, metallographic, high-temperature and microscopes for nuclear research and for microelectronics. The list of them is very long. And there are also devices for microphotographic filming and micromovie filming. The SKB is a unique organization in the USSR which is engaged in development of luminous microscopes of different designations. The office also develops measuring devices to investigate the roughness of machined surfaces and also works on development of devices for local microspectral analysis.

One of the leading designers shows me an experimental model of the new MMR-4 microscope. They have long been waiting for it at the metallurgical plants and at scientific research institutes.

It is very important in manufacture of metal to determine as accurately as possible the structure and different inclusions. The MMR-4 metallographic working microscope helps metallurgists to investigate more precisely the structure of alloys. It is equipped with optics with plane field--so-called plane optics. Due to this, the microscope clearly "sees" an object through the entire visual field, whre as its predecessor produced a sharp image only in the center.

"How does standardization in microscope design appear in practice? Here is at least one example."

"An entire series of polarization microscopes was renovated during the Ninth Five-Year Plan. Transmitted light microscopes--the MIN-8 and MIN-10 (for investigation of transparent minerals) and the reflected light microscope--the MIN-9, designed to work with opaque minerals--have been replaced by standardized devices of the POLAM [expansion unknown] type. The labor productivity of geologists will be increased significantly by increasing the operating qualities, introducing new optical components and changing the design parameters."

The designers, mathematicians and investigators of the SKB are working on a broad topic of standardizing these microscopes. A group under the supervision of R. M. Raguzin manages the design part, investigations are conducted by the group of chief engineer A. I. Frez, while new optical systems are calculated by specialists headed by engineer T. A. Ivanova. Many microscopes developed by them have won the State Emblem of Quality.

"Does your SKB develop only microscopes?"

"The thinking of designers and investigators of the SKB is directed toward development of devices that considerably alleviate the work of geologists. For example, we are working on an integration device to measure the quantitative composition of minerals--a microrefractometer that permits one to determine the refraction of fluids and others."

Incidentally, it becomes ever more difficult to determine where a microscope ends in "pure form" and where other devices begin since all modern optical devices are a complex installation and include both a microscope, spectral equipment and also laser equipment.

Incidentally, a word about the devices which the firm makes for geologists and metallurgists. There is among them one which is a "hybrid" microscope and laser. Its designation is microspectral analysis.

Geologists have discovered, for example, a hardly discernible point--impregnation--in a rock specimen. This is possibly a substance or mineral, a trace of which they are seeking. But try to extract it to make an analysis. The problem is solved simply by using the device: the specimen is placed under a microscope coupled with a laser and this valuable point is found and the crosshairs visible in the microscope are aimed at it. This means that the laser is also aimed at the point. A flash and the impregnation is converted to steam while a spectrograph (it is also contained in the device) records the composition of these vapors. This is a "three in one" device for you: a microscope-spectrograph-laser. But lasers are another matter of the SKB.

On the Trail of the Magic Ruby

Yes a laser is now known to everyone. During childhood many love to amuse themselves with a magnifying glass and to ignite a sheet of paper with the rays of the sun. One or several watts of power are produced during this. Modern physicists who utilize light rays in their work have learned how to concentrate power of 100,000 kilowatts on a single square centimeter. The temperature of the light spot reaches 100 million degrees. The thinnest light beam drills through diamond within a fraction of a second. Impressive data!

The operating principle of the laser is quite simple. A crystal ruby rod is placed alongside a powerful flash lamp. The ends of the rod have a coating. The electrons in the ruby atoms are set into oscillating motion due to the light pulses until the beam generated by them breaks through a narrow aperture in one of the doped ends of the crystal.

They sketched the circuit at the design office and I saw a laser in operation in the demonstration hall of the firm. It is demonstrated to touring school children and in their presence the laser beam drills through a metal plate which the lads and lasses take with them as a treasured souvenir.

Industrial production of lasers was first developed at LOMO with the assistance of scientists of the State Optical Institute and peaceful lasers designed for our

industry and medicine were also developed at LOMO. Surgeons call them bloodless scalpels. The most delicate operations on the eyes are made with these remarkable instruments and oncologists use them successfully.

The laser design office is the youngest in the firm because this field of technology is also very young. And the chief designer is comparatively young and we walk with him into one of the optical shops to watch the birth of a laser.

A worker brought a ruby rod from a case. He was supposed to machine its ends with very high accuracy.

I saw those people who were attentively following numerous instruments. The people studied all parameters of newborn lasers, noted the slightest deviations from the norms and immediately decided what to do to eliminate these deviations. This was also the main task of the adjusters.

Workers--but the level of problems which they solved was an engineering level that requires broad theoretical knowledge. The laser adjusters, like adjusters of other, most complex devices at LOMO, are usually people with an engineering education or are students of vuzes.

Behind each door are enthusiasts and developers of models of new equipment, new devices and apparatus which are thought up here, calculated and acquire the first outlines in drawings.

Incidentially, almost all the movie theaters in the Soviet Union are equipped with movie projectors with the mark LOMO and the sound engineering equipment developed and created at LOMO--the largest USSR enterprise in production of modern apparatus for creation and showing of movie films--is used in almost all movie theaters and in all the largest concert halls of the Soviet Union.

The deputy chief of the TsKB Tamara Mikhaylovna Senchugova talks about this:

"The engineering process of developing a film is very complex. Different devices--preliminary sound recording equipment, dubbing and duplication. Sound amplification equipment, modern microphones and loudspeakers are required for movie concert halls and places of entertainment. The specialized design office develops all these these devices.

The best specialists were concentrated in the office during organization of the firm. This made it possible to carry out developments at rapid rates and at a high technical level.

For example, the essentially new apparatus Zvuk reproduces the sound of ordinary and wide-format films. Its sets are designed for the most diverse outputs. And they can also be used for operating with an ordinary microphone, tape recorder, radio receiver or phonograph--in general, in the widest range of operations. The Zvuk immediately forced out many expensive amplifying devices of different types. They were immediately taken out of production. The new apparatus is more improved but is simpler to manufacture. It is designed on the basis of standardized units--

preliminary amplification, power supply, loudspeaker heads and so on. Standardization makes it possible to use a progressive technology, efficient organization of labor and naturally leads to an increase of productivity in the shops and also makes it convenient to operate.

Movie theaters and clubs have received an interesting innovation during the past few years. The KZVP-10 universal portable sound-reproducing device was developed and put into serial production. It is designed to serve movie theaters and clubs with capacity up to 200 viewers and also for mobile movie installations which number up to 150,000 in the country. This is a small, transistorized device designed on the modular principle.

The Solist mobile sound engineering equipment, which is designed to serve stage presentations, was first developed in the country at this SKB.

Cinematographers who must frequently conduct filming during expeditions are assisted by the Ritm-2 tape recorder, designed to record speech and music under full-scale filming conditions. A special recording console that permits 10 pieces of equipment to be switched on simultaneously (monitored by the sound engineer) offers great opportunities to sound operaters.

The SKB has conducted considerable research to improve the sound amplifying equipment which is designed for multipurpose halls. It now completely provides stereophonic and monophonic sound amplification and sound reproduction when showing wide-format, wide-screen and ordinary movie films having magnetic and photographic sound tracks.

Unique sound amplification equipment has been installed in the large Kremlin palace, in the building of the Presidium of the USSR Supreme Soviet and in the reception building.

The design office develops standardized sound engineering apparatus for recording, re-recording and copying magnetic sound tracks. Integrated circuits and transistors will be used in the electronic units.

"We now have everything for successful operation," continues Tamara Mikhaylovna Senchugova, "the firm makes available to us a special acoustic test room and a research center of the laboratory."

Now work, create and bravely experiment.

The Great Grandsons of Fotokor

The reader knows already that one of the first Soviet cameras--the Fotokor with bellows camera--was born during the prewar years in the shops of GOMZ.

Now millions of modern cameras--grandsons of the Fotokor with the mark LOMO--are in the hands of amateur photographers not only in the USSR, but in many countries of the world--England, Italy, West Germany and others. According to general acknowledgement, LOMO cameras are now superior to the products of some foreign countries

in their class in quality and, which is no less important, in cost. A number of models and mockups of the latest cameras can be seen in the camera SKB and one can meet their developers.

How many generations of amateur photographers dreamed about an automatic camera which would free them from selecting the exposure time and diaphragm size prior to taking a picture. And many factors must be taken into account to correctly determine these values: brightness, contrast, the light sensitivity of the film and so on.

Hence there are frequent uncorrectable errors which not only amateur photographers but professional photographers as well make.

"Our designers," they related to me at the camera SKB, "helped to a significant degree in making the dream of amateur photographers come true by developing the Sokol camera."

The required shutter speed is set prior to filming. It is known that a fast shutter speed of approximately 1/250 or 1/500 second must be set when filming moving subjects, while the shutter speed has no significance when filming a landscape but in this case it is very important to set the aperture size so that the depth of image sharpness is increased when the object is diaphragmed. An automatic camera selects the diaphragm size for the set shutter speed. If the amateur has set an incorrect shutter speed for which the necessary diaphragm cannot be selected, the automatic camera corrects the error.

LOMO designers went further, having developed the world's first five-program automatic camera with preliminary information in the viewfinder on the actual values of shutter speeds and diaphragms. The amateur only has to lightly press the start button prior to filming and the digital values of shutter speed and diaphragm appear in the viewfinder which the automatic camera triggers.

The developers of the Sokol camera have obtained an inventor's certificate for it in the USSR and LOMO has patented it in France and Japan. Moreover, this camera was awarded important gold medals at VDNKh [Exhibition of Achievements of the National Economy] of the USSR and at the International Leipzig Trade Fair. And despite this, the joint work of designers and technicians is persistently continuing at the design office on improving the operational characteristics, on simplifying the design and on reducing the cost of the camera.

The enthusiastic designers are ready to talk continuously about the newest and latest cameras for amateurs. This includes their contribution to fulfillment of the socialist pledges of Leningrad workers to assimilate production and produce new consumer goods.

Among the new goods is also a family of modern, reliable amateur movie cameras, the Avrora.

"The Avrora-14 is the latest representative of the so-called simple class of movie cameras," explains the chief designer N. I. Panchenko. And here he notes with a smile: "However, what does simple class mean in our time? The amateur movie

photographer needs a convenient and simple camera. The new camera also meets these requirements. It is supplied with the most complex systems which ensure filming on color and black-white 8-millimeter movie film of super-8 type. Cartridge loading of the camera is used for the first time. This is a great convenience for amateur movie makers. An objective with variable focal distance was used for the first time in a camera of this class. This permits the scale of the image to be changed during filming a large background and to diversify the film."

Even prior to production of the last model, the movie camera had recieved high marks of Soviet and foreign amateur movie makers. Here is just one letter from England: "Gentlemen, last year I acquired your movie camera Avrora. Until now I had never made amateur films. I found that the camera is simple to handle. My first film was quite acceptable. I feel that I should thank your association for developing such an inexpensive and good design of a camera. I hope that I can make even more amateur films. B. J. King, London."

Those Who Saddled the Rainbow

The rainbow, the rainbow--it is long ar oused not only the fantasy of poets but the thinking of scientists as well. Scientists have established that this intriguing arc is nothing more than refraction of light and splitting of it into the spectrum. Developers of spectral instruments which now find the widest application in all kinds of scientific research and to monitor various production processes, make use of this phenomenon.

Yevgeniy Ivanovich Lebedev has for many years headed the specialized design office of spectral instruments, without which progress in different spheres of modern science and technology, from metallurgy to medicine and chemistry, would now be practically impossible. Yevgeniy Ivanovich is in his forties. He is a broad-shouldered and broad-faced man with cheerful hazel eyes.

In 1944 his father enrolled him in the plant technical school where they trained optical specialists. Yevgeniy was attracted to optics. Not having yet defended his diploma, student Lebedev, who had only turned 18, was assigned to work in the plant design office. Together with the other engineers, he was immediately entrusted with developing an optical device.

An the facets of his talent were discovered here: independence, initiative and creative daring!

In the shop the metal workers and engineers assembled a device "from paper." They are the first advisers, consultants and critics. Since then there has remained a special attachment, a special partiality and trust in these consultants in the work shops.

But even long before Lebedev received a vuz diploma, the young designer was summoned by the then chief of the design office, who said with a smile:

"Be glad, Lebedev. It has been decided to appoint you the leader in the group who will develop the IKS-15."

"The IKS is an infrared spectrophotometer. A completely new model of a device, more improved to determine and measure the chemical composition of matter, had to be developed. These devices were required for research institutes studying the structure and quality of materials."

The future device was represented by an entire complex in which both optics, mechanics and electronics would be combined. When the IKS-15 was born, an entire collective labored on it--engineer Nikolay Sergeyevich Golyandin was responsible for the electronics, Neonila Ivanovna Ivanova, a specialist in physics, conducted physical investigations and Natal'ya Sergeyevna Moskaleva supervised the investigations.

But Lebedev remained the leader. He was responsible for joining all the systems into a unified organism and for giving the device its final form. And his word was last in all debates, inevitable during creative search.

After LOMO was formed, the SKB acquired well-organized and equipped scientific research laboratories: electrical engineering, optical-physics and diffraction gratings. Ye. I. Lebedev headed the SKB which now reminds one in scope and scales of activity more of a large scientific research and design organization.

What are they now doing, what are they working on and what are they developing?

Yevgeniy Ivanovich shows an installation connected to a gray metal housing, inside which is hidden a secret miraculous rainbow.

What is it for?

Now imagine an open-hearth shop and a molten flow of steel filling a gigantic ladle. But before releasing the steel from the furnace, one must find out whether it is ready or not and whether it will receive the mark which it has been given. This was previously done thusly: a sample of steel was taken with a special ladle and the metallurgist guessed "by eye" and by color whether or not it was time to pour it.

This was in the past. The development of metallurgy now requires precise and objective analyses. And chemistry came to the aid in this case. But the foundry worker at the open hearth waited for 30 minutes to an hour until the chemical laboratory provides an answer. As a result the process itself was delayed. Chemical analysis took too long.

But could it not be done more quickly?

It could. Metallurgists take a sample of steel and receive a precise answer about the quality of metal within minutes by using a spectral quantometer. The specialists figure that if quantometers could be universally introduced into metallurgy, the productivity of smelting would be increased considerably.

"Metallurgists were pleased with our device," says Lebedev, "but even so this device required too much time. Follow the pointers on the scale, take the readings and calculate from special graphs."

And a group of designers developed a special automatic electronic device. And they equipped the new quantometer with it. Now it not only makes an analysis within 3-4 minutes, but automatically issues an answer in written form on a form: the percentage of manganese, sulphur, nickel and so on.

The long row of desks in the SKB is just like sailboats arranged near a dock wall. Every draft of the assignment is sent directly from the drawing board to the experimental shop, is converted into a model, then into an experimental prototype and again undergoes investigations in laboratories until it receives authorization for serial production.

For example, the MFS-5 is a new type of quantometer. It predicts whether it is time for an article, machine or engine to undergo major overhaul. Only a drop of oil taken from the engine subject to checking is required for this. And the degree of wear will be determined instantaneously.

Yevgeniy Ivanovich shows letters from the depot of Vologda Station: "Your MFS-5 monitors the condition of 300 diesel locomotives. The saving is approximately 100,000 rubles annually." And this is at one depot alone.

Somewhat later I am in the shop of assembler-metal worker Yuriy Ivanovich Murav'yev, who developed the first of these devices and explained its operating principles. He related how oil specimens ignite and metal residues are detected during this and how the device fixes the percentage of metal saturation of the spent lubricant.

And the developers of this device--engineers I. Trilestnik, M. Fridman, N. Sidoruk, A. Livshits and S. Orlov--have long been working on new, more improved models of the device. The first device is only a starting point.

Workers of the Lebedev SKB designed a spectrophotometer for medical workers. The devices makes a diagnosis rapidly and without error. Take, for example, a thrombosis or hemorrhage.

And I would also like to note one characteristic feature of the spectral SKB. Lebedev recalled a case which caused serious speculation among the designers. Once a new universal quantometer was installed at one of the metallurgical plants. Before shipping it, it had been carefully tested and checked at the firm. The device operated perfectly. And suddenly there was the alarm bell: the device was not operating! A colleague of the SKB flew immediately to the place. What was wrong? And the fact was that the person did not really know how to work with such a complex device. Printed-circuit designs, even the most detailed, were inadequate. The least inaccuracy and the device failed.

They decided that the operators should be trained at the firm. That is to say at the primary sources. And so representatives from Moscow, Izhevsk and Donetsk were in the SKB laboratories. And engineer-researcher Svetlana Vyacheslavovna Podmoshenskaya, one of the developers of the quantometer, conducts exercises with the operators. A dependable device should be in dependable hands!

And when does custody of the SKB over its child generally end?

"This is not a simple question," says Yevgeniy Ivanovich. "After all you can't predict everything and foresee everything beforehand. Take the DFS-10 quantometer. It seemed to the designers that everything in it was "absolute". But the device operated for some time in the metallurgical shop and it suddenly became clear that dust, despite special protection, still penetrates onto the optical mirrors. And this means that they must be carefully cleaned from time to time, but the coating is worn away with this. And the concerns of the investigators again begin anew: what to do? What should be done? Formally we are perhaps not responsible. However, we cannot act on the principle: "Once the customer accepts it our duty is done." Our investigator requests the assistance of the electrovacuum laboratory of the firm: the mirrors must be enclosed in a reliable protective layer. And they search, test and set up experiments immediately in this laboratory. Finally they find the method. And the optical mirrors are enclosed in a strong protection."

Yevgeniy Ivanovich relates how literally every day ever higher requirements are placed on the quality of modern spectrophotometry. The range of customers is expanding continuously and each has their own specific requirements.

I saw a list of new customers. The Scientific Research Institute of Cardiology, the Alma-Ata Airport and the Belgrad Vitamin Plant, the Agricultural Experiment Station in the Ukraine and the Institute of Obstetrics and Gynecology in Georgia request spectrophotometers. Tens of new and the most different devices in innumerable versions are required. Are now the limits of the SKB too confined for this?

"This is a flexible concept--confined or not confined. We look at this thusly: the more diverse the instruments which we develop, the more flexible and more efficient should be the approach to solution of any creative problem. Those high requirements which are placed, let us say, on spectrophotometers, can be satisfied primarily by "families" of instruments that solve different problems on the basis of a single baseline instrument rather than by development of new models and consequently standardization of numerous assemblies and parts is necessary. There are immediately many advantages here both for production and engineering."

Incidentally, this standardization made it possible for a group of SKB designers to develop a thematic plan ahead of schedule for yet another mark of ultraviolet spectrophotometer.

A step was then made toward improvement of spectrographs. The designers developed and created for them special photoelectrometric recording accessories. And it turned out that many research institutes had no reason to acquire the expensive new instruments. It was sufficient only to acquire the accessory. Thus, yet another feature of this collective of designers of little importance was manifested: concern not only about the economy of their own SKB or their own firm, but also about the economic interests of all for whom they work.

Concern about economy pushed toward a new important direction in the work of the SKB designers--a reduction of the metal consumption of instruments. They do not conduct a campaign because of some slogan, but from sober thrifty calculation. After all, for example, tons of pig iron are expended on massive castings for the bases of instruments alone.

Lebedev and his colleagues began to calculate not only the excess weight of metal but also the excess time and escess labor of the machine tool operators which is expended on machining the heavy castings. And it was suggested that they reject these castings and replace them with a design from sheet metal.

Initially there was much concern even about this. An unusual approach! But even so the latest model of the IKS-29 spectrophotometer sits on a sheet rather than on a cast iron foundation and the results are excellent. And at the same time tons of cast iron are saved from being machined into cuttings.

As you can see, the people "who have saddled the rainbow" have their feet on the ground, but sober thrifty calculation does not interfere in any way with the flight of creative thought!

An excursion through the engineering building is similar to an excursion into the world of the latest modern technology of instrument building from its very sources, where it is "created," where unusual monitoring and measuring instruments begin their journey from the drawing board to the real world. Here is an instrument for measuring the diameters of quartz tubes by the contactless method, here is an interference inside micrometer designed to measure openings with accuracy up to 0.1 micron, an automatic dividing machine for high-frequency hatchure gauges, an automatic scale monitoring device and mockups of video tape recorders for the country's television centers.

It is difficult to imagine that all this innumerable variety of the most complex equipment is created at one enterprise and at the highest level too.

What are the most pressing problems common for the entire TsKB that are being solved today?

"One of the most pressing problems," relates the chief engineer of the TsKB, is universal introduction of microelectronics into design of optical instruments and equipment. This alone will ensure their high reliability and will reduce the weight of many instruments by a factor of tens. The laboriousness of equipment manufacture will be reduced through extensive use of integrated microcircuits.

The problems are many and complex, but they are solvable.

THE FIRM CONDUCTS RESEARCH

What is a modern enterprise and a modern production association? Today these are not only shops which are saturated with automatic lines, machine tools with program control and remote control devices but these are also design offices and scientific research laboratories. The joining of production and science has entered the epic of the scientific and technical revolution as one of the main indicators of the time. New production processes, new materials and new designs are being developed in industry ever more frequently through their own efforts.

An example of this is the Leningrad Optical-Mechanical Association imeni V. I. Lenin. There are many doctors and candidates of sciences here. The design offices and laboratories of the firm are ever closer to the level of scientific research institutes in the scope and scale of their activity and in their practical results.

A designer-scientist working in industry is now a widespread phenomenon. These are people who combine high theoretical training and the capability of independent research with the grasp of managers and with extensive knowledge of the characteristics of serial production in the fine points of its technology. They also now emerge as leaders in the competition of Leningrad workers to reduce the deadlines for development and introduction of the new begun at the initiative of the leading associations.

I shall attempt to talk in these features about two engineer-researchers of LOMO who participate in solution of this problem.

Fomenko, "Who Can Do Everything"

There is absolute quiet behind an ordinary door with an ordinary nameplate "Electrovacuum Laboratory" if one does not consider the low conversation of 2-3 persons in cream-colored smocks. You look around and everywhere glass or metal domes and domes of the most diverse sizes and shapes, transparent and opaque, flash. Then somewhere aside you notice the blinking of small different colored lamps on a console.

My escort, an elderly stocky person with very kind blue-gray eyes, Pavel Nikolayevich Fomenko, conducts me now downward past enormous black cylinders, now along a narrow steep stairway, now upward onto a platform from which you can see the blinking hemisphere of a gigantic disk. Fomenko's movements are light and precise and he enthusiastically points out the most diverse equipment and fantastic installations.

Thus we complete an amazing excurions: here under each dome or rather under each cap a small "cosmos" has been created, that is, the air has been pumped out with special suction equipment and the same maximum degree of vacuum has been crated as in circumterrestrial orbits. Under these secret caps installed on heavy slabs, glass castings polished with maximum precision, of different sizes and shapes, make planetary motions with the aid of the most precise mechanisms. And the glass under these same caps is bombarded by billions of aluminum, tungsten or gold molecules.

The molecules are "blown off" from metal coils or rods through which an electric current passes. There is nothing threatening about them since there is no oxygen in a vacuum and they cannot burn or become oxidized and nothing interferes with their flight since there are no counter molecules of air in their path and they settle firmly on the bright polished surface of the glass and are transformed into the thinnest, imperceptible film fractions of a micron thick. This film transforms the glass into truly magic mirrors which are installed in a special microscope to penetrate the secrets of the structure of a cell or into powerful telescopes to trap the glow of remote stars and galaxies. Optical mirrors different in design, shapes and sizes are required for hundreds of modern optical instruments most diverse in golds and designation.

Until these mirrors were developed there could be no talk about modern optical instruments. But until they mastered and assimilated in industry the creation of the thinnest and most precise films by means of the electrovacuum method of coating, it was impossible to dream seriously about manufacture of these mirrors.

These films were first assimilated and introduced at LOMO. One of the main enthusiasts of development, introduction and creation of these and many other optical films, the author of the most important inventions in this field, is winner of the state prize Pavel Nikolayevich Fomenko.

The electrovacuum laboratory which he has undoubtedly headed for many years is his child and his pride.

The name of the future engineer-researcher first appeared in the press in 1937. But this had no relationship whatever to his occupation. They wrote about him as about a master in classical wrestling. It turned out that Fomenko, who is now 70 years old, was among the 10 strongest wrestlers of the Soviet Union in the semi-heavyweight class and occupied no lower than fifth place in the championships of the country. And before this he was a boxer for two years.

But the chief attraction of the young Pavel Fomenko was always engineering. First in the small town of Tetkino near Sumami, where his father worked in the rural mill and then at a sugar plant as a fitter-machinist, then in construction, where he liked the occupation of installer. And later he worked in the university laboratory.

Pavel Fomenko liked everything only he hadn't formed his own character. Once he went into the forest with his father hunting--he didn't raise his weapon. His father joked: "Look, the rabbits are amazed at you. They are running around in front of your nose and you are still looking for mushrooms and berries."

After being admitted to the physics faculty of LGU [Leningrad State University], Pavel simultaneously decided to "develop his character." The studies were easy and as is known, his character was being hardened if one overcomes the difficulties. On the advice of his friends, Pavel engaged in classical wrestling. It is not known whether Pavel Nikolayevich's character was changed or whether it needed to be changed, but the physical hardening prepared him for the future.

A boy from the remote Ukrainian countryside intelligently solved the most complex problems. Once Professor Vladimir Ivanovich Pavlov, who at that time taught electronics theory, entering the faculty laboratory where practical exercises were usually conducted, suddenly turned his attention to the electronic instruments. How much time they had not operated, gathering dust and being inoperational. And even so there were not enough people or skilled masters who could repair them. And here they are standing in complete working order ready for operation.

"Who did this?" asked the amazed professor.

"I," timidly answered Fomenko and thought with alarm: Have I broken something?

"Have you previously worked on such instruments?"

"No," admitted Fomenko and began to justify himself: "They were simply interesting to me."

Pavlov smiled and continued:

"Would you like to work at the Institute of Applied Physics? As a laboratory technician. It is right alongside. If so, then come to me tomorrow."

It wasn't far to walk. The laboratory of the institute was then located in the university courtyard. Fomenko's duties were formerly simple--to assist the scientists in conducting investigations.

Academician Sergey Eduardovich Frish capitvated him with problems in the theory of light, spectroscopy and geometric optics. Fomenko grasped the prospects and practical possibilities that had been opened up on the mutual positions of electronics, optics and chemistry. He was the first to encounter the first attempts to apply films to optical glass under high-vacuum conditions. He was very interested in this. And he did not think at that time that his whole life would be devoted to this field.

The university graduate was seemingly given an honored appointment--to teach at the industrial academy. He taught physics and higher mathematics there for several years but his heart ached for something different and he was attracted to research. After all the daring fellow noted precisely that he who accumulates knowledge and does not use it is like a man who plows but does not sow.

And there was a happy encounter with Shoshin. Ivan Alekseyevich Shoshin, a scientist of many talents who at that time was the scientific manager of the design office at GOMZ and a university instructor, was distinguished by yet another quality: he loved talented people and brought them to the plant.

He had no difficulty in convincing his former student, about which they said at the university that he has a clear head and skilled hands, to come to GOMZ as an engineer-researcher in the department of the chief technician.

They tried in the modest laboratory to manufacture by the cottage industry method a vacuum installation for coatings and tried to apply silver to mirror glass.

Fomenko was immediately involved in research work. As an inate engineer, he noted the imperfection of the first vacuum installations and equipment and suggested that they be modified. At the same time he was involved in other problems, including one of the timely problems at that time--magnetic flaw detection. It turned out that very important parts, immaculately machined, suddenly broke and failed under loads under a press or when rotated at high rpm's.

How could they check beforehand whether there was a hidden defect or crack in these parts? Fomenko recalled a prediction described in one of the scientific papers: the properties of permanent magnetic permeability may be useful for flaw detection. If one can magnetize metal and cover it with iron oxide powder, the powder will be arranged in parallel lines on a "healthy" surface. And the lines will follow a crack hidden in the interior and will be bent on the same surface.

Fomenko began investigations and worked out a method and practical method and handbook on magnetic flaw detection. A special instrument was developed which technicians jokingly called a "Fomenkoscope."

Fomenko remained in Leningrad during the blockade. He was the last among the plant staff to be evacuated. The order was issued: the remaining specialist opticians were to be used in work for the front. Combat vessels urgently needed special nonmagnetic instruments at that time. "If they need them, we will make them," answered the opticians.

On one of the days the warehouse where the necessary machinery for these instruments was stored burst into flames, ignited by fascist bombs. And then Fomenko together with his comrades rushed to the burning warehouse. The necessary mechanisms had to be saved. Production of nonmagnetic instruments for combat vessels was organized.

And again an important question arose: where to obtain transport to deliver the parts? There was no fuel and almost all the vehicles were at the front and there was no one to drive them either. The only lorry was a gas transporter which "puffed and blew" and stopped frequently. The driver was unable to start it. He cranked it in front by hand in the old fashion. Who had the strength? They asked him, the former wrestler, Fomenko! Here at one time was accumulated some strength!

Fomenko did this willingly, but like a true engineer, figured that the efficiency from this effort was not so high. And what would happen if he himself sat behind the wheel? And he learned how! He received an official driver's license. And the engineer-researcher, "who held more than one office," took the wheel, as they would say now, "like he was born to it."

But what is one machine for a plant? And once in the plant yard a gas-delivery truck of completely unique design began to rattle in the plant yard. It was Fomenko's design. He collected parts, assemblies and components from former trucks at dumps and along the sides of the roads to the front. This was probably the first case in history when an optician had built a truck. This now sounds like an amusing curiosity. But at that time the Fomenko truck labored quite successfully in lumber procurement.

Later, toward the end of the war, Pavel Nikolayevich, with the firm reputation of a person "who could do everything," supervised construction of the plant railroad branch.

Thus, during one of the most severe days of the blockade he made a "invaluable" gift to his comrades for those times. They opened the newspaper and in it was fresh bream!

Where did this miracle come from? Did God send it or did it create itself? Incidentally, it is obviously no accident that Fomenko can do everything.

They found out accidentally that there was a fish artel at Lakhta, and people go there only once or twice. And there are wages there which nature pays out. He hired himself out. As the strongest one, he manned to oars. The remainder let out or drew in the net. He was soon "elevated" and became the brigade leader on the boat.

He worked all night. He slept a maximum of three hours. And in the morning he came to the plant as if nothing had happened and began to fulfill his numerous duties.

Once Ivan Alekseyevich Shoshin, excited and joyful, came up to him.

"Pavel Nikolayevich, that's enough! There is a time to finish and a time to begin."

"I didn't know that it was time for me to finish."

"It's time for you to finish everything unrelated to electrovacuum equipment. And it's time to begin everything related to it. We will obtain the equipment. Everything--suitable or not, complete or not, I don't know. Disassemble it yourself. Besides yourself, there are no other vacuum specialists. You will have to begin from the beginning. This is a new section!"

The days and nights were the same for Fomenko. An a small, close room similar to nothing more than a production section rather than to a laboratory, he assembled each device, evaporators, transformers and filters, frequently even without drawings, simply on the intuition of a born engineer. At the same time he developed the production technology and equipment for manufacture of various coatings, including clear films for the most important models of optical equipment which they had begun to develop at that time.

It is easy to say to develop. But with whom? They gave him several teenagers for assistants at that time and he talked of himself as their "kindergarten."

Nevertheless, he taught each one with envious persistence, giving each one as before his boundless energy and teaching them love for a difficult, very difficult occupation that requires maximum attention, concentration and a special feeling. The young boys and girls from Fomenko's "kindergarten" imperceptibly grew under his instruction into qualified masters and later became prominent specialists. And now they are leading engineers of the firm--Vladimir Nikolayevich Skorodumov, Georgiy Fedorovich Zubov, Ivan Romanovich Aipolotov and many others and they are now involved in development of large mirrors and the most powerful telescopes.

The tasks of the "laboratory-section" were expanded and newer and newer specialists were required. One feature of Fomenko's character also helped. He knew how to recruit and ignite with his energy and attraction people of different occupations. Soon enthusiastic researchers were working alongside him--Larisa Yakovlevna Pinskaya, Nikolay Fedorovich Makarov, Shmul' Abramovich Furman, Nina Alekseyevna Malinina and others.

It seemed the simplest things required experiment and creativity. How does one position or place a part under a vacuum cap to spray its surface with tungsten? How does one evaporate chromium so that its film protected aluminum against oxidation and how does a layer of protective zinc sulphide behave on glass? Can a tungsten coil evaporate in a quartz cone?

This and much more must be known to design the most sensitive bolometer device that permits one to record invisible heat rays. One must also gain the interest and recruit consultants from the Physicotechnical Institute, USSR Academy of Sciences, for this. This is one aspect. And on the other hand, one must seek out a magician-glass blower who would clearly understand that he must create from glass for an instrument that has never before existed.

Fomenko found both the scientist and the glass blower. Moreover, Sokrat Yevgen'yevich Gur'yanov--the oldest master glass blower from the optical shop--brought in trusted assistants--two of his sons Leonid and Aleksandr.

Fomenko had to be directly a researcher and a "coordinating center" between scientists, designers and workers in one person. The instrument which physicists-scientists were awaiting so much was developed within a very short deadline: within one month!

An enormous role in development of the scientific and technical revolution belongs to modern optics and consequently to electrovacuum technology. Improved optical devices and optical instruments are being developed, by means of which one can investigate the earth's interior, the structure of metal and can aim the most powerful telescopes into the sky.

The new electrovacuum laboratory, which it was suggested that Pavel Nikolayevich Fomenko head, began to be developed with the birth of LOMO.

Fomenko was somewhat perplexed. He had not worked in his own laboratory for three years. Bagrat Konstantinovich Ioannisiani, the chief telescope designer, "called" Fomenko to his office. Pavel Nikolayevich was involved at that time exclusively with astronomical mirrors.

At first it was necessary to develop some special types of reflective and protective coatings for the unique mirrors. Because nothing similar had ever been done before in the country. There were attempts to order these mirrors from abroad. The Leningrad opticians decided to make them themselves. A special design office was created to which Fomenko also transferred in order to be exclusively involved in the difficult and complex problem of large telescope mirrors.

Together with the researchers, the designers made preliminary calculations and substantiated the specifications. They made a rough calculation of the unusual installation which had never before been done in Europe at that time. Who can manufacture it for us? It was suggested that one of the Gor'kiy plants could. Fomenko travelled specially to Gor'kiy with all data for the detail design.

When the installation arrived, Pavel Nikolayevich Fomenko headed the group of engineers that installed it. He had to ascertain personally that each lead, each joint and each assembly in the evaporator, each tiny screw and rod, all the countless components for the electric discharges were in the most complex system under the gigantic hood made for the first time of special grades of stainless steel rather than glass, and that everything was in place. That is the nature of Pavel Nikolayevich.

But the telescope for the Crimea and the telescope for the Caucasus had already been installed. And Fomenko sets out on a trip to see how his "mirrors" are behaving. The Order of the Red Banner of Labor, which he was awarded in 1961, reminds Pavel Nikolayevich of those stormy and hot days.

While they were building the new laboratory, in planning and equipping of which Fomenko participated most actively, Pavel Nikolayevich set up an experiment in the optical shop and recruited prominent scientists to participate in the developments, trained personnel and even when he "moved" to the new large laboratory of the engineering building, part of the optical shop continued to remain his unique branch.

Accelerated work was begun to develop coatings on special mirrors in optical devices that separate narrow spectral regions "upon order." Together with a group of his colleagues, he is developing and putting into production so-called interference filters required in quantum electronics, photometry, microscroscopy and various fields of instrument building.

The work of the firm laboratory acquires such a scope and scale that people began to come here from the most diverse cities of the country, optical enterprises and institutes for consultations, to borrow the experience and for joint scientific work. The remarkable perfection of the technology for applying a film to astronomical mirrors strongly interested many scientific institutions. Thus, the firm's laboratory became the epicenter of scientific developments for all the country's optical enterprises related to solution of similar problems.

Here are the lines from one letter (and there are many of them) addressed to the general director of LOMO M. P. Panfilov: "The Institute of High-Energy Physics thanks LOMO for the excellent quality of making mirrors for working in the ultraviolet region of the spectrum, required to conduct scientific research on the world's largest proton accelerator. And it requests you to express gratitude to the

direct executors--chief of the electrovacuum laboratory P. N. Fomenko, deputy chief of the laboratory M. A. Furman and chief engineer A. A. Metel'nikov."

But for him this is a phase that has already been passed. The search continues. And now Fomenko heads a creative group which is seeking a method of applying a unique film in a vacuum on a six-meter mirror already installed in a strong metal support. Otherwise the very thin reflecting layer may be damaged. This is an entire epopee related to development of a completely new technique of metal coating of mirrors and development of special evaporators for application of an aluminum layer one-tenth of a micron thick. Moreover, there is the problem of strengthening this layer and also of cleaning the future mirror whose surface should be super sterile. If even a small piece of dust invisible to the eye falls on the coating it becomes an eyesore on the ideal surface of the mirror and will make a rough error in the coefficient of reflection and may spoil the mirror.

And the workers of Fomenko's laboratory must successfully solve these problems. The large computer complex developed at LOMO renders invaluable assistance to them in this case. The computer selects 10 of a thousand possible versions and suggests them to the investigators. It is of course much easier to select the one, most suitable version from 10 versions.

Fomenko jokes: "If this proceeds any further, we will become totally lazy and then what will we do with our time."

But the electrovacuum workers have no free time. Experiment generates new possibilities. And the most unexpected ones at that.

For example, they reported from the Chamber of Commerce that cameras with the mark LOMO--Smena, Sokol, Avrora and others--were enjoying popularity on the world market. But they must now be made even better. They should have an especially illuminated objective which permits one to take pictures without the least distortion of light. Exceptional accuracy is required here. Because variation of the thickness of the coating by the most negligible fraction of a micron--one-tenth or one-hundredth--already produces an error.

But there were not only production difficulties here.

The fact is that old wizard vacuum specialists, who knew how to determine intuitively and erroneously the proportion of the coating, were involved in this most complex operation, but the number of these old "wizards" has decreased.

And Fomenko's "guard" of electrovacuum workers developed the technique of amber coatings and determined all the required calculated data for the required proportions. But during the first days thousands of objectives were decisively rejected by OTK.

They referred to Fomenko in the shop. This was rejection of his laboratory. However, when the researchers themselves went to the shop, everything turned out fine!

Fomenko did not make excuses, although he firmly knew that the technology had been developed and calculated precisely. But he also knew something else: to work out

something little, one must introduce it and one must count in this case on hundreds of ordinary young girls--graduates of PTU who were working for him, rather than on the notorious "wizards." And this was also in the tradition of LOMO: a development was considered finished when it could be "released" for mass production so that it produced no less effect in the shop than in the laboratory under special conditions.

And these "special conditions" existed. When they were only working out the technology in the laboratory, a special instrument--a photometer to determine the proportioning of the coatings--was created through their own efforts for the process of investigation itself. What would happen if this photometer was made not only a laboratory instrument but a shop instrument as well? It permits automatic determination of the necessary amount of material even during coating in a vacuum. Several of these instruments were manufactured from laboratory drawings at the firm itself. Fomenko allocated them to his colleagues who taught female workers to use them directly in the shop at the job site.

Besides the planned topics, Fomenko's laboratory was also involved in researve topics. Thus it was with a number of problems that had ripened with regard to the vigorous process of improving color television. Pavel Nikolayevich foresaw that the association would have to become involved in manufacture and improvement of special units that split white light into red, blue, green and other colors. The laboratory was linked to scientists: they jointly studied the physical and chemical processes related to this and preliminarily worked out the technology, testing its components in the shop.

Sometimes the scope of research of Fomenko's electrovacuum laboratory acquires such scales when the special assistance of colleagues from laboratories of completely different profiles is required. This causes no difficulties whatsoever in the firm. The electrovacuum workers, for example, must apply coatings to optical parts which are attached to metal supports by means of an airtight seal (a special glue which should guarantee absolute sealing of the seam). The sealer is a polymerized composition. It is initially similar to cream. It is injected in this form into the gap between the lens and metal support. It is then vulcanized and becomes hard. And absolute airtightness is achieved!

But hermetically sealed connections that can at the same time be "disassembled" must sometimes be made in modern optical instruments.

And the laboratory of organic chemistry develops a nondrying hermetic seal. But this hermetic seal emits gas under high vacuum conditions. And both laboratories jointly set up experiment after experiment and new types of hermetic seals are developed. One of them, used in application of chromium to a glass plate, yields excellent results. But what was done was unusually important for all optical-mechanical production!

Fomenko finds "related" problems among the "global" problems of optics. For example, how to force ordinary glass to perform and be irridescent like real semiprecious stones? The problem, solution of which is local industry, was incidentally solved quite unexpectedly. Its simple technique made it possible to produce women's jewelry that sparkles in all colors.

When I became acquainted with Pavel Nikolayevich and with his concerns, problems and research, it seemed to me that the laboratory did not leave him any time at all. But then I see in the hall of the engineering building the announcement: "The next lesson in the system of party education is being held. Propagandist P. N. Fomenko is conducting a seminar on problems of economics."

The old communist has been conducting propaganda work for many years now: the history of the party, philosophy and a range of economic knowledge. The range of his interests are broad. And not only in the field of technology or ideology.

Once when we were arranging the next meeting, Fomenko said:

"I can't tomorrow."

"But tomorrow is Saturday."

"Tomorrow I'm travelling to Dibuny. There is urgent work in the garden."

He grows flowers and fruits in his garden and of course with the inventiveness inherent to him.

"Can you not postpone it until Sunday?"

"No way! Otherwise my father will begin to do everything himself."

"Your father?"

"Yes, he is already 90 years old," Pavel Nikolayevich smiled and added: "He is my primary support in engineering. But he still does not trust very much what I plan to do in horticulture. What can you do!"

Man and Miracle Gratings

Sometimes one can hear the following question in the conversation of opticians: How are things going with Rowland's ghosts?

Ghosts? But there are no mystics here! Although there really are "ghosts." As you can see, they even have a name. And it is not so easy and simple to control them, especially when manufacturing such a miracle of optics as a diffraction grating in the literal sense. The grating is the main component of all modern spectral instruments and was designed to split light into the spectrum. It consists of an optical mirror on which almost invisible lines-channels are cut. There are hundreds and thousands of these grooves on each millimeter. The more precise and improved the spectral device, the wider the range of problems which can be studied by using it.

The prominent Levsha would not take up this work. Because it is a simple matter to shoo a flea compared to cutting diffraction gratings. And if he had taken it up and if he had suddenly become able, then five of his lifetimes would not have been adequate to cut only one of the smallest mirror blanks. Imagine--2,400 grooves on a single millimeter! The accuracy of arranging them is determined in thousandths

of a micron. And each groove should not differ in depth and angles of profile, regardless of whether the mirror surface is flat or curved.

Unique dividing machines developed especially for this purpose seemingly achieved superaccuracy. They achieved it and even so the meticulous researchers, or rather the American scientist Rowland found that even the best modern diffraction gratings, despite all the perfection of machining, splitting the light into spectra, sometimes create illusions of nonexistent and false spectra. They are called Rowland's "ghosts." These "ghosts," despite all their "transparency," can lead to very real errors. Only a superfine diffraction grating, which in itself is a very accurate physical instrument, can erroneously split light into the spectrum and can align the emissions in a specific order by wavelengths.

And now imagine that manufacture of these gratings with incomprehensible machining accuracy is no longer a problem for Leningrad opticians. The LOMO firm, which produces still and movie cameras that have become known throughout the world, has become the leading enterprise in development and manufacture of the most complex spectral equipment. But as before, the basis in any spectral instrument is the diffraction grating. It was developed by the cooperation of GOI [State Institute of Optics imeni S. I. Vavilov] scientists and was put into serial production by the firm's engineers and workers. The technology of manufacturing it is being improved in a special laboratory headed by Ivan Zakharovich Semenov. He is unobtrusive in appearance. He is short, lean with blond hair and has kind cornflower blue eyes. When you see him for the first time it seems that you have met him already somewhere. He is very similar to an agricultural worker.

In fact he is a native of a small, quiet village in Novgorodskaya Oblast, from a peasant family.

"There were five of us," he says. "I am the youngest. After seven years of school I came to Leningrad to become nothing else but an architect. Generally I took the first exams and in my thoughts I already saw beautiful homes constructed from my designs. But optics? I never dreamed that I would at some time have any relations with it. Incidentally, my childhood dreams did not proceed further in architecture. After the second exam I took my papers. There were family circumstances. My father died and my eldest brother--the commander of a regiment--was killed on the Volkhov front when he was 43 years old and my mother became ill. In short it was decided--I had to enter a trade school and had to stand on my own feet as soon as possible. My air castles could wait."

"It was necessary! And if it was necessary then so be it. I understood this. And now I was in the trade school on Kondrat'yevskiy Prospekt. I was studying to be a metal worker-pattern maker. I finished with excellent grades, with a high rank and it seemed to me that there is no better occupation in the world, so fine, accurate and amazing."

"Later there was urgent service in the navy and they taught me a new specialty on the ship--I became a navigator electrician. There is a new technology in my consciousness--gyrocompasses, radio direction finders, echo sounders. Again I applied myself and it seemed that I changed my previous occupation. Instruments, precise, complex instruments was now where my heart lay. It was a pleasure to tinker with

them. As soon as I was released from the navy, the first day afterward I headed toward an address that I had long loved: LITMO--the Leningrad Institute of Precision Mechanics and Optics, to the radio engineering faculty. I was attracted by electronics. I defended my diploma on the subject "Tracking Systems for Remote Installations." And I did my prediploma practice in laboratories of the just founded firm LOMO. And again I think there is nothing better and more interesting in the world than this occupation of an engineer-optician. At that time optics was a modest duet of glass and metal. Now optics is radio engineering, electronics, telemechanical and chemical. Here I understood that I had not "changed" my former occupation in any way since they all served me in good stead for the present and the main thing which always requires newer and newer knowledge from the person who has selected it."

During the year when Ivan Semenov finished LITMO, both the institute (Semenov was already seen as a graduate student, bearing in mind his extensive knowledge and tendency toward theoretical, scientific work) and industry were quarrelling over him. Even during practical work, he managed to manifest those qualities which are especially valuable in an engineer at LOMO--breadth of knowledge, the creative vein and the strong grasp of an organizer.

The young engineer, during the first steps of the firm, participated together with other engineers of the firm in development of the large astronomical telescope (BTA). The chief designer of the BTA Bagrat Konstantinovich Ioannisiani, unexpectedly for Semenov himself, entrusted the young engineer with the most responsible assignment--development of an automatic system for aiming the telescope at the stars in azimuth using a computer.

It is a tradition of LOMO to trust a young specialist. The important, serious matter in which he revealed himself as an engineer without any excess delays, shows what he is worth.

When Semenov heard about his first assignment from Bagrat Konstantinovich, he was glad and at the same time alarmed: could he cope with it? One can imagine with what fervor he took up the work together with the other engineers and specialists in automatic control and computer technology. When this system was designed and installed at LOMO, it had to be checked and worked out on an existing mockup of the telescope. This mockup was a reduced model of the future, the world's largest and most improved telescope, which was later installed at Zelenchuk. But the mockup--with 60 millimeter mirror--was installed in one of the towers of Pulkovo observatory. It also underwent plant trials in the tower. During those days or rather nights, Semenov was the chief in the tower and supervised the tests. Then for the first time his look "jumped over" the terrestrial threshold and saw the stars in the eyepiece. For the first time they were quite close.

Here even a star was not called a star, but an object. The task was to see that the telescope tracked a celestial object, equalizing itself to the rate of motion of it through the heavens. Otherwise a photograph or spectrogram would record a smeared image.

"This was done thusly," quietly relates Semenov. "We took several stars, calculated their coordinates and trajectories, entered the data in the computer and the computer transmitted signals to the automatic processing system."

But this was not done immediately. Ivan Zakharovich's friends and colleagues recall those restless days and nights in the tower of Pulkovo observatory when all this intertwining of the most complex systems suddenly broke down and the synchronism that they had achieved with unbelievable labor was suddenly disrupted.

Semenov was the first to determine the need to use a special linear converter to improve the system: a machine to control the signal of a moving device. The innovation freed the system of errors related to the inevitable mechanical oscillations. This made it possible to precisely aim the telescope automatically without fluctuations from the given value.

Everything that the young engineer thought up and suggested was initially realized in a mockup and later in the gigantic telescope itself.

And incidentally, there is yet another tradition of the firm: the young engineer here is not only immediately and daringly trusted with a lot--many people help him. The most experienced people, the most talented people, engineers, designers and scientists. After all, they have a "profitable" interest in the success of each other. Because the overall success of the firm depends on the success of each one.

After the gigantic telescope had been intalled at the Zelenchuk observatory, the chief of the TsKB suggested that Semenov head the laboratory of diffraction gratings. The young specialist was again trusted with a very complex assignment--to improve their manufacture.

Imagine six large booths with transparent walls whose doors are sealed just like safes in a bank. No one can enter there. You can observe the "secret" occurring during operating of the dividing machine, whose quiet no one dares disturb, only through the window. Even the machine itself has no right of the slightest deviation and is therefore installed on a special floating foundation. The motor of the machine is located in another, adjacent hermetically sealed separate booth and is installed on the same floating base. And there even the motor or the breathing of a person can distrub the specific temperature and humidity required for a precise production operation. A difference of more than 5/100ths of a degree in temperature fluctuations may lead to rejection.

If an adjuster enters the booth, and this occurs approximately once per month, then the machine operates on "idle" for one or two days afterwards until the instruments show that temperature is normal. One can work.

And then the diamond cutter on the mirror surface begins its infinite motion. The diamond labors for hours on each millimeter of mirror area. Day and night. And the cutter is hardly worn in this case. And the grinding of the drive screw of the dividing machine, on the "spacing" of which the accuracy of cutting the lines also depends, continued for no less than 6-8 months and the most experienced masters were involved in this.

These superprecise machines must be improved even more! Rowland's ghosts--what about them? How can one eliminate these ghosts? Ivan Zakharovich's laboratory was now supposed to answer this question.

The appearance of the first dividing machine and the first diffraction grating is related to the State Optical Institute (GOI). LOMO specialists studied the model developed at GOT and designed and manufactured six unique dividing machines at the firm on its basis that became the production base for manufacture of diffraction gratings.

The struggle for accuracy began from the first steps of developing the machines. The most accurate optical checking instruments--collimators--suddenly revealed undesirable surprises. For example, mysterious black and white, so-called moire patterns that altered the true brightness of light, appeared in the visual field of the collimator.

One of the leading scientists of the optical institute, doctor of technical sciences Fedor Maksimovich Gerasimov, with whom Ivan Zakharovich later became closely acquainted, then worked out special scanning sensors and an original electronic circuit for taking these moire patterns into account, which had to be taken into account during use of the gratings.

However, that which the scientist proposed and developed could be used only on the single-screw machine of the institute itself, whereas the two-screw version of the dividing machine was being operated at LOMO. One screw was a rough "transport" feed screw and the other was directly a dividing screw. The LOMO version guaranteed the highest accuracy and the highest productivity.

Semenov together with his colleagues in the laboratory Yuriy Iosifovich Braynin and Aleksandr Ivanovich Solntsev carefully studied that which scientist Gerasimov had worked on and learned how to apply his electronic circuit to the designs of machines developed at LOMO. As a result the diffraction gratings were of very high quality, which made it possible to sharply expand the range of spectral instruments. The machine was checked again and again and so-called "creep" phenomena were found when the carriage supporting the diamond and responsive to an electronic signal was supposed to stop, but continued to move forward for some thousandths of a micron due to inertia. Braynin and Solntsev attempted to replace the cast iron carriage with a lightweight aluminum carriage. They felt this was supposed to somehow neutralize inertia,

Experiments were again conducted. They served as a thrust to broader investigations in developing methods to utilize the principles of compensating for the "creep" factor caused not only by mechanical stress but as it seemed by temperature conditions as well.

A discussion arose once in the small group of investigators. Some were proponents of precision mechanics and others of electronics. Ivan Zakharovich, knew from his experience of working for the BTA that only fusion of precision mechanics and electronics and their combined efforts could reach the goal in modern optics. And they worked on the problem of "joining" the dividing machine to an electronic circuit which would guarantee absolutely precise and strict stopping of the carriage at a given point. Many scientists of research institutes were involved in this problem.

Thus the firm's production laboratory became a unique epicenter for improving everything new that was being developed in this field of technology.

As a result work of theoreticians of the institute and investigators of the firm began in developing completely new types of gratings.

Besides doctor of technical sciences F. M. Gerasimov and Semenov, engineer Galina Nikolayevna Rassudova and the amazing engineer, the local "lefthander" Yuriy Mikhaylovich Balyasnikov participated in this tedious and complex work.

An arsenal of weapons was gradually accumulated for a decisive attack against Rowland's ghosts--the enemies of precision.

Rowland's ghosts were reduced to a minimum under production conditions and the moire patterns were first "made harmless" in the unique dividing machines designed and constructed at LOMO. Semenov's laboratory was the first to develop and introduce a photoelectric system for monitoring the main nerve of the working member of the machine instead of a mechanical system. This system automatically and with maximum accuracy checks the path of the screw and makes the dividing machine free of residual errors.

News about the victory over Rowland's ghosts quickly spread throughout our country. The miracle gratings received high marks of scientists from many ccuntries. Spectral instruments with the new gratings were require by those who observe stars and satellites and by those who must conduct the most precise analysis of metals during smelting and by those who desired to look into the secrets of cells.

Thus the most complex task in modernization of dividing machines was accomplished. This permitted the firm not only to improve the quality of gratings but to produce completely new types of spectral devices. The possibility of cutting 1,800 or 2,400 lines per millimeter instead of 600 lines, which was considered the maximum, was a new achievement in serial production.

Modernization under conditions of the firm's modern laboratory is not only research and checking one or another systems. This is both development and creation of all the required equipment for modernized machines and this is improvement of the technology itself and application of it in practice.

And it is really not surprising that only five engineers and eight workers were involved in this large laboratory with multicomplex equipment.

And here is the enchantress--the dividing machine is "under complete control" of the worker servicing it. He adjusts it himself, repairs it himself and installs blanks and diamond cutters himself, manufactures test gratings and himself participates in checking their quality on special instruments. This in itself requires the highest qualifications and extensive, universal knowledge of a rank and file worker servicing the machine.

The senior engineer of the laboratory Anatoliy Ivanovich Malyshev, a knowledgeable and talented inventor, began work here as a rank and file worker. Working as a mechanical engineer, he studied at the Northwest Correspondence Polytechnical Institute. Here he developed a new spindle assembly for a machine on which diamond tools were sharpened.

Sharpening the diamond cutter to cut gratings is one of many of the most important problems for the laboratory, both engineering and economic. The fact is that a diamond cutter is supposed to cut approximately 25 kilometers of grooves without stopping. It is impossible to replace it during operation. The research of Malyshev immediately led to solution of the problem of predicing the wear resistance of a diamond cutter, which is related to its natural microstructure and the flexibility of the surfaces being machined. Almost all the laboratory collectives began to work on this problem and subsequent investigations led to development of new instruments which helped to finally solve this problem.

The design office of microscopy needed a standard instrument to determine the roughness of optical surfaces. Malyshev developed and manufactured such a standard. Much can be said about this young, light-haired engineer. Semenov talks about him briefly and expressively: Malyshev knows all and knows how to do everything.

Such a definition is quite suitable for mechanical engineer of the laboratory Yuriy Mikhaylovich Balyasnikov. Yuriy Mikhaylovich thought up many accessories for cutting gratings. The effect of the accessory is equal to starting up yet another dividing machine! The accessory cuts two gratings immediately rather than one during the same cycle, but with two diamond cutters!

But Malyshev did not stop at this. And what if two gratings could be cut with only one diamond cutter? The laboratory engineers together with the chief developed a new, completely original drive for the dividing machine that permitted this version to be used. Malyshev's new machine tool then came to light for grinding diamonds.

Despite the high requirements on diffraction gratings, the laboratory turns them over to the OTK without checking. And any OTK hardly checks them more strictly than laboratory worker, engineer Maria Petrovna Ustyuzhaninova. She took on herself the voluntary duty of additional checking of the gratings.

The LOMO mark is on almost all the machine tools and machines of the laboratory. The special nonstandard equipment shop manufactured them. Only the firm is capable of having such a shop. How many designer ideas have already become embodied here in metal!

When I was leaving the laboratory, Ivan Zakharovich Semenov suddenly opened yet another door:

"Look in here."

"And what are they doing here?"

"Still the same--they are making diffracton gratings."

"But where are the dividing machines and the diamond cutters?"

"They are not needed here. This is still an experiment. We are testing a laser beam instead of a diamond cutter. But this is a matter for the future."

WORKING GUARDS

If one begins an excursion through the firm from the engineering building and if one becomes familiar with its numerous design offices and laboratories, then one can show that LOMO consists primarily of scientists, engineers, designers and researchers.

This group of specialists occupies an ever more significant place in production under conditions of the scientific and technical revolution.

However, the same scientific and technical revolution now requires even greater creative initiative than at any time from the broadest mass of rank and file producers and from rank and file workers. They emerge not only as executors, even the most faultless and highly qualified, in a modern socialist enterprise such as is LOMO. But most frequently they are both developers, creators of the new and advisers and colleagues of engineers, designers and technicians. They lead the chorus of communist labor.

And it is obvious here at LOMO how quickly the functions of a worker change along with his experience, level of education and occupational training.

I had occasion to become well acquainted with many workers at the firm and to observe their growth. Growth not in the sense when a rank and file worker becomes an engineer, technician or chief of a section or shop. But primarily growth of knowhow, skills, breadth of knowledge and feeling of responsibility for the entrusted matter. I have in mind the growth of a worker as a creative personality and moral and ideological growth that provide the right to the proud rank of Soviet labor.

Ivanov's Personal Matter

Tuesdays are reception hours for personal matters at the general director's office. It is known what these "personal matters" are: concerns about housing, complaints about some injustice and a request to transfer to a different post and so on. Among those who requested a reception is Mikhayl Ivanov, a milling machine operator of the experimental shop.

"I have come about the plans in our shop to arrange the new equipment. Imagine, they want to locate the grinding machines under the very nose of the OTK. How can sensitive instruments operate if everything is shaking alongside them?

"It is understandable. Well, what is your personal matter?"

"This is it. They proved it in the shop--they did not listen. They said that the planning has already been confirmed and it is generally not your concern."

Panfilov glanced at his watch:

"All right. Let us end the reception and go to your place of work. We shall continue the conversation on the job."

The director's conversation with the shop specialists ended in that Mikhayl Il'ich Ivanov's suggestion was approved. Panfilov later reprimanded the service chiefs who were involved in replanning:

"It would not have hurt to have consulted beforehand with the workers."

This one episode milling machine operator Ivanov related to me at the association. Therefore, it is admitted that Ivanov impressed me as a person with a stern and authoritative character and with a decisive exterior. And here we were meeting him in a small, one-room and very comfortable apartment in a new building on Vyborgskaya Storona.

I saw a kind person. And although he was short, everything about him seemed large and solid: a compact figure, a weatherbeaten face, thick black eyebrows and remarkable smiling eyes.

He was about 50 years old, but he appeared to be the healthiest of persons. When toward the end of our conversation I jokingly mentioned this to them, he laughed:

"This is true, I am an iron man."

His wife, looking in to the room for a second from the kitchen, noted:

"You sure are an iron man. You carry 80 fragments in you. And all the time he gives the appearance that there is nothing special about this. He should be treated and observe the regime. He catches cold at the least drop. Not likely! He has been a Komsomol volunteer his entire life. And you say he is 'the healthiest of people.'"

"Now that's enough, Valya," he softly interrupted her.

Ivanov's working life, like most people of his generation, began in the most literal sense with "Komsomol-volunteers." He had hardly finished school when he was hired at the plant and dreamed of becoming the same as his father--a shock worker of the Third Five-Year Plan. But this was in the June of 1941. "They sounded the trumpets of alarm" and the student milling machine operator together with other young Komsomol workers of the shop volunteered for the army. He was sent to a military-political school. He was a cadet for 10 days and the school was closed. Everyone left for the front. Like the others, he was issued a pass in which the unusual, such capacious rank was denoted to which he remained true his entire life--Ivanov was a political fighter!

He received his christening at the front in Estonia, repulsing fascist attacks. On the first day "Messerschmidts bathed their antiaircraft battery in a leaden shower. He regained consciousness in a medical and sanitary battalion. He heard how, leaning over him, someone was slowly counting: "78, 79, 81." And this same voice said:

"All right. The fragments from the bursting shell are small ones and there is no time to dawdle. Prepare him for evacuation."

But he was not sent to the rear. At first the roads were cut and then Ivanov himself began to refuse: "I feel better, I'll manage."

And he really "did manage." Soon machine gunner Ivanov was defending Moscow. He then campaigned in the Bryansk woods, participated in the liberation of Czechoslovakia and fought in Manchuria.

He returned to the shop in 1946, which he regarded as his own, although he had been working in it only a little more than three days before the war.

"So he returned," said the old master, looking Mikhayl over.

"And how else! The earth is round! No matter what point I left, I arrived here!"

They gave him a test. He helped to adjust machine tools and they gave him the job of milling 200 of the simplest parts. Ivanov tried as well as he could and turned them over by the deadline. But soon he heard the angry request from the OTK:

"Who made this mess? They are all rejected."

"Well, we got through it!" said the foreman. "Now get out of it yourself. Take the rattail file and try to take off the corners carefully. It can and it will work out well."

Ivanov filed these corners until late evening. And the rattail file, as if to spite him, had no handle and for that reason burned his palm--he had scratches, blisters and callouses everywhere. He went home in an angry mood. He no sooner had crossed the threshold than he met his father:

"That is it! I will not go to that plant again: look at these hands, just look."

His father looked:

"Poor thing, he has callouses! The fact that he is lacerated through and through with bullets and fragments is nothing. But he can't tolerate callouses. What do you think--you think they are playing games at the plant? You are in no way of the working class."

Mikhayl became confused and suddenly everything became funny to him when he tried to look at himself through his father's eyes.

The next morning he arose earlier than everyone, poured icy water over himself and again went to the plant and decided to request that he be admitted as an apprentice. He found out with amazement that even so he was awarded third rank. He assumed for himself that he had been given an advance.

Stormy days and nights of mastering his occupation began for him. He studied furiously and did not let himself or others rest until he had meticulously learned everything.

He mastered very rapidly the skills of many and achieved the highest, sixth rank. And he immediately took on apprentices to himself. Young people love to work under his beginnings. The generous unselfishness and kindness of this man attract the fellows. Regardless of who else in the shop one studies with, you still cannot get along without it in precision and complex optical production. Reckoning here is only in microns and fractions of a micron. And experimental models mainly "travel" in this shop. The technicians themselves rarely rely on the experience and inventiveness of the machine tool operators such as Ivanov.

For example, take the history of one part for the objective of the latest microscope. Such a complicated thing had never before been done, even similar to this. Mikhail Il'ich looked over the drawing for a long time and carefully read the production chart. At which end to begin? If one proceeded according to instructions it would be too long and would the part be produced with the precision as thought out?

He walked around puzzled for a day or two. He readjusted the machine tool and changed the cutting heads. And the result was an essentially new solution in the technique of milling the most complex parts of optical devices, a method which permits one to increase productivity thirtyfold! This innovation of Ivanov, used in the entire sector of instrument building, saved tens of thousands of rubles.

The most refined innovations of Mikhail Il'ich also became the achievement of his appreentices: Yuriy Sosnin, Oleg Mikhaylov and many others. When they note in the shop how Mikhail Il'ich unobtrusively observes the work of young machine tool operators, they jokingly say: "Hello! Ivanov is looking for talent!"

He seeks passionate lovers, like himself, of "headbreaking" work. And if he is not given this work he finds it himself. Once in the shop they were manufacturing eyepieces for special microscopes. A superprecise thread was required so that each turn had an ideal surface. It was assumed that this fineness could not be achieved with the most filagreed milling. Almost invisible scratches over which tens of metal workers then sweated, removing them manually, remained inevitable. It is understandable that this exercise of the metal workers was hardly joyful work; so many times at meetings they teased the machine tool operators: "It comes out and you have nothing to do with it one way or another without manual labor."

Ivanov did not plan to protect "regimental honor." He extracted the next creative task for himself from this criticism. He thought for a long time. He tested and ground this way and that and gave unusual profiles to the cutting edges of the cutter. He used an original "slotting head." And so they again began from the beginning.

Metal working labor was not provided for at all in the production chain proposed by Mikhail Il'ich.

Ivanov was always modest about what he himself achieved. He travelled to the other end of town, to the well-known Kirov plant. He studies whether there is something worthwhile in the milling machine operators there. Or as soon as he has a day off he heads for the House of Engineering Propaganda on Nevskiy Prospekt to find out whether something valuable has turned up there. How can one compete otherwise? He always says to his friends: "Always hold the alignment to better and better!"

And it is he, M. I. Ivanov, Hero of Socialist Labor and delegate to the 24th Party Congress, that is considered the best in the shop.

Some think that, having received the "highest praise," Mikhail Il'ich will settle down and will cease to be troubled by rest. No way! Once they brought to the section a blank weighing about 20 kilograms to manufacture an experimental part, and the part should weigh one-tenth as much. Mikhail Il'ich immediately raised the alarm--metal could not be squandered! At the first party meeting he immediately proposed that measures be implemented so that this was not repeated.

Once it was noted that Mikhail Il'ich was a constant visitor to the job site of a young communist machine tool operator. He would come up, observe for a little bit and leave frowning. And hardly any complaints of any kind could be made against the young fellow. He was fourth rank, he performs his tasks and there are no violations. What is it? But Ivanov shakes his head:

"What is this 'what now'?" Yes, I have known him for a long time. I have known about his head and his hands--he could have control of mountains, but he remained calm, became lazy and deprecates himself."

And the persistent question arises: should the machine tool operator be called to the party group--it must be analyzed what kind of person he is and why he is stuck among the "mediocre types"? And even more important how can he be helped? Mikhail Il'ich is first of all ready.

And as always, the fate of this young fellow and the affairs of the shop collective and of all LOMO is Ivanov's personal business.

To Be First

The competition was being held for the rank of best in occupation among the youngest workers of LOMO. The entire brigade of milling machine operators awaited the result with excitement. The brigade leader, Yuriy Aleksandrovich Metelkin, was himself especially excited. After all, no one other than Viktor, his apprentice, to whom he had tried to transfer his skills, craftsmanship and spirit, participated in the competition. But the main thing is that Viktor at his own initiative wanted to participate in this competition. Metelkin trusted the young fellow: he was clever and persistent. And he had finished secondary school. But he was still a youth! without any experience.

Metelkin was glad for his apprentice and he himself would have taken his place. After all, like Viktor, he began his journey here in this very shop, 23 years ago. As an apprentice. Only after demobilization from the Soviet Army. Someone advised him to seek out a "non-dusty" position, but Metelkin decided to become an apprentice for milling machine operator.

He was an apprentice for a very short time. The senior foreman Ivan Fedorovich Khlopchenko to this day recalls the capable apprentice. He worked with skill and persistence. He loved the most complicated work. And all the time he learned. He learned from his comrade foreman. No year passed that he did not gain a new rank and finally he achieved the highest--sixth rank! Having attached oneself to any machine tool and to any system you could not go wrong with any task!

But Yuriy Metelkin, having seemingly reached the top in his occupation, still continued to study. He heard that Ivan Leonov from the Kirov plant was using a special cutter of his own system--he immediately went to him: "Show me, teach me!"

He had occasion to be a guest in Moscow and he immediately headed to the capital House of Engineering: what valuable things there could he take away and introduce in his own brigade? But Metelkin's brigade was a guard's brigade: Nikolay Bogdanov, Nikolay Lyubich, Anatoliy Illarionov, Gennadiy Uvarov and Vladimir Petrukhin. They were all highly qualified milling machine operators. Not all of them were highly qualified when they entered the brigade but they became so in it. Metelkin laid the basis for the tradition: to help each other, always be ready to replace a comrade and to manage oneself freely at his own machine tool. It is no accident that Metelkin's workers bear the rank of brigade of communist labor.

And now Metelkin wished that his Viktor, for whom he had felt pain in the competition, would also become such a real guardsman of labor.

His Viktor is not Metelkin's son, his son Viktor also works at LOMO as an electrical fitter. His Viktor is Viktor Zhukov--an apprentice for whom Yuiry Aleksandrovich feels no less than for his own son.

The competition has ended.

And now the young fellow with eyes bright with happiness runs to meet his tutor:

"Yuriy Aleksandrovich, complete order!"

Viktor Zhukov had become one of the winners of the labor competition among milling machine operators.

It is interesting to follow the work of Yuriy Aleksandrovich and the expression on his face. During these minutes he was seemingly carrying on a silent conversation with the machine tool and finds a complete understanding with it.

And this may be so. After all, Metelkin can manage to do that on his own machine tool that no one else has ever been able to do. Once, they received an unusual urgent order in the shop--to manufacture specially precise cast iron plates for a series of very important optical instruments. These plates were initially machined

with great difficulty on the milling machines and were then sent to the experienced metal workers. Their task was to quickly and methodically remove invisible micron unevennesses on the surface of the metal and to achieve ideal surfaces whose precision could be determined only by special indicators. This is a long, exhausting process in which hardly 4-5 plates could be machined and brought up to condition.

And Metelkin suggested the improbable:

"We can turn out not 5, but 50 of these plates per shift! And without any scouring. Simply on our own machine tools."

And the improbable unexpectedly becomes the obvious. It turned out that Metelkin, as soon as he learned what concerns his comrades in the shop are expecting with regard to the unusual order, began to think: how can I help here? After an agonizing search, the idea of an original attachment to the machine tool was born. The idea "was floated around" with his brigade comrades and the first experiments and corrections to the thought-out idea were begun. Finally the first plate taken from Metelkin's machine tool was in the hands of the inspectors. Indicators and micrometers are in operation. Not one error! This was a great victory!

And Metelkin now has a new concern. How to change the design of the cutter so that two grooves could be made immediately by a single cutter? In turn he got the idea of a single attachment which would permit low-qualified machine tool operators to perform a number of crucial operations accessible only to experienced masters.

Yes, the plans were enormous.

I am talking with Metelkin. His dark complected face is very young and devilment is in his hazel eyes. He talks jokingly about himself:

"The occupation of milling machine operator? It is simply to know geometry. Here we have a geometry circle!"

But then he talks about each one in his brigade willingly, warmly and even with kindness. And he notes not without proudness:

"Almost every one of our workers now turn over products themselves without the OTK. We have our personal stamps."

"And you put the stamp on the parts?"

"Why?" he is amazed.

"Well, and if someone suddenly"

"We don't have these 'suddenlys.' If it happened, it would be easy to find out by the 'handwriting.'"

"Can one really determine who milled one or another part if all of them are identical and they were made from the same drawing?"

"Of course! Take for example musicians. They play the same piece. The same notes are in front of them. But they sound different. It is about the same among us milling machine operators. You recognize a machine tool operator by his 'handwriting' and by his style. The trained eye can immediately and erroneously determine by external appearance the parts, who did it and whether the spirit of the machine tool operator participated in the operation, besides his hands. Generally, we are the same as in music."

"I see that you love music. Is this your attraction?"

"Yes. I love music." He thought for a while about something and quite unexpectedly adds: "Once it helped me to find Gennadiy, my youngest brother."

And he continues:

"My father and mother died even before the war. My older brother worked as a lathe operator at the Krasniy Viborg plant and he died when fascist 'incendiary bombs' were dropped on the roof of the shop. And we and Gennadiy, understand, were orphans in a children's home. We hold firmly to each other. He was still quite a small lad. And I was almost grown--14 years old. And I was Genka's guardian and mentor. And suddenly separation: I was taken into the army as a pupil in the military brass band. I played the trumpet. Later, as you yourself know, the war interfered with everything and Genka's children's home was evacuated somewhere from Leningrad and I was stationed near Moscow in a military school. In the band. They don't send young people to the front. And now the cadets are having a graduation party. The young officers of tomorrow are going to their regiments and fighting the fascists. We played marches, waltzes and polkas. And now we were supposed to play my favorite waltz Amur Waves, I couldn't stand it any longer and I asked the band leader to let me dance. I was dancing with some unknown girl, I had hardly managed to look at her and the dance was over. And already here the voice of my chief: 'Metelkin, return to your position!'"

Suddenly the same girl touched me on the sleeve and looked at me closely: "So you are Metelkin?" "Yes, I am Metelkin." "And you have a younger brother?"

I felt a shock. "I have. His name is Gennadiy. Where he is I do not know. But why do you ask?" "Because I probably know your brother well and I saw him quite recently. He talked so much about you." "You know him? You saw him? Where? How?"

And this is how it was. It turned out that the girl had come from Ryubinsk a few days ago where her father worked as the director of a children's home and my brother from whom I had been separated by the war was being educated in this home.

The very same evening I go to the company commander. I outlined my situation: I need to meet my younger brother. Either I go to him or he comes to me!

My brother came to me and we were never separated again. The company commander assigned Gennadiy to the band as a pupil. But we decided as soon as we were demobilized to go immediately to some plant. Our father was a lathe operator and our older brother was a lathe operator. So we also inherited the "working stone."

I soon was able to see the younger brother. Gennadiy Metelkin works in a neighboring shop. Of course he looks like his older brother: the same tall, energetic person with fast movements. It's true Gennadiy is not a milling machine operator. During the postwar years at the insistence of Yuriy, who was for him the only authority, he entered a trade school and studied to be an automatic metal worker. He works in the neighboring shop and became a specialist in repair of metal working machines.

A few years have passed since then. They are both fathers of families. Yuriy Aleksandrovich from time to time looks into Gennadiy's shop. "How are things going with my younger brother?" And Gennadiy always turns to his older brother for advice.

The opinion of an older brother is important to everyone. Yuriy Aleksandrovich was often elected to the people's control group, the party bureau and to the party committee.

In the shop they recall the time when Yuriy Metelkin headed the people's control group. The history related to storage of finished parts, which sometimes rusted and were roughly thrown into a corner, is especially memorable. The guilty parties were found and no excuses of any kind helped. Metelkin received a special order of the shop chief in this matter and did not rest until he had checked that everything had been done as it should be.

But Yuriy Aleksandrovich has long had a new public commission and he does not walk quitely past if he sees disorder.

Once Gennadiy asked Yuriy:

"Listen, where do you get such influence from? I know you better than anyone: you are a kind and soft person and you do not at all have the character of a manager. Share you secret like brother to brother."

"My secret is the simplest," answered Yuriy. "If you agitate and struggle for something, begin with yourself. In order that people cannot reproach you: after all, everyone can make mountains out of a molehill. You have to test yourself. Yourself!"

Probably this is the essence of the matter. If you want to show people how to achieve an important and good matter begin with yourself. Be the first.

And he is one of the first. Milling machine operator of LOMO Yu. A. Metelkin was awarded the rank of Hero of Socialist Labor for high indicators in fulfillment of tasks during the third, decisive year of the Ninth Five-Year Plan.

Toward Maximum Precision

In an enormous shop with snow white walls, everything is lighted by a bright blue light falling from above from a whole cascade of fluorescent lamps. Hundreds of people are working with concentration at long desks. Here is the pinnacle of precision! These are universal measuring microscopes--UIMs. They are so sensitive that air temperature fluctuations or even a loud conversation during assembly can affect their accuracy.

And people are working quietly.

Here is an old man with thin face and blue eyes in horned-rimmed glasses. From time to time he puts a secrewed up eye to the microscope eyepiece and with his fingers slowly rotates an almost visible screw under the black scale. He writes something in a notebook, thinks for a long time about the notations, then sighs with relief, smiles, gets up and paces alongside his work bench with rapid, light steps.

This is Aleksandr Antonovich Bespalov, winner of the State Prize, and veteran of the firm.

When future young workers hear about the amazing path which their enterprise travelled--from semicottage workshops to one of the world's largest optical firms, they often hear the name of Bespalov among the other names.

If the talk is about the First Five-Year Plan when shorinophones were being developed--the first sound-recording apparatus--one immediately hears: "Bespalov was the one who assembled the first model" or if one is talking about the first Soviet movie camera movements again one hears: "At that time they came from Bespalov's light hands."

A conversation breaks out about how the first astrophysical instruments were developed and again: "Bespalov began the assembly of an experimental model."

And Bespalov talks briefly about his own work:

"What do I do? Well, you can say that I assemble and adjust experimental models of a gun for hunters of microns. There is now no letup from orders for ever newer and newer models of measuring microscopes."

The work of Aleksandr Antonovich requires effort, the fullest attention, patience and the most precise skills. When a very complicated optical instrument is completely assembled, this is still only the beginning. The main and most difficult thing then begins--so-called adjustment. The adjuster slowly "conjures" over the tiny assemblies, levers and lenses for long hours, days, and frequently even weeks. And it turns out that during these minutes he holds his breath so as not to alarm them and so that the "axis" of the instrument is not shifted by a hundredth of a micron and so that the established and regulated "focus" is not disturbed. Each instrument of the series is adjusted in this manner. And Bespalov is responsible for the standard instrument in the experimental section. He does not have the right to make an error.

This same Bespalov at one time adjusted the first assembly of the UIM. Although everything was correct in the drawings and calculations, the instrument erred. They tried to assemble the instrument in a specially equipped room without vibration. But the instrument still erred. And each time by ill-fated two microns. Regardless of what they tried and what they changed the deviation from a straight line still appeared upon maximum motion of the optimeter tube and still there were those two little microns.

They tried newer and newer versions. And it was all the same. Deadlines passed but the UIM was not delivered.

Investigators worked intensely and Aleksandr Antonovich and his comrades worked late in the shop. And they found a solution.

They checked the path of the microscope table--it was in complete order. Accuracy was guaranteed. But as soon as the machine tool began its return path the pointers of the scale deviated by a total of six microns. The specialists worked on this problem and Bespalov found justice for this "capriciousness," having designed a device which completely eliminated the vibration.

The group of its developers was awarded the State Prize for this UIM and the name of worker Aleksandr Bespalov was rightfully on the list of winners.

Many instruments have passed through his hands and there has not been one, development of which has proceeded without his thought, creativity, clever and at some times the most unexpected corrections in the calculations of designers, developers and investigators.

They were demonstrating a unique measuring machine in the Soviet pavilion in Brussels at one of the international exhibitions which could make measurements of all parameters with high precision and speed by means of optics. This machine was awarded first prize--the Grand Prix--at the exhibition. The machine operated at full speed and performed the most complex measuring operations. The display guide gave detailed explanations to all visitors through an interpreter but frequently without an interpreter--in German and sometimes a little in French. LOMO worker Aleksandr Antonovich Bespalov serviced this machine.

Long ago in the youth of Bespalov, which coincided with the years of the First Five-Year Plan, the plant Komsomol workers, as now, insistently demanded from each young worker--study!

And Sasha registered for courses in foreign languages in order to study foreign technical literature in the original. He engaged in boxing and strengthened his character--with persistence he achieved that of which he thought and about which he dreamed. This is his character: not leaving that which has been begun half finished, one does not deviate anywhere until he is victorious. This is how it was in the courses. No matter how difficult the German language was, he overcame it methodically with an iron patience until he had mastered it.

During World War II, the Komsomol member, young optical worker Aleksandr Bespalov campaigned near Leningrad and was wounded. He found himself in the north in one of the aviation units after being released from the hospital. Here the optician-inventor became an indispensible person.

He organized the instrument facilities in this unit within a short time. Moreover, Bespalov fundamentally changed the instrument system of the aircraft, having designed a special fixing mechanism which ensured reliability of the most connected instrument with the aircraft in any position. KAB--Bespalov's aviation correcter--was the name of this device.

When restoration of the demolished plants was begun, including optical plants, specialists were rapidly demobilized. And now Bespalov in his overcoat without shoulderboards hurries to Chugunnaya Ulitsa to a familiar passage.

Suddenly someone called to him:

"Aleksandr Antonovich?"

Before him stood Mikhail Panfilovich Panfilov--then a technician and the future general director of the firm.

Panfilov told him how much the country was expecting of the Leningrad opticians and how those such as Bespalov were now needed.

"You do not need to persuade me," answered Bespalov. "I am a political fighter myself."

Yes, he, a working communist, always felt that he was a political fighter all his life. An he always tried to remain true to his party duty--to go forward, to take on the most difficult and take charge of oneself.

During the early postwar years when the rubble of shops destroyed by fascist bombs was being excavated, he saw an instrument changed to unrecognition which Leningrad opticians had once been the first to develop in order to photograph the stars.

Aleksandr Antonovich well remembered with what love and care prominent scientists, engineers and workers, including he himself, had worked on it here at the plant and how much pride, romanticism and how many dreams were related to this instrument.

And now it's all ruined. A few fragments. He felt grief.

But in those days Bespalov became one of the enthusiasts for restoring the plant and then became one of the first proponents for developing new optical equipment. He was elected to the party committee and he again felt himself a political fighter. And how could it be otherwise. He, a communist, could not longer see for himself any other role than to always be a party fighter. And primarily in his labor and creativity here in the shop, in his own experimental section and at his own job site.

This became part of his flesh and blood: if something did not go right for someone in his or in a neighboring section, he was ready to immediately find out, explain and assist them. Thus it was when a finished lot of optical instruments were turned over for measurement of caliber--a snag. It wasn't so terrible--three instruments of the entire lot "played tricks." And regardless of how the engineers and adjusters fought and regardless of what they did--nothing worked.

And Bespalov immediately went to look and to help them analyze, to find some omission and somehow to improve it.

And this is the way it is every day. But ask him to recall even two or three of these episodes and he shrugs his shoulders: this is an ordinary thing. Incidentally, everyone recognizes Bespalov as an innovator if you judge by the summaries and the few formulated innovator suggestions. This is something he does "by himself" and he does not feel it is necessary to record all this.

His constant concern is to teach, to pass on knowledge to young people and to transfer experience accumulated at the plant over the long years of all the five-year plans--from the first to the present--to them. Wherever you meet his former apprentices today, he has given that one his thirst for creativity and his desire for the new. Engineer Anatoliy Budinskiy comes into the shop--this is Bespalov's apprentice, and he consults with innovators deputy chief of the design office Boris Shustov--also a pupil of Aleksandr Antonovich. Entire generations of young people change at the firm, but in each of them there is an apprentice of worker-communist Bespalov.

But not only the section in the shop--the entire firm is in his field of vision and he sees all its concerns, anxieties and joys. And often, having completed work in the section, Bespalov does not go home, but to the party committee to consult with the secretary of the party organization, to share his thoughts and to ask about the news. Aleksandr Antonovich always came here with support and advice when he was a deputy to the Supreme Soviet of the RSFSR and when he performed crucial commissions, being a member of the municipal party committee and as a member of the firm's party committee. Many crucial commissions are entrusted to him.

"So then," the secretary of the party committee said to him once, "we have exchanged opinions and have reached a decision: you, Aleksandr Antonovich, are the most suitable candidate to become more familiar and to check how things are with us in the chief technician's department."

And Bespalov carefully checked the work of the most important department. This is how it is recorded in the reports: "30 devices were developed and created." Bespalov, not only as a member of the party committee and as an engineer-specialist and innovator, was interested in looking at them and in analyzing and seeing the work in the shops and in the sections.

These devices really do exist but for the most part either in drawings or if they are in metal, why do they lay on the shelves. And how do they operate?

There are many questions. Bespalov gives a report at the party committee.

The feeling of a manager in his plant brought ever greater acuteness in him as the years went by. Yes he, worker Bespalov, is manager of a firm, a city and of an entire country. And this feeling was especially developed in him during many foreign trips. He is a member of the administration of the Soviet Society for Friendship and Cultural Ties with Foreign Countries and he is a member of the Presidium of the Leningrad Committee for Maintaining Peace.

Bespalov has been in Poland and in Czechoslovakia, in the GDR and in Finland, in Sweden and in Norway. He has participated in many international meetings, discussions and forums devoted to the struggle for peace. And everywhere he has appeared as a representative of his own country and of his own Soviet motherland.

Once he was visiting the enterprises of the well-known Karl Zeiss firm. He talked about the Leningrad firm LOMO. And he felt not without pride how the foreign specialists were amazed by the success of the Leningrad opticians. After all old Russia generally had no optical industry and now the Leningrad firm was competing

on the world market. The mark LOMO became a symbol of high quality. And during those minutes Bespalov was especially glad to recognize that he, a rank and file worker of the firm, is directly related to this.

Yes, Bespalov, despite all his cumbersome titles of rank and awards (he was awarded the Order of Lenin and the gold medal "Peace Fighter"), is primarily a rank and file worker-communist for which the main party affair is his daily "commonplace" work.

"Commonplace," this as before, together with designers and researchers, is to develop the first models of ever newer and newer unique measuring instruments. He is now working on a new model of a device of unusual accuracy and perfection. One of the devices is a special optical thickness gauge for checking and focussing the lenses installed in supports. It is a routine, commonplace matter. He himself gave no special significance to his new innovation. But he received a routine inventor's certificate for this device.

This "commonplace" exists in everything. Participation in the work of the scientififc and technical society, a new commission of the party committee with regard to exchange of party documents, correspondence with foreign friends, work on articles for a literary journal about his trip to Scandinavia. And on a rare free evening when his wife and son Vladimir have already returned from the plant, it is good simply to sit and listen what his old friend Vladimir Petrovich Vereshchagin has to say. At one time they completed the factory training school together, they entered the Komsomol together in the shop, they went to the front together and together they mastered optics from the beginning. Vladimir Petrovich has something to tell his friend. As an optical specialist he travelled to Morocco, Vietnam and to France. The firm has business everywhere, and they, like thousands of other workers, engineers and scientists, are representatives of the firm and its main people.

Family Treasures

Goncharov looks at Goncharov. In order to see better without rushing to put his hornrimmed glasses on, he brings the newspaper a little closer to his eyes. This is LENINGRADSKAYA PRAVDA, but an old, old edition--dated 3 July 1945. On a half-faded, yellowed page was preserved a still rather clear photograph. It was a group portrait of the Young Komsomols of the brigade that assembles movie projectors. And in the center, in the forefront is the brigade leader: thin and ruffled, staring with a victorious look into the lens. What is this! It was mentioned in the caption under the photograph that the brigade leader produces three norms per shift. Goncharov looks at Goncharov. Thoughtfully, with a soft hardly discernible smile: and the young fellow was dashing." He pronounces these words not with pride, but with sadness. And again he looks closely at the photograph. He looks at his friends of the same age and at himself as if his friends were in front of him whom he met long ago and had again had occasion to see. And suddenly his eyes light up with a mischievous, joyful fire. His face immediately becomes younger and he unexpectedly tossles his hair combed smoothly back as if he wants to say: "Well, and what about it if some thick gray hairs are visible and what about it if there are some wrinkles. But this is I--this is I!" And for an instant I see him as that "dashing youth," as which he impressed his photocorrespondent more than 30 years ago.

"It is good to preserve this issue of the newspaper," he notes pensively. And he adds as if joking: "It's something of a family relic. A family treasure. After all I have three sons. One works with me in the shop, the second works in the neighboring shop and the third--also one of ours, part of the firm, studies in the technical school attached to the association LOMO. These are treasures in their hands."

The list of family treasures in the working familiy of engineer-metalworker of the LOMO firm Grigoriy Andreyevich Goncharov is not so small: among them are certificates of shock workers of the First Five-Year Plan, combat medals of a Leningrad defender, certificates for innovation and inventiveness, metals of VDNKh for success in development of new models of movie equipment, an award of the Polish Peoples' Republic and finally the highest award of the motherland--the Order of Lenin.

But one of them is not kept at home but in the personnel department of the firm. This is Grigoriy Andreyevich's work book. And in the column "Job data" there is only a one-page notation: 1933; admitted to post of engineer-metalworker.

Everything began when Goncharov came to Leningrad from the little town of Dorogobuzh, which is near Smolensk. There he considered himself a confirmed "movie fan," and he went to see each film several times. And when he saw "The Battleship 'Potemkin'" he decided that from then on his entire life would generally be related to movies.

No, he did not dream about either the occupation of movie director or about a career of a film star, he was attracted by something else. He looked at the old, chirruping movie library installed in the passage between benches and that transmitted enchanting beams onto a curtain attached to the wooden wall as a miracle. The young boy was very envious of the two movie engineers who participated in this sorcery, one of which turned the handle of the projector with an unusually important look, and the other of which operated the generator drive, producing electricity. To touch this apparatus with one's hand was already happiness. And to find out how it was made? And who made it? Once he looked at the mark on it: Leningrad Optical-Mechanical Plant." And this decided everything. He did not like to put off anything. Within a week he was already in Leningrad at the plant and in the shop where they made movie projection equipment.

And busy days then began, and what days! The human voice was heard for the first time on the country's movie screens. Coming out of the movie house, they sang the song of Maksim that had just been heard: "A blue globe spins and turns" and no one knew that the lean worker, young Grisha Goncharov and his comrades had assembled those first movie projectors.

But even outside the shop he again dared to hold a movie projector in his hands. Once he heard from a friend from an adjacent enterprise: "I have not yet seen 'The Opposite.' I can't get a ticket and they did not show it at the club. Thre is no movie engineer." "There isn't?" asked Grisha. "That's no misfortune. We will help them!"

Thus he also became a voluntary amateur-movie engineer. "The movie spun around" on the latest libraries with the mark of his plant in clubs and in schools--

everywhere where they only asked for it. The audience applauded "Chapayev," and were overjoyed with the success of Maksim and of the heroes of "The Encounter." But Grigoriy was three times glad: both for the heroes of the film, for the viewers and for himself--he saw how necessary his labor was to people--apparatus which he assembles with his own hands.

And one more thing: he can now not only be proud of the fact that he assembled this equipment but can soberly and critically analyze their quality even on the job, can note their merits and deficiencies even from the viewpoint of an experienced, interested movie engineer. He thus became an innovator, unique counselor and conselor for those who designed and improved experimental models of projectors. And how important this was at that time!

The Peoples' Commissar of Heavy Industry G. K. Ordzhonikidze came to the plant shop from Moscow. Goncharov saw him several times. The Peoples' Commissar met with people and became familiar with new marks of projectors and talked about how these projectors were needed in all corners of the country, especially on the kolkhozes. The shop collective then developed a simple and most dependable projector and called it Gekord, that is, the abbreviation for Georgiy Konstantinovich Ordzhonikidze. It was pleasant to think and know that part of one's labor and one's concerns, ideas, hopes and knowledge was left in this Gekord.

And with regard to knowledge, the further he went, the more that he needed. He entered the workers' faculty. It was difficult to sit behind a desk in the evenings, after a hard shift. But he did not give the appearance that it was difficult. And not in order to embarrass his instructors. It was not them but a girl from Svetlana in a red kerchief sitting quietly near the window. This girl was called Kseniya. In Kseniya's presence he could not answer the instructor's questions at all as if it was she rather than the instructor who was greeting him. It was as if she was a controller over him.

It must be said here immediately that this is how it happened in reality. Kseniya Zakharovna became Goncharov's wife, came to work with him in the shop where she has now been working more than 25 years and her duties are a controller of the department of technical control, and it is frequently she who checks the movie projectors which her husband and his comrades assemble. As Goncharov himself states, it is very difficult to find a more particular and more "pernicious" controller.

In 1941 they interrupted their joint plans for the future. The first bomb dropped by fascist pilots on the plant came into the shop where Grigoriy Andreyevich worked, whose specialty had become manufacture of mines, antitank grenades and so on.

In May of 1942 several bright 150's rushed along the Ladoga, raising a spray of the liquid ice. Their wheels were hidden under the water and the machines, finding themselves under fire, could be seen from a distance as some fantastic squadron. They soon unloaded not far from Volkhovstroy, from which the line of the front passed three kilometers away. And the just delivered machine tools were installed in one of the empty shops of the Volkhov Aluminum Plant. The two surviving turbines of the Volkhovskaya station provided power and after the second day here they began to produce weapons for the defenders of Leningrad. Young worker Grigoriy

Goncharov organized this production. He trained the unusual personnel on the way: housewives who had never seen a machine tool before and still quite green teenagers.

Nevertheless each day the weapons manufactured by Goncharov and his comrades were sent directly from the shop to the front from hand to hand. They were sent from the workers to the troops.

Thus was established the basis for the character of the future ancestor of the working dynasty of Goncharovs. And primarily a keen feeling of personal responsibility for the fate of the entrusted matter. A beloved matter, great or small, but needed by the people. Thus the moral heritage of the Soviet worker was accumulated which he later, years later, could trasnfer to his own sons.

The growing sons unwillingly learned facts and events from the unwritten family manuscript, perhaps not very significant for others but for them important, that entered their consciousness and comprised the object of their pride.

It will always be remembered in the Goncharov family how, returning to the plant even before the end of the war, Grigoriy Andreyevich together with his comrades examined every piece of the territory under the snow: there they found a cartridge, there a roller, there a lens--they assembled sound projectors for hospitals and clubs. And later, after the end of the war, having finished his shift, he went to restore the equipment of the bombed-out movie theaters on Nevskiy Prospekt. They recall how the head of the family did not return home until late--they found out that he was organizing assembly of new complex instruments for spectral analysis. The instruments were made in the neighboring shop and they were needed by many enterprises. Grigoriy Andreyevich came to assist. A person of enormous skill, a born engineer who had if one may say so "engineering intuition," he entered the course of affairs quickly. He trained an entire section of assemblers who were transferred to another shop. They suggested that Goncharov also transfer there. They promised high wages. He did not go. "It's more interesting for me here. I am a movie fan."

And that is true. It was not easy to find a skillful master in manufacture of projection equipment of any systems and any models--portable, stationary and those designed for showing of any films.

The rank and file worker becomes a full representative of the firm LOMO abroad. The famous hall of science was erected in Warsaw and the sons accompany Grigoriy Andreyevich to Poland. The father will install the Soviet movie equipment there. Later his labor "geography" already encompasses Prague, Tokyo, Osaka and some African countries. His sons accompany him to Guinea, Togo and Mali.

Grigoriy Andreyevich is a kind, simple and open man to whom people are attracted, answering friendship with friendship and listening to his words. Once in Mali he even became an instigator of a unique "subbotnik." There during his free time Goncharov and his new friends organized immaculate order in the room of the movie theater where the movie projector was installed. They quickly became accustomed to Grigoriy Andreyevich and the local residents asked him to repair their watches and some kinds of household appliances. He repaired them. Unselfishly and with friendliness.

Once his oldest son asked Goncharov:

"Tell me frankly: You've been working for 40 years in the same shop and in the same section and you have been involved in the same thing for 40 years. Tell me, swear to me, is it not boring? Wouldn't you like to transfer?"

Goncharov shrugged his shoulders, removed his glasses and looked with surprise at him.

"Now what is this! Transfer. First, I have one love. I love my work, my occupation and as they say in the song, "I hope that this is mutual." Work and an occupation love him who is true to it. It then opens for him one secret after another. If one only looks at it more attentively, it opens to one that which amazes oneself: of course, how did I not guess this earlier."

And since all members of his family are avid movie and photographic amateurs, he explains:

"Let's say that two persons take a photograph of Mednyy vsadnik or some other well-known site. You look at the photograph of one and you have seen it a thousand times. But in the photograph of another there is a discovery! It's as if this miracle occurs for the first time before your eyes! This is because the second person looked for and found an unexpected angle and knew how to see that which all others had passed by."

Thus it was in the shop of Goncharov himself. A long time ago they had put into serial production a single movie projection apparatus. It came off the conveyor lot after lot over many years. And it seemed there was nothing "to take away and to add" to it. And the comments of users were the best. No one gave any attention to the KPT, as this apparatus was called. But Goncharov did. He looked at the ordinary with a fresh eye. And he suddenly saw that the system for switching on the cut-out arc was insufficiently perfected and convenient. One could get along without it. One could make it so that the arc itself was switched on.

Of course, this is what they did. The designers agreed immediately. Because Goncharov's unexpected suggestion was extremely simple. And the advantage from introducing it was enormous.

Incidentally, if one calculates the advantages from the innumerable suggestions of Goncharov, they would have long ago been worth 200,000 rubles, not counting those introductions which were officially not formalized.

The most experienced designers of the firm feel that Grigoriy Andreyevich is their own colleague. There is reason to talk about him, to consult with him, to think and debate with him. Yes, yes and to debate since it happens thusly: the old engineer-metalworker, usually quiet and obliging, unexpectedly becomes prickly and implacable. This is when he is convinced that he is right and that failure to introduce his suggestion may inflict losses on the firm. Again and again he sets up an experiment and seeks new, more convincing proof of his position.

Incidentally, most frequently his situations are still without conflict. There where true talent, invaluable experience and knowledge are found, there is noplace for conceit.

How long they had racked their brains over a mechanism which was supposed to guarantee simultaneous automatic exposure in an installation of 11 projection apparatus which was ordered for a cinerama in Tokyo. Grigoriy Andreyevich suggested the solution.

All these histories of course become worthy of the unwritten family manuscript and are given to the sons--the heirs.

The heirs. Grigoriy Andreyevich, when they gather together around the table, attempts to talk with them more carefully "so as not to chatter," although he still looks at his sons with an evaluating glance and smiles. All of them even in character are hardly similar to each other, but there is something of their father in each one.

The oldest, Viktor, has a high forehead with a forelock and has been with the firm for several years already. Viktor came to LOMO immediately after the eighth grade, became a radio installer and learned the fine art of installing the most crucial assemblies in spectral analysis instruments.

Father and son consulted many times and debated various engineering problems but not only engineering problems occurring in production. Grigoriy Andreyevich was glad that his son accepts everything warmly and close to his heart that concerns the life of a shop and Grigoriy Andreyevich was glad when once Viktor showed his father a new certificate of a shock worker of communist labor.

The most pleasant for the head of the family was not external indicators, but the essence of character. He saw that it was easy for the young fellow to both work and study, completing the 9th, 10th and 11th grades in the evenings. But the firm urgently needed builders for reconstruction of the shops. There were not enough builders. The young people decided: we will help and we shall work on the construction project. And Viktor was among them--one of the first.

Another time Viktor heard friction in the shop. Grigoriy Andreyevich was planning to step in but his son sharply stopped him:

"I will do it myself."

More than anything in life he generally likes independence and self-reliance as incidentally does everyone in the family. Like Gennadiy. Many saw in him the future of a musician from his childhood. Grigoriy Andreyevich bought a piano for his son and the young fellow had absolute pitch and could listen for hours, enchanted, to a melody that he liked.

But the son selected his father's path. He entered the shop where his father works. He became a worker.

And music? No, he did not forget it. True, not so much time remains for it: work, studies at the technical school in the evenings, but still the hours which he can devote to Tschaikovsky and Chopin are doubly precious.

His father patiently taught his son to think about any, even a seemingly simple operation so that each action was justified and previously calculated. And if it was complicated he said: "Do not hurry. Think about it. If something does not work then think about it again. I will say nothing. You will achieve it with your own mind and you will remember it more strongly. To think is the main thing in any occupation."

Gennadiy has already attained the third rank of assembler-engineer and his father has attained sixth rank. This is still a very difficult position to achieve, but Grigoriy Andreyevich has no doubt that Gennadiy will reach it successfully. Although the road is steep, but if it was laid by the father, the son will travel more easily along it.

The third son, the youngest, also plans to travel in his father's path. And it is not only in the fact that Sergey is studying in the technical school at the firm but perhaps even more important is the fact of how he listens and instills in himself what his father, mother and two older brothers say at home about the enterprise. And they always talk about this since their common work is at the firm--the main and inseparable part of their life.

The Generous Life of Valentin Petukhov

Our first meeting with Valentin Yakovlevich Petukhov occurred in the shop where modern videotape recorders are developed for television studios. Hundreds of people in snow white smocks were working behind long tables in an enormous light hall similar to a scientific laboratory. Among them I sought out Petukhov, a solid, wideshouldered man with thin and soft features of a dark face.

He looked somewhat like a kindly schoolteacher and this was unexpected for me since I already knew that Petukhov served in the paratroopers during the war years, participated in the liberation of Vienna of fascist occupation troops and was awarded the Order of Glory, third degree. At that time he had just barely turned 18.

Now he, like everyone here, was sitting in a snow white smock and holding in one hand a small electric soldering iron and in the other pincers and carefully, like a surgeon, touched different points of a dark panel on which, unfathomable to the foreign eye, a labyrinth gradually occurred in the thinnest varicolored wires. The labyrinth contained nuemrous triodes, diodes and capacitors--the filling for various types of units which, bein joined with other electronic and optical devices, are transformed into a videotape recorder. This videotape recorder with the mark LOMO then receives a permanent registration in our or foreign studios.

His friends in the shop Vladimir Sutulov, a former Baltic sailor and now an installer, member of the party rayon committee, the oldest worker Tat'yana Nikolayevna Ul'yanova and veteran of the firm Ivan Ivanovich Tsyganov asked me to write about Valentin Yakovlevich.

He enumerated tens of names and about each knew what "really should be talked about."

"You already know what kind of people these are," says Petukhov, "when I came here, I was already approaching 25 years. And I had no specialty at all. I worked as a stevedore for several years after the war. The wages were good but the work was not very interesting. I decided that I will spit on the wages and become an apprentice. And Speranskiy, the then deputy chief of the shop, says to me: 'well, young fellow, it is already time for you to take on a family so how can I take you on as an apprentice? And what about it if we immediately give you the fourth rank? You have a secondary education and you were connected to engineering in the army. I will talk to the fellows. One must assist a former man of the front.'"

The next day he was already hired on the production line where they at that time installed the sound amplifying equipment for movie projectors. He tried as well as he could. He was very excited. It seemed to him that everyone looks reproachfully at his unskilled hands. But Tat'yana Ul'yanova came up to him and at that time she was still a very young installer.

"Don't be embarrassed, no one can glue it immediately. You have already managed so much!" she praised him, although a whole pile of parts had accumulated near Petukhov and he was unwillingly delaying the remaining ones on the production line. Tat'yana skillfully assisted him. And not only she, but Sutulov, Tsyganov and anyone that he requested about this and those that even he did not ask.

Petukhov relates many of these stories and finishes them with the words: "You know that I was always lucky to be among good people." There was among these stories one quite long ago during the blockade. It turned out that he stayed in the besieged city even as a teenager without parents and relatives. He roamed through the snow-covered streets and fell into the snowdrifts, weakened and powerless. And probably he would never have gotten up if some Red Army soldier, passing by in a sleigh, dug him out, brought him to consciousness and took him home.

We met with Petukhov many times. His involuntary "lyrical asides" helped to understand much in his character, which was kind, gentle and sympathetic.

LOMO had long ago become for Valentin Yakovlovich not only the place where he works but the main content of his life. This was a platform for creativity for which Petukhov and many others comrades live. He is at the center of the social life of his shop and his firm. During 23 years of work he was elected to the shop committee, the secretary of the party bureau and a member of the party committee of the association. A quiet life is not for him--he is always advocating something, makes some suggestion, checks and organizes. He also has integrity. But this is the integrity of a working man and a foreman who loves his work. And if he, Petukhov, installs a complex model of a videotape recorder, for example, the Elektron-2, then everything should be at the highest level.

It is because of this feature of his character that Petukhov insists on an operation which is here called "a hairstyle." This operation is the last before the new apparatus is sent to its point of destination. Petukhov carries out the final

and the most precise finishing. This always costs him enormous tension. After all, even the strictest controllers give their approval but Petukhov still has something to finish. Once one of the foremen could not stand it:

"Well, how much can you do. Soon you will begin to sign your name on each instrument."

Petukhov shrugged his shoulders:

"Our signatures--mine and yours--already are on each instrument. And the signature of everyone who works at the firm. This is the same signature, the collective signature LOMO."

Petukhov's concern was always businesslike and creative. However, he talked very temperamentally at the party meeting of the section and the design office. But this was not simply the fervor of an orator. The very next day he and his comrades in the brigade began to think about developing a special improved bench so as to check the correctness of installation of the most complex circuits more rapidly, more precisely and more reliably. And soon a special board with varicolored signal lamps appeared in the section. Press a button and the manycolored lights instantly let one know how one or another circuit is behaving.

Yet another innovation was born here through the joint efforts of the same installers--special production boards for so-called tying of the bundles when installing the videotape recorders. All this facilitated and accelerated labor and improved the reliability of the most important assemblies and units in the apparatus.

Nevertheless, Petukhov did not parade his participation in innovation and in creativity. But when he as secretary of the party bureau and later as a member of the party committee was called upon to "create, seek and test," no one could reproach him: But how are things with yourself?"

The word "study" is not simply a slogan at LOMO. Courses, the evening school, the technical school and the division of the vuz are an entire academic combine to one's own efforts. Valentin Yakovlevich has already taken knowledge from almost all these sources. But he also has other sources. Former apprentices. Here he goes into the design office to the chief engineer Aleksandr Kuzin:

"Sasha, I would like to consult with you on perhaps one question."

Sasha Kuzin and 18 more of the same teenagers as he came to LOMO from the PTU when it was just beginning to be organized and they were all taken under the wing of Valentin Yakovlevich. Petukhov taught them and acted as their mentor. He noted Sasha Kuzin especially when they were assembling sound recording systems: from the start the young fellow grasped the situation and exasperated his mentor sometimes with the most unexpected but very lucid and serious questions.

Petukhov also thought at that time: here is someone that will be turned into an engineer in the future. And he directed the young fellow: study! The years passed. And Petukhov comes to one of his former apprentices, now the chief engineer of the firm, for advice and consultation.

The breadth of this knowledge and his rich experience also made Petukhov himself a consultant but frequently an authoritative arbiter in discussions as well. The version was frequently confirmed which Valentin Yakovlevich had given high marks to. And then they say at the SKB: "So, Petukhov's version is accepted." Sometimes Petukhov's versions are also accepted far beyond the borders of the country to where Valentin Yakovlevich travels as a chief assembler and a full representative of LOMO. Thus it was in Bulgaria, Czechoslovakia and Japan where he together with a group of other workers assembled the cinerama ordered in Leningrad for movie theaters.

Can he really forget those restless days and nights in the laboratory, in the experimental section of the assembly benches alongside developers Kira Nikolayevna Tsvetkova, Militsa Aleksandrovna Bamm and others. He recalled the first two shy female students of the institute of movie engineers who were trained in the shop in the assembly-installation section. They literally did not leave the side of Valentin Yakovlevich when the first cinerama set was being assembled. Everything had to be solved for the first time: for example, how to assemble the motor. The success of synchronous starting of all the systems, including those related to focussing the image, sound transmission and so on, depended largely on the accuracy of selection. The experience and knowledge of chief installer Valentin Yakovlevich Petukhov were natural here.

And all together triumphantly noted the first awards--the bronze medal of VDNKh and diplomas from the CSSR government.

An order from Japan then came in. But it was a new order--this was not a repeat of the past order. There is the same tradition at LOMO: each new model of an apparatus or device is continuously more improved than its predecessors.

The cinerama for Japan was the most complex unit with the most modern magnetic tape devices and noise-protective filters controlled from a single console. The new unit was too sensitive for long voyages and malfunctions appeared during the test startups. The search and intensive experiments continued during assembly in Japan. And this was very difficult since the deadline for turning over the apparatus was determined.

Petukhov, like his remaining comrades, had reason to become very much agitated; without stopping assembly, they changed this and corrected that "on the road."

The cinerama was turned over to the Japanese within the established deadline. During assembly the Japanese specialists treated Petukhov with special deference. He inspired in them involuntary respect of his skills, erudition and some special modesty and kindness. The curious Petukhov asked the Japanese about their life and told them about his own Soviet country.

When Petukhov returned from his next short assignment abroad to his own shop, he had the feeling that the separation had continued for entire years.

Once, after a long absence, he noted two young, broad-shouldered youths in the mechanical section at the milling machines. Petukhov at first thought, these are novices and I must become acquainted with them. Later, having looked closely, he smiled and loudly pronounced: "You returned!"

And they both looked toward him:

"Valentin Yakovlevich! How are you!"

He was glad to see them like his own sons. These two had come to the shop once from the PTU. But their efforts did not flag. Their work in the section was precise and complex. And they were intimidated by it. And therefore of course their wages were low. But once confidence in onself is less, the consequence is almost always being released at one's desire. Petukhov, and not only he, but many other communists of the shop sounded the alarm: We must help the fellows stand on their feet.

However, some then tried to cool their ardor:

"Is there a reason to fire the crew? They will have to go into the army within 6 months anyway."

But Petukhov came to the party meeting:

"We must look ahead and help the fellows to gain confidence and to convince them that their future is here in the shop. So that they themselves will return to us to the firm from the army. They must do it themselves."

After the meeting there was a confidential conversation with Anatoliy Babanov and the best milling machine operators in the shop.

"Fellows, I am hoping for you. This is my personal request. Take these two still untried youths and do not let them be separated from our collective."

Experienced mentors appeared among the fellows. And they tried. Valentin Yakovlevich was frequently among them and advised:

"Do not attempt to 'overtake the plan' immediately. Try to do no more, but do it better. The speed will take care of itself."

And now they learned and how! They served their term in the army, returned to their own shop and received good wages and study.

And it was that Valentin Yakovlevich, having zealously tried to hold each of them in the shop, said to one of his apprentices:

"But perhaps it is better for you to leave. You have another calling."

This was Oleg Mikhaylov, a 16-year-old youth. He had been hired in the shop on the request of his mother. He was a student. But Petukhov later took him under his own wardship. He was not a youth, but quicksilver! And he seemed to be intelligent. But he did not desire to understand the simplest things in assembly. Petukhov also frequently noted something else in him: the youth's desire for drawing. He was always drawing and everywhere. Petukhov saw in his home the numerous sketches--landscapes, portraits and genre scenes. He then decided:

"Whether you believe it or not, you have a different path--to the artist's school."

This was a long time ago! And now Oleg had graduated from a special school and was a decorator artist of Lenfil'm. When Petukhov sees his name on the movie credits he is proud: "My Oleg!" And as before Oleg regards Petukhov as his teacher.

Landscapes given to him by Oleg hang in Valentin Yakovlevich's new apartment received from the firm. Petukhov and his sons are constant visitors of exhibitions in the Hermitage and the Russian Museum. And this is an irresistible need and attraction toward the beautiful. And therefore it is not accidental that the section foreman, talking about Valentin Yakovlevich, once said:

"Petukhov knows how to do everything only beautifully. As if her were drawing it. He is an artist in his own way."

Hence, another of his passions is understandable: flowers. Flowers which he grows at his dacha at Karel'skaya Peresheyka, an object of his special pride and tender concerns. His many shop acquaintances also love these flowers. Petukhov's dacha was obtained "from the firm" in a special resort zone of the association. He brings his friends there in his Moskvich so that each one can fall in love and share with him the joy of meeting the amazing creations of nature.

The Petukhovs have three sons. The oldest, Valentin, works in Far Yakutiya, the youngest, Aleksey is still a student, and the middle one, Andrey, serves in the Soviet Army. A letter has already come from the unit in which the commander thanked Valentin Yakovlevich and his wife Nina Vasilevna for their excellent education of their son.

Petukhov lives in Vyborgskaya Starona on old Vasenko Ulitsa in no way especially noticeable. But they are frequently on Laboratornaya Ulitsa. Here many people know Petukhov and especially the workers of the housing offices. He now calls one with regard to repair of the recreation and reading room, about the library, or he organizes lectures through the efforts of the residents themselves.

Why is Petukhov here? He is not a deputy nor an inspector of the Department of Culture. But Valentin Yakovlevich is this type of person: he is always there where there is the possibility to do something good, interesting and useful.

Petukhov's sons were attracted in childhood, even without his influence, to radio engineering. But are there really others who are not interested in this? Thus there may be the opportunity to organize these circles for the young people--his neighbors on the street. And is there not joy in bringing music, the theatre and creative arts to his many friends?

All this led Petukhov to the party committee of the firm where he was appointed the chairman of the coordinating council to work with the population.

And he has had many enthusiasts: workers, foremen, engineers and retirees. All of them are from LOMO. And Valentin Yaklovlevich heads these people.

Optics is Their Family Matter

An Unexpected Acquaintance

My first acquaintance with the Golovan workers' dynasty occurred by correspondence and under unexpected circumstances.

They told me at one of the scientific research institutes where problems of genetics were studied what amazing possibilities modern biological science has. What is it now not capable of establishing, penetrating into the secrets of the living cell!

They showed me an instrument toward which they exercised special respect and care, carefully touching its dull gray body. It is called a fluorescent biological microscope.

"This is an entire unit filled with the most complex and delicate equipment," continues my guide. "All previous biological microscopes regarded as perfected cannot compare with it. How can they! We can observe a cell only in section. It was specially processed, frozen and stained. Many, many hours were spent on this. And we observed it only in the static state--dead and immobile. And at that only visually by eye. The new microscope has produced a revolution! We see a cell in its natural state--live and in its own light. We see all the changes in its microstructure. We can make any photograms, use spectral methods of analysis, obtain automatic recording of information and use polarization microscopy. And all this in a single instrument."

"Incidentally, they sent a specialist to us at the LOMO laboratory for these instruments so that everything would be debugged, regulated and adjusted locally. We were amazed by his work here--fast, precise and confident. His name is Golovan' and he is young, sympathetic and jolly. And later as it turned out he is not an engineer nor a technician but "simply" as he said, an ordinary optical engineer. And he assembles these unique microscopes in his own experimental section.

The scientist expressed a wish upon parting:

"If you are at LOMO talk with Golovan'. He should be an interesting person. And from all of us give him our respects."

I decided to fulfill the scientist's wish with pleasure, but it turned out that it is not as simple to do this for the most unexpected reason. They asked me in the personnel department of LOMO:

"Golovan'? Which one? Do you know how many Golovan's we have?"

The young female worker of the department began to enumerate:

"Mikhail Golovan', that's one. Viktor Golovan' is two, Tamara Golovan' is three and Nina Golovan' is four. Incidentally, Nina is no longer a Golovan' but a Smirnova because she married, but her husband also works here at LOMO."

In general an entire dynasty. The girl talked about this dynasty with pride.

"But I need Golovan' the optician," I said more carefully.

"But they are all opticians."

"All? Well, the one of them who is a specialist in microscopes. Fluorescent biological microscopes."

"They are all specialists in both fluorescent and ultraviolet and generally in any microscopes which the LOMO company produces."

There was only one way out: to meet with all the Golovan's. And this is how I proceeded.

A Matter of Heredity

And now almost all the Golovan's were assembled in a large three-room apartment on Vyborgskaya Storona at the youngest of the brothers'--Viktor Georgiyevich, as it turned out the very one to which the scientist sent his best regards.

Unlike Viktor, quiet and thorough, Mikhail is warm and fiery. Both look much younger than their age and something boyish and mischievous remained in them. They both suddenly began to quarrel, recalling yesterday's fishing trip to Shchuch'ye Ozero, now "seizing" on the character and "intelligence" of pigeons. They have been attracted by pigeons since childhood.

In general they are very fond of living nature and therefore the rooms have been filled with aquariums with electric lighting, with fantastic grottoes among the algae, among which swim odd, exotic fishes. And their home is also full of flowers. Flowers are also a "weakness" of the Golovan's: They have transformed their plot in the collective garden of the firm into a living, fragrant and beautiful carpet. And of course everything that they do, they do "scientifically." Much special literature has been read and assimilated both about raising aquarium fish and about raising flowers.

They do everything scientifically--this has become a habit related to their work at the optical firm. It isn't enough to have "golden hands" here, one must also have theoretical knowledge.

Viktor Georgiyevich is an optical engineer in the experimental section. Mikhail Georgiyevich has the same position in the Laboratory of Microscopy of the Central Design Office, the wife of Viktor, Tamar Petrovna is a designer and the husband of Nina Golovan', Vladimir Smirnov, is a designer.

Microscopy is really a family occupation of this dynasty. Those who develop microscopes at LOMO are permanently connected to such scientific and scientific research institutions as the Institute of Psychology, the Military Medical Academy, the Institute of High Molecular Compounds, the Institute of Physiology and the Botanical Institute. And each institute has its own special requirements on an

instrument and its own special tasks and goals which its developers must take into account. Therefore, one can see at the assembly table in the shops a venerable scientist-designer and optical engineer discussing problems related to the development of the next experimental model of a future instrument.

They are all Golovan's with secondary and specialized education, not counting the innumerable courses for raising qualifications which they have taken.

Mikhail adds:

"We at LOMO are all 'permanent students' and study there never ends for anyone. You study--and everyone here, regardless of whether you are a worker as Viktor and I are or designers like Tamara and Volodya are. It is impossible otherwise. One must maintain the mark. The mark of the firm. Yes, and speaking frankly, the mark of a dynasty."

The mark of the Golovan' dynasty is thought of highly at the firm. LOMO veterans say that this is a family of specialists, public-spirited persons and good successors to working family traditions that have been given to optical production for more than 150 years.

Roots and Branches

The present Golovan's are a branch of the root which was begun here by the hereditary St. Petersburg worker Georgiy Metrofanovich Golovan'. He began; already being married, he became an apprentice automatic lathe operator and gained the occupation of machine tool operator. He was one of the shock workers of the First Five-Year Plan. He finished the technical school and headed the optical shop of the plant. During World War II he was evacuated together with the enterprise to distant Omsk, where he was elected the plant party organizer.

The present Golovan's were still young boys during the difficult military evaucation. They recall those rare hours when their father was able to be at home. They looked at him as at a wizard who could create amazing things "from nothing." For example, he could make a stool, table or even a cabinet from seemingly unnecessary slabs.

They then worked together: wooden skates with metal runners, skiis and games. And all this was made with their own hands. With their own hands! What joy it was for the young Golovan's to give a game made with their own hands to one of the comrades and to hear their approval:

"Well, how about that! You really did it yourself?"

The father said:

"Would you like to make an even more valuable gift for your friends? Then teach them so that they can make the same thing themselves. Hands are not only for holding a spoon but a hammer as well. Right?"

Unfortunately, this happy time of being alongside his father did not happen very frequently. He taught day and night at the plant and everyone was working for the front: mother, Valentina Mikhaylovna, a seamstress by profession and grandmother.

The grandmother, Yekaterina Mikhaylovna Golovan', was an old Bolshevik. Despite her advanced age, she took cares on herself during that difficult time to assit the tens of Leningrad opticians evacuated from the besieged city, bought provisions for them in the surrounding villages and patiently and persistently helpd her small wards to find their parents.

Thus lived the Golovan' family, with an open heart. There were no strangers for them. You would come and there would be enough warmth for everyone. The family became an orphan after the war--Georgiy Metrofanovich perished. There remained a sick mother and three children--Mikhail, Nina and Viktor. In memory of their father they preserved the Order of the Red Banner of Labor, the Order Badge of Honor and the Medal for Labor Valor.

And there was yet another award which was always kept in view as during their father's lifetime. A small, simple school microscope enscribed with their father's name given by the collective of the enterprise--a memorial gift to Georgiy Metrofanovich, shock worker of the First Five-Year Plan and enthusiast for development of Soviet optics. How many times their father's hands carefully and gently touched the black burnished body. What pleasure it was for the children to place their eye to the microscope eyepiece and then to tell their friends about the fantastic "secrets" that they had seen.

Georgiy Metrofanovich's friends from the optical shop helped the young fellows to accomplish their father's dream for them--to become real opticians.

Nina, who had already successfully completed the 10th grade, had already been appointed as a laboratory worker. The well-known optical engineer Afanasy Petrovich Terekhov took on Mikhail as an apprentice. And Viktor--he was only 13 years old at that time. Special permission of the trade-union obkom was required for Viktor to be hired at the plant as an apprentice.

Teachers and Students

The teaching of the brothers proceeded very rapidly. First, their father had instilled in them since childhood the thirst for skills and the joy of creativity even in the simplest work. Second, the occupation of optician was always the most significant and interesting in his eyes and his sons looked at everything through their father's eyes. Third, Mikhail, who was two years older than Viktor, managed to learn something in the Pioneer House as a schoolboy, learned the skills of milling and lathe operation and could himself turn a fine part. Viktor learned everything from his older brother.

The main thing was that from the first steps the working youth of the brothers was surrounded by the kindness of Georgiy Metrofanovich's friends--Galakhov, Terekhov and many others who remembered his sincere generosity. Afansiy Petrovich Terekhov seemed strict and closed to Mikhail. At first he even felt some fear of him. And why not feel fear! From the first days Terekhov gave him unexpectedly difficult assignments.

He had to learn to think for himself. Mikhail understood very quickly how right his mentor was, who only from the side could seem to be "a dried-up man" and who in fact from the first steps tried to teach the novice the most important thing in his occupation which was always related to a persistent independent search and solution of many difficult problems in assembly, installation and adjustment of optical instruments.

It is unimportant that you made an error. It is important that you thought, Terekhov loved to repeat and added: "You know, they say among the people, he who knows little makes no errors but that who is confident and knows everything does make errors. And then he began to patiently explain what the error was."

Mikhail was transferred long ago to another section and if there was a need for it he went to Afanasiy Petrovich long after for advice. And even being an optical engineer of sixth rank and working in the research laboratory on experimental models of the latest microscopes or rather on mockups of these models, he mentally consulted with Terekhov. And it was as if he heard again as in his youth: "Now you think about it! You think about it again!" And it turned out that this advice was constantly effective: to think and learn in one's own experience and in the experience of one's colleagues.

His father's friends were worried about selecting the future occupation of the 13-year-old Viktor. Petr Markovich Tychin and Pavel' Nikolayevich Pavlov--adjustors of automatic machines--tried to get him into the automatic machine shop. Lathe operator Nikolay Vasil'yevich Kuznetsov and old optical engineer Feodor Aleksandrovich Galakhov tried to get him to their shop in the assembly and experimental section. They argued where it would be better for the young fellow and where it would be most interesting.

Viktor decided himself:

"I want to work with Misha. With my brother."

He then began learning the skills of a comparatively young engineer--Ruf Ivanovich Kolosov, with whom he quickly became friends.

Everyone tried in his own way to teach the lively restless youth in the occupation of optician. In order to learn all its fine points, constant attention, the capability of careful accumulation of skills and of scrupulous analysis of one's own successes and failures were required. Only then could one gain the real attraction of an occupation.

Would Viktor become such a one?

Like a sponge he soaked up everything that Galakhov and Kolosov said and showed to him. And he learned their working procedures and secrets of his future occupation. The young Golovan' changed before their very eyes. The boyish fidgetyness disappeared and he became reserved and close-mouthed. And the single thing with which he exasperated both his mentors and the designers, developers and investigators who came to the shop was his endless questions.

Viktor worked with ecstasy. No one seemingly noticed when this young fellow contrived to learn everything. It was suddenly discovered that he could work on the milling machine and it was not known when he had learned the fine points of lathe arts. Kolosov "suddenly" discovered this in him. And Kolosov gradually began to trust Viktor with assembly not only of small assemblies, but the most complex adjusting instruments, including special micromovie units, microhardness measuring instruments with remote control and finally models of biological microscopes.

Young Veterans

Kolosov looked at his charge of whom he was truly proud.

"Now here is a real Golovan'," he began to repeat, "he knows how to maintain the family honor. You only have to trust him and he will fulfill it."

"Do you think you are not getting too carried away?" Georgiy Viktorovich Orlov, the most "nagging" foreman from the control service, tried to moderate Kolosov's enthusiasm. This was the most experienced specialist whose keen, proficient eye was hardly inferior to the most delicate instruments and standards which he had used in checking.

"I will answer for the young fellow," answered Kolosov.

And the professional skills of the young Golovan' brothers who had given great hope, received the high marks of specialists.

Moreover, the brothers helped each other and extricated each other. The 20-year-old Mikhail acquired the highest sixth rank in spite of all the adopted deadlines. Viktor, when he was only 18 years old, had already achieved the fifth rank and soon, like his brother, achieved the sixth rank of optical engineer.

Fewer and fewer of the veterans--friends of their father--remained at the enterprise. And it soon turned out that the "veterans" were now regarded as the Golovan' brothers themselves, although they were still of Komsomol age.

The brothers already enjoyed the reputation of very experienced specialists by the time that LOMO was created. They were now requested to train personnel for the expanded production.

Creativity of the Brothers

Mikhail was persuaded. A central design office was being organized and a special research laboratory of microscopy was in it. You will work alongside researchers. As what? As their first assistant and participant in investigations. You will develop new circuits and check them on models for them. And of course you will make these mockups yourself. You are capable of doing this.

Mikhail agreed.

The establishment of the firm opened up new vast opportunities for creativity. Microscopes with the LOMO mark had already been sent to the markets in tens of countries and the most diverse institutes--from medical to metallurgical--sent in orders for development and creation of ever newer and newer microscopes.

Mikhail occupied a worker's position among a large collective of investigators in the laboratory. And he worked alongside engineer-specialists Inessa Leonidovna Zarubina, Irina Konstantinovna Lapina, Natal'ya Dmitriyevna Glazunova, Natal'ya Sergeyevna Kibitkina and Natal'ya Mikhaylovna Gunchenkova, designers Anatoliy Ivanovich Mamayev and Aleksey Alekseyevich Kulakov, designers and specialists in optical calculations and among them was doctor of technical sciences Viktor Alekseyevich Panov.

Mikhail worked alongside each of them or rather together with them. Together because an investigator and developer unwillingly seems to think aloud alongside Mikhail's job side, desiring to hear his opinion continuously.

Mikhail listens attentively and rubs his hand through his tousled hair. Beginning to develop a new device, he knows already for whom this device is designated. Another time a developer of a mockup must literally show "on his fingers" how he would like it and how he sees the future instruments. New assemblies and parts are not always manufactured specially for the mockup but old, used parts are used in most cases. And frequently this mockup looks ridiculous externally. And even so this is a "live" instrument. It should indicate what it is capable of, whether it is true to the idea in the design and whether the calculations were accurate.

And now much depends on the rank and file worker, optical-engineer Mikhail Golovan'. The mockup was made with skill and knowledge and with a feeling of responsibility and this is a prototype of a future, but still only an experimental model. The fate of the instrument is frequently on his conscious: will it be or not. And there is no lack of consultants in the laboratory and the SKB--scientists-specialists. And what about practical doubts? Mikhail picks up the telephone:

"Hello, Vitya? Could you drop in. We must.."

For a long time Vitya was for Mikhail only a younger brother over whom he lorded it as an older brother protected him and taught him how to think. The younger was now already a figure among the microscope specialists and he already travelled to Moscow, Kiev, Tbilisi and other cities as a representative of the firm. He independently adjusted special microscope units. The first optical instrument assembled by his hands for investigation in ultraviolet beams was exhibited at the world exhibition in Brussels. Many other improved models of ultraviolet microscopes which the firm developed with his participation were displayed and received high marks at the exhibition in Montreal.

There was perhaps not a single model of an instrument into which Viktor has not put something of himself: either a correction to the design itself or to the assembly technique or to the method of adjustment that guarantees the greatest accuracy. Viktor, having become a recognized leader among the assemblers in the optical section and their brigade leader, has also made a name for himself in the research laboratory to which he of course came not only at the request of his brother.

Once Viktor together with doctor of technical sciences V. A. Panov was sent from LOMO to Stockholm. Here they assembled and demonstrated the latest model of an ultraviolet microscope. Representatives of the Federal Republic of Germany with their similar unit also came there. An involuntary comparison was awaited: whose model is best?

When they unpacked our instrument it seemed that it had been basically damaged during shipment due to someone's careless. Panov, placing his eye to the eyepiece, exclaimed:

"Viktor Georgiyevich, look. What is this? There are some shadows in the field of vision."

They appealed to the Swedish workshop. Under the vigilant observation of Viktor and upon his instructions and with his participation, the Swedish workers repaired the instrument. Viktor did not sleep until almost the following morning.

When Panov again began to check the instrument, he could only say to Viktor:

"You are a real wizard. Honestly."

The most prominent specialists compared both instruments over a period of time in Stockholm. The instrument with the LOMO mark was rated higher in all parameters.

Viktor was also in England, where he went as an exhibit guide to an industrial exhibition where all firms of the world producing microscopes displayed their products. That is why when Viktor comes into the laboratory or the design office he is listened to with the greatest interest. They know that Viktor has a precise and clear eye in precision mechanics.

And now Viktor has come to Mikhail's laboratory. Mikhail shows his brother the mockup of the new model of the ultraviolet microscope.

It turns out that one of the investigators suggests some new version of the assembly or unit in the instrument. If Mikhail or Viktor says: "No, this will not do," they may not waste time in checking. And it really will not do. If they say: "Yes, this will do," then there is already no doubt that effort, energy and funds can be expended on final finishing of the device.

And what will Viktor Golovan' now say to his brother?

Viktor does not hurry with the answer. He slowly walks around the mockup, looks at it, asks Mikhail to show him now one, now another assembly, listens to the explanations of the developer and asks many questions. Viktor understands the entire crucial nature of what has happened and does not waste words. He is interested in eliminating possible complications in the design beforehand. After all, he will be the one who will assemble the first experimental model after the mockup.

He must think. To think--in the language of both brothers this means that they will test all the unknown methods and procedures of precision machining of the surface and will invent new methods and procedures day after day both during work and after work. Viktor is especially skillful in this.

For example, the surface of the disk had been brought to the ideal. This was only the beginning. Now a layer of special "sealer" glue a fraction of a micron thick had to be applied to the disk somehow ideally. And only then did Viktor answer the investigators:

"You can produce this instrument. We can cope with it!"

Later, when Viktor Golovan' was accepted into the party, one of the old workers who had recommended him said:

"Viktor Golovan' lives with his work and is anxious about his work and for him it is everything in the world. Some say that he is not very talkative. They ask whether he teaches young people? His main educational line is again work. Every instrument assembled by him teaches people in itself with its high quality. He increases respect for labor and respect for the working man. An instrument developed by Golovan' is its primary characteristic. Not only young but experienced opticians come to him for experience. He is a thorough person in everything."

That was truly said: "He is thorough in everything." Viktor Golovan' penetrates not only to the heart of an instrument but to its economics as well: he calculates and knows how much a fluorescent microscope will cost the firm. Why it is not less expensive is also his personal concern. He suggests that some especially laborious processes be made more efficient. The result is 1,500 rubles saved for the firm. The most complex assembly, accessible only to assemblers of the highest rank, is located in the three-floor photochamber of an instrument for taking pictures with different degree of lighting. He suggested the technique in which a number of the most complex operations can be entrusted to young optical engineers.

Generally if one listens what the youngest Golovan' is talking about at party meetings, it may sometimes seem that he attracts newer and newer concerns to his shop. For example, something is not going well with his neighbors and Viktor asks that these assemblies be transferred to his shop. Not everyone likes this. Sometimes the rejoinder is thrown at the orator: "You will make a mess of it yourself." And he as if nothing has happened says: "Of course I will. I would like to do it with your help."

"Yourself" is his brigade which includes his old mentor Kolosov and his young friends Valentin Galakhov, Mikhail Shalygin, Pavel Sobkin and others.

Golovan's and Smirnov

He was not quite five years old when he was left without his father. His mother, Yekaterina Dmitriyevna, a trolley conductor, took him with her when there was no one to leave the young child with. From ring to ring. Thus, the war found him and his mother in the trolley car. When bombing or artillery bombardment of the city began, the passengers had to immediately run to shelters. And only the driver and conductor had not managed to leave the car when everything thundered around them from the explosions.

"Mama, what about you?" he asked when an air raid alarm sounded in their path.

Yekaterina Dmitriyevna quietly answered:

"I? I am on duty."

Once at night in 1942 when the fascist aircraft were bombing Leningrad especially heavily, "incendiary" bombs began to patter on the roof of the house on the Okhta where they lived. A land mine exploded somewhere nearby. Yekaterina Dmitriyevna immediately went to his bed: where is her son: where is Volodya? And it turns out that he is on the roof. He is busily extinguishing the "incendiary" bombs together with the adults. His mother throws up her hands:

"What are you doing?"

He answers her:

"And I am on duty. That's all!"

At 13 Volodya was awarded the medal "For the defense of Leningrad."

Several years later Young Komsomol member Vladimir Smirnov became a radio engineer on a combat vessel plying the vast reaches of the Baltic.

He entered LOMO after the army. He worked and studied. His bent was radio engineering and he found special happiness in electronics. Because at that time the very first steps were begun here in the unique "cooperation" of optics and electronics in an instrument itself, in the future microscope. All this attracted the young engineer. And he became totally involved in electronics and began to study all the possible versions of interactions with optics. He was carried away with his work. A practical knowledge of optics or rather knowledge from the practice of instrument building, assembly and adjustment of microscopes for which his "electronics beginnings" were intended, were required.

At this time the young Golovan's, hereditary opticians who now as one of the first had to organize manufacture of the latest special microscopes equipped with different electronic units, needed their "own" consultant.

Thus the acquaintance was made, later a friendship began and later an alliance of engineer-researcher Vladimir Smirnov began with the working dynasty of Golovan's (Nina Golovan' became his wife).

Vladimir had only to express an idea (he was always full of new ideas) about improving the noise resistance of a circuit or about a new, more successful in his view system of selecting the diameters or something else and the Golovan's were ready to test it and try it.

And their voices were heard more and more frequently at party meetings. They talk about what is first discussed in the family circle: a modern microscope is a multicomplex and expensive unit and every customer has his own specific requirements on it (biologists have some, chemists have others, metallurgists have still other requirements and so on). So does it always make sense to develop a special device

for every "one-time" customer from the beginning and to the end? But what about travelling a different path: develop a generally universal design but provide replaceable assemblies and change them depending on the customer's profile and requirements.

Vladimir, a young communist, often insisted on this idea at the laboratory's party group and at party meetings in the TsKB. And although this idea hardly belonged to anyone personally, everyone now supported it both with words and deeds until it became the rule. And again and again the enthusiast engineers-investigators Maria Davydova, Natal'ya Gunchenkova, Irina Lapina, Vladimir Smirnov and, of course as always, alongside them the brothers Golovan'--Viktor and Mikhail--assembled them.

This is joint labor and joint creativity and a joint search for new paths in which both the scientists, engineers and workers of the LOMO firm participate on an equal basis. This is a continuous search. LOMO specialists only quite recently began, for example, new serial production of an entire family of biological microscopes, so-called "biolams."

Incidentally, development of instruments for investigation of the microscopic world is one of the most important specializations of the firm during the 10th Five-Year Plan. A large group of specialists--scientists, engineers and workers--has been working on development of new devices that help to penetrate the secrets of the living cell.

Thus it turned out that all the Golovan's assembled most frequently at Viktor Georgiyevich's. And regardless of what the conversation touched on during the meeting--about detached duty of one of the family members abroad about tours of MKhAT in Leningrad or about a new book of fiction which one of them had liked and which each of them would undoubtedly read, everything still turned to these "microscopes."

Sometimes Nina sighs:

"Again, again they have started talking about microscopes. As if there was nothing more interesting in the world. You come and they 'arrange' a production meeting for you."

And this is true. They all applaud and laugh. Everyone is silent for a few moments. But Viktor unnoticed looks at the old dull black school instrument on its base which had been given to his father with his name. And he says to his sister:

"Well, Ninochka, what can you do. Microscopes are our family business."

KOSTYGOV UNIVERSITIES

The role of the foreman in production is important and the responsibility placed on his shoulders and the responsibility for everything that occurs in his section and that occurs with those under his wardship is important.

Not everyone can be a foreman and not everyone will take on this difficult matter.

Once in the large shop of astronomical instruments of LOMO I had occasion to make the acquaintance of the oldest foreman of the mechanical section Sergey Mikhaylovich Kostygov. I did not know at that time what position he occupied and I did not know that quite recently he was awarded the Order of the October Revolution for his labor success.

It was one of the last days of the month. Behind the glass partition where the foremen usually are I saw three. They were gravely talking about something. One of them was familiar to me: the old milling machine operator, LOMO veteran Ivan Fedorovich Kolesnikov. The second also seemed familiar: the athletic face of a young man in light coveralls, a foppish array was worn almost on the back of his head. He had a dark thin face. His eyes looked out seriously and thoughtfully from under his thick dark eyebrows. I had seen him somewhere. I remembered that his portrait was placed in the enterprise newspaper. He was the winner of a competition among young lathe operators.

The third one I did not know. Young-looking, wide-shouldered with an energetic face. He was showing them a drawing spread out on the desk.

"Well, friends, our neighbors are having no success with this instrument. It's amazing that there are so many operations in one part! How can we help them? The technique has hardly been developed and organized. What else can we invent here? They are asking us for help."

They were talking about serious difficulties in manufacture of a new, very complex instrument for spectral analyses in the adjacent shop. Development of this instrument is one of the items of the firm's socialist pledges.

Both workers--the old and the young--were listening attentively. Ivan Fedorovich slightly pursed his lips, asked something, then added: "So, so" then, putting the drawing aside, he said quietly:

"Sergey Mikhaylovich, I don't yet know exactly but we will solve it. We will take on the entire world. If it must be done then it must be done! Let us begin right now on the machine tool."

Kolesnikov left and then the young lathe operator. And the one who they called Sergey Mikhaylovich remained sitting at the desk. Placing his hands on his cheeks, he again looked the drawing over. I introduced myself. He extended a wide, strong hand:

"Kostygov, senior foreman of the mechanical section." And he follows immediately with the statement: "You could write about Kolesnikov. The old man can literally do everything at his machine tool. A different, even serious part that you have 'tried' thousands of times, but he suddenly looks at it in a new light and you can be sure that he will turn it more precisely and faster. Volodya Skol'nov, who was just here, is the same type of pilot."

"You have many of these aces here?"

"That's true, but there will be more," he finally answered.

"The main thing is that everyone wants to become one. And we will help them."

"We" is a school of communist labor in the machine section which senior foreman Kostygov heads. This is his party commission.

To my question whether the post of foreman is to his liking, he answered directly:

"It is hard work, but I like it."

And he immediately asked me a question:

"What topic exactly are you interested in?"

There was nothing for me to do but lay my cards on the table:

"Well, what about the role of foreman."

It is probably very curious to hear about an interesting person from other people.

The oldest milling machine operator of the astronomical shop Ivan Fedorovich Kolesnikov, who had already reached retirement age, had seen in his time many foremen, first talked briefly about Kostygov:

"A person with his feet on the ground."

He then thought about it and began to talk:

"Yes, the foreman in the section is now everything. Even more so a senior foreman. I have met many: some are fussy and panic. And everyone feels with them that here is one of the best. Another makes up to everyone and doesn't want to quarrel with anyone. Even so he is not respected. After all, it is important that workers

really feel that the foreman is the chief one in the section. Now regardless of who you take--the people are educated and each requires respect. And it is simply that the foremen do not become respected in their position. What kind of production commander is he today and what kind of educator is he if he is hardly more than a senior clerk who opens and closes details."

But Kostygov is different, quite different. He says, "It must be done," and you do it, lay it out and do it. This is how everyone feels both old and young. And mainly young ones. It is difficult for them to recognize authority. Our section has gained communist rank. This rank is not given for nothing. Each of the workers passing through his "universities" seems to have his head on his shoulders. A "green" novice quickly becomes an experienced worker. After all you would be interested in Volodya Skol'nov.

Senior Foreman and Novice

It happened this way: one year before the end of World War II Kostygov was called into the army and Volodya Skol'nov had just been born. In 1966 Kostygov was appointed the senior foreman of the machine section while Volodya, having served in the Soviet Army, came to Sergey Mikhaylovich that same year to the section as a lathe operator.

He was literally the first one who met Volodya directly in the personnel department and kindly clapping him on the shoulder like an old acquaintance and welcoming him to the firm, conducted him across the large, but amazingly clean and green plant yard to the astronomical shop directly to his future job site.

They talked along the way and before coming to the shop the senior foreman had already found out that Volodya's father died near Konigsburg in 1945 and that his mother worked as a grinder at one of the plants. The youth had grown up and had made something of himself. He had completed the eighth grade. Kostygov then liked the remark that he made with a guilty smile:

"They always felt that I would become a hooligan. But in the army they appointed me commander of a division, awarded me the rank of sergeant, even though there were fellows more educated than me with secondary and higher education. I had to 'make a try at it' since they believed in me."

Volodya unwillingly thought how easy it was to talk with almost stranger. It was as if he was simply and frankly talking with his own father.

Kostygov knew from experience how important it was for a novice on the very first day and even the very first hour in the shop. Much depends on this, including rapid acclimitization in the collective. A novice is after all especially impressionable. If the job site is not prepared then someone will be hurt.

Kostygov conducted each new arrival this way. And Volodya Skol'nov as well. His neighbor in the section was excellent lathe operator Valya Fedoseyev with whom he quickly became friends. He immediately felt the kind attitude of yet another machine tool operator--Viktor Gordiyenko, a student at LITMO, and the firm's leading player on the volleyball team. Volodya's replacement was qualified lathe

operator Vladimir Ivanovich Loginov, although Skol'nov himself was still only of third rank, which he had acquired even before going into the army. He observed within the work of such skillful lathe operators as, for example, Nikolay Aleksandrovich Kozlyakov. Once, having seen how Volodya looked at the work of the well-known lathe operator, Kostygov noted:

"Incidentally, it is difficult to achieve this skill without special knowledge and it is simply impossible to maintain the LOMO mark without it. By the way, we now have at the firm a first-class academic combine. So that one who plans to remain here for a long time must study. There is no path to lathe operation or to becoming a foreman to anyone at LOMO without this."

During his first year on the job, Sergey Mikhaylovich sent Volodya to take courses to raise his qualifications. At the same time he entered the ninth grade of the evening school. He then passed on to the 10th, 11th and then entered the technical school.

And during the year of his coming to the firm, a complex plan for the social development of the collective was adopted as one of the first in Leningrad and the country. And Volodya Skol'nov was one of 5,000 LOMO workers who received an education provided by the plan in schools of working youth, technical schools and vuzes during the Eighth Five-Year Plan. He was one of many young worker-students in Kostygov's section.

Of course, Sergey Mikhaylovich also has many concerns about those who study. First, each student must be arranged on the same shift: one on the morning shift and another on the evening shift. Then additional leaves are also granted to the student. Some of them must work during this time.

But these present no difficulties to the students. On the contrary, when meeting Kostygov, they undoubtedly ask: "What success? It is difficult, but I understand."

Sergey Mikhaylovich had already found out about competitions of occupational skills. And now the ideas caught on: a competition of young machine tool operators must be organized.

Kostygov invited the most well-known and multiexperienced lathe operators as judges. Who else but them could properly evaluate the skills of the young people!

The day before the competition the senior foreman wished each of them separately victory.

The young lathe operators had never before worked with such truly combat attitude. This was the most memorable and happiest day for Volodya Skol'nov. Unexpectedly for himself he surpassed the very intensive standards almost doubly and the quality of the parts made by him were recognized as excellent by the thorough "oldsters." Kostygov, being happy with his ward, thought: Here is a long-range reserve--knowledge--to become a future reserve! Free orientation in trigonometry, sterometry and total skills in reading a complex drawing. This is how all this seemed and how!

True, there were some misses at that time. Some of the participants of the competition had rejects. The rejects literally signalled to the young people where the brakes were hidden which interfere with intensive gaining of productivity without loss of quality.

Kostygov together with the shift foreman patiently examines each case of failure. This is even more important since no one can be accused of negligence or carelessness. Everyone tried as best he could in the competition.

But everything did not turn out equally as well for everyone. For different reasons. Significant gaps in theory were found in some and slow response to high-speed conditions were found in another and a third had not yet learned how to apply the latest fittings and how to use them. Thus an individual approach was needed for each one. And the foreman teaches them. Like they teach, for example, in the school of communist labor. The party and trade-union organizations of the firm warmly supported the idea of the competition among the young workers and soon approved competitions even on a wider basis and began to conduct them on the scale of the association and later on the scale of the ministry. Special conditions were worked out and a very discernible stimulus was provided. The winner of the competition would be advanced to the next worker's rank ahead of schedule. And here, moving forward, let us say that fellows from Kostygov's section, including Vladimir Skol'nov, who is unanimously recognized as the best among the young lathe operators, usually led in the competitions.

"Do you know what is especially important for me?" says Volodya. "The senior foreman is continuously present among those who failed in the competition. He feels for each one and is concerned about us. And he sweats for the honor of the section and for our small collective. Generally you don't feed our 'senior' with bread only if his section is first. It is first in everything, even in sports."

Talking about this, Volodya smiles and continues:

"Can even our Kostygov remain on the sideline if it is a matter concerning his section? Never. 'Fellows,' he says, 'do as you like, but everyone should participate in sports competitions. I will also come to the stadium.'"

And he did go. And not only to applaud from the stands. But like everyone in his athletic suit. Like everyone he ran the hundred meter dash. Moreover, his time was not bad. This strongly impressed us young people. We had generally become accustomed to the fact that the 'old man' was always with us everywhere and he knows everything about each one and he feels for each one as if he is our own father."

Vladimir recalled a hardly usual case. A young lathe operator and good machine tool operator with whom he had participated many times in the competition suddenly had a case of the blues. Once he came to work happy and later loafed. Once he was a different person. He did not want to talk with anyone. And a complaint also came from his family.

The fellows in the section were disturbed and even more so since he had also been rude to Sergey Mikhaylovich. Many waited for the "old man" to bring the guilty party to his senses.

However, Kostygov did not hurry to "bring him out of it." He once appealed to Skol'nov:

"Volodya, you should find out quietly what has disturbed him. He won't say anything, either he's ashamed or afraid. Or he doesn't trust him. But he is an arrogant fellow. So we have decided to give you a delicate mission with the party group organization. You are both young. He will be more frank with you. But to punish a person for a long time the main thing is to find out everything."

And Kostygov found out and helped him.

"The senior foreman said 'it must be done!'" This is the formula which determines the degree of importance of one or another commission. This formula is the guiding one for most workers.

Volodya recalls how he dreamed about whether they would trust him with such unique work as Koslyakov was doing. And once he received it. He tried very hard. The part came out. Volodya decided that from now on he would work together with a veteran. But he heard something else:

"Wait. It is early. You have little experience. We can't risk it here."

He was first hurt but then analyzed it and everything became clear to him. The machine tool was too valuable and the part was too crucial to take even the slightest risk. But even this was not the most important thing: there were so many fine points in the work that his simple knowledge and simple skills were clearly inadequate to do it. For example, he held in his hand a delicate part--if its temperature increased by only 1-1.5 degree it would no longer be accurate. The lathe operator's hand was supposed to feel the degree of heat more accurately than any thermometer. This is experience!

And soon he said solemnly to Volodya:

"Well your hour has now come. The machine tool has now been freed about which you have been dreaming. Go to it. And don't tremble. The more delicate the work the more confidently should be the hand and the harder should be the character. Like that of a surgeon! Is it clear?"

Senior foreman Sergey Mikhaylovich Kostygov is a unique director of everything happening in his section. He seems to direct everything quite unnoticed. And not only current work directly. People consult with him as to who to advance by the Komsomol organization of the section. After all, senior foreman Sergey Mikhaylovich is a communist and a member of the firm's party committee.

The Komsomol organization elected Volodya Skol'nov. And here Kostygov was the first adviser and assistant. "To become a real leader one must first be himself in front," he says.

Once during a meeting Sergey Mikhaylovich asked:

"I heard that the Komsomol generation is organizing a movement of innovators in the section."

"Exactly, Sergey Mikhaylovich!"

"This is good. This is at the heart of things! Even more so since the collective of the firm has promised to turn over and introduce no fewer than 14,000 innovator proposals during the current five-year plan." Kostygov smiled knowingly and Volodya already knew that he was already asking: "What about yourself?"

The Komsomol organization made its recommendation but he rejected it as unrealistic.

Kostygov then said:

"It is sad. After all, you correctly rejected it. You look everything over as you should. Think about it but calculate. There is something here for your hands."

And now Vladimir began to check the entire production process of manufacturing the most laborious parts. He went to the assemblers and consulted with them. He independently calculated the laboriousness and consumption of metal with the old version of the billet and with the new one which he himself suggested. It turned out not bad: the labor consumption was cut in half but the saving of special steel was 400 kilograms!

Volodya Skol'nov's method was adopted.

Kostygov congratulated him:

"You now see that you are a real worker. Even though you are of fifth rank, a real worker begins with a thrifty attitude about the entire production. Then he becomes a real innovator. So then comrade Komsomol organizer. Yes, incidentally, and what about your Komsomol generation?"

Volodya laughed:

"I understood you Sergey Mikhaylovich. After I had done it myself they all began to make suggestions more actively."

After some time Vladimir Skol'nov was accepted into the party. The senior foreman gave a talk at the first meeting:

"Did you know I myself did not notice how everything occurred. Only it seemed that a green youth had come to the section. And he is already the best lathe operator. And he is already the best innovator, a restless soul and the inventor of many worthwhile suggestions. In short, he is a real experienced worker."

How Kostygov Became a Foreman

Let us return to the story about my first acquaintance with Kostygov.

In a complex situation for himself, the senior foreman asked for advice and assistance not only of the multiexperienced machine tool operator Kolesnikov but not without accident of his young ward Volodya Skol'nov as well.

The first thing that had to be done was, having solved the next production problem, to find a method of rapid manufacture of unusually complex and laborious parts and to help the adjacent shop which could not cope with the manufacture of these parts. The main rule of the socialist competition is active here.

Second, Kostygov did not doubt that there was someone about the "patriarchs" of milling machine operators of the shop that Ivan Fedorovich would think of. And the young lathe operator, the future technician-inventor, sees much with a fresh eye and utilizes all his acquired knowledge.

Sergey Mikhaylovich's confidence in the success of the unique duo of workers--the senior milling machine operator Kolesnikov and the little-experienced, but theoretically excellently trained novice lathe operator Skol'nov--was completely justified this time as well. After careful "analysis at home," Volodya showed the possibility and need to use precise casting in manufacture of these parts--this would immediately reduce all machine-tool operations by 70 percent and would reduce the laboriousness of them almost by one-half. Ivan Fedorovich, indefatigable in his inventiveness, of course introduced his own original fitting and changes in the configuration of sharpening the cutter.

The planned tasks are always constantly fulfilled in Kostygov's section. How? On what does the personal qualities of the commander of such a comparatively young, but important section in organization of production as the section depend?

In the first specific case we are talking about senior foreman Sergey Mikhaylovich Kostygov. What is exceptional and special in him? What made him one of the best foremen of the firm?

There is nothing special in him and there is nothing exceptional in him. And perhaps initially he had far fewer formal data to occupy this position than others. He came to the firm not having a secondary education. At that time he did not have a single civilian specialty. He was drafted into the army as a youth and he later reenlisted as a master sergeant. He was immobilized already "in years," the father of a family--a wife and two children.

Of course he wanted more interesting work. But where could he find it at that age? As a student? They hired him at LOMO as a stoker. They warned him on his first day in the personnel department: "that he must study continuously. This is our procedure. Look it over and do not forget about this."

At that time Kostygov did not give any special significance to these words, as if they had been dropped randomly. He still did not know that from the first days of the firm's founding the tradition had been established: cultivate your cadres for all sections. They felt that it was better if the tone was assigned at the enterprise by those who started the roots here and who felt something for the collective. And the firm began to place bets on the more capable of them.

A year later before finishing the ninth course, Kostygov requests that he be transferred to another job on the same shift so as to continue his study.

It was hard for the new rigger: to load and carry heavy rolls of copper wire to the electric motor section. His shoulders and back hurt from such unaccustomed

labor. To sit at a desk and to concentrate on what the teacher is explaining after such work required a very strong effort. But he did not let it show. And somehow it turned out in the shop: yesterday's master sergeant now gives out good advice or is now called on to replace one who is out sick. Sergey Kostygov was an observant person. He watched and he tested. And is there too much bustle in organizing the work of riggers? He corrected in his own way the path of the carts with the load and calculated the most feasible time to deliver the wire. Kostygov was later appointed brigade leader.

A year later the brigade leader of riggers had successfully passed exams for secondary school. They suggested that Sergey Mikhaylovich become the shift foreman of the revolving section in the astronomical shop.

"Foreman? In the revolving section? I have seen revolving machine tools only from a distance."

The secretary of the party committee laughed:

"That's no misfortune. You will master it. The main thing here is that people come here unwillingly. The firm begins to organize the latest optical instruments for different sectors of science, engineering and medicine. We must force out our competitors on the world market. This is not only a question of economics but of politics and the country's prestige as well. So that you, as a communist, should understand that this is a combat and party matter."

And so he appeared in the astronomical shop. A rather modest, strong figure. His blue eyes look at you softly, openly, but kindly.

The revolving section operators did not immediately recognize him as chief. Kostygov went up to one young machine tool operator without any tact and said:

"Please learn the occupation of revolver operator. I learned it. You are only helping and coping. Otherwise how can I supervise you?"

His directness hit the heart of all the workers. They willingly went to meet him. But all the intricacies of the occupation could not be practically mastered immediately. Obviously, it is important to analyze the essence of the matter. To be a foreman means first to learn how to organize labor and to manage people. And this idea of Kostygov was correct. All the machine tool operators in the astronomical shop were soon joined--the lathe operators, milling machine operators, metal workers and revolving section workers--into a single machine section. Sergey Mikhaylofich Kostygov was appointed the senior foreman. At that time he had already brilliantly defended in the evening division of the institute his diploma, related to problems of planning and economy of production.

The Section--School of Communist Labor

A worker approaches the senior foreman and says:

"What is happening, Sergey Mikhaylovich? The machine tool is standing idle. There will be a direct loss to us and to the shop. We and the fellows have already figured out how to get around this."

A lathe operator or milling machine operator could earlier come to the senior foreman with a complaint: when will the machine tool be adjusted and how long can it stand idle? The worker now inevitably presents the "economic base" and calculates how long the section, shop and firm will remain idle. This economic accent in the daily conversations about production matters did not arise suddenly.

Kostygov has propagandized his economic knowledge several years running. He is the director of the school of communist labor, which has also become a school of economic knowledge, a school of advanced experience and a school of moral education. It also has precisely allocated hours for studies, but it is not regulated by any time framework. Because this is a school of labor. Not only students but the propagandist himself is educated and grows creatively in it.

It began with the small, seemingly quite insignificant. Machine tool operators were assembled and it was suggested that they themselves organize in their own section. They then tried to convert to self-checking. A worker of the OTK was released but they began to check the parts even more rigidly.

The senior foreman thought about the first results for a long time. It was not bad. And the matter is not only one of indicators. Here, thought Sergey Mikhaylovich, one must know human psychology. A lathe operator who tidies up in his own section would not let chips fall where they may and will not let grease or emulsion drip over the edge.

In his time Kostygov understood very well what "standard-hours" and "nomenclature" were, but he also knew something else: all these standard-hours are provided by specific people about which nothing is said in the summary reports: Ivan Kolesnikov, Vladimir Skol'nov, Nikolay Nikolayev, Petr Malyy, Valentin Fedoseyev, Boris Rusak, Nikolay Kokurin--generally tens of the most diverse people both in age and occupation and with different level of qualifications, but even more important different in character.

And Kostygov suggested to the shift foreman that a daily personal schedule be entered so as to see from it who is working and how they are working. A machine tool operator comes up, looks and it is clear to him how he worked today and how his neighbor worked with whom he was competing.

The senior foreman assembles the students of the school of communist labor. He has something to say to them.

Here the personal schedule lets one know whether things went well with one young lathe operator. How is this so? He is hardly a capable fellow. The worst thing is heard--he became disillusioned: "He is bored. You think that it is very important to turn bolts and screws?"

And this circumstance also depressed Kostygov. He understood that until the fellow feels interested and respect for his work that no rules will help. How can one bring him "to the people"? They also talked about this with concern at the studies in the school of communist labor.

But now some of the workers--students of the school--turned attention toward that which had hardly attracted anyone. On a tour. How many of them are at LOMO! People from many corners of our country and foreigners.

Well, is it really less interesting for one to look at all this who turns, mills or polishes parts customarily day after day?

They suggested to this same fellow and not only him that he participate in this tour through his own firm. And many saw their "nuts and bolts" in a quite different light for the first time--as part of a unique technology. They heard how one of the renowned adjusters at the firm, showing them the operation of the most complicated optical instrument, said:

"You can't really say what is more important in this instrument--the precision of the lenses or the quality of an ordinary screw for adjustment. Everyone who has been lucky enough to put his hands to development of this miracle deserves great respect."

Everyone. One of them was also this fellow.

And this seemingly was all. Seemingly nothing special occurred but the young worker for the first time thought seriously about his place in the shop. And he began to change. For the better!

"Internal reserves," says the senior foreman, "are in every person. True, it is not always easy to reach them. The competition is the main assistant in this."

Kostygov loves to work with skilled people. And he tries so that everyone who deserves it is singled out with gratitude in orders throughout the shop. He is not ungenerous in his gratitude.

The senior foreman has a routine exercise in the school of communist labor. The topic is the culture of labor and the quality of production.

The workers themselves began the class. The one who he had previously asked to think about these questions: did they feel it was time to start rejecting articles? What measures did they propose to increase quality? The studies were conducted directly at the machine tool operators' positions. A lively interested conversation takes place. After all, these are the managers of the section. All of them!

But quite recently the experienced teacher and manager Sergey Mikhaylovich Kostygov was sent to an even more responsible production section--he was appointed chief of the shop.

THE DIPLOMA OF THE SHOP CHIEF

The topic of the diploma project of student Alekseyev was called "Improving the Operation of the Shop by Improving the Use of Equipment." And the main thing is that the diploma candidate has himself managed one of the largest shops of LOMO for many years. This shop is not inferior to other plants in the volume of products produced. It sends parts to numerous shops of the firm. And if something slows down here, almost the entire association inevitably begins to get a fever.

A new chief. Meeting with him, I tried to imagine at what price he managed to raise the prestige of the shop and I mentally drew a portrait of a thoroughly exhausted person weighed down by a thousand concerns, with continuous phone calls and urgent questions. However, the Vladimir Ivanovich Alekseyev with whom I first had occasion to meet in his large and light office was in no way similar to the portrait that I had mentally drawn for myself. He quietly and confidently answered phone calls--there were plenty of them during these days: the routine quarter was ending. He answered with a quiet businesslike manner.

I felt during the first minutes that before me was a skillful organizer who knew his business. But what the main thing in his skill was I still had to analyze. After all, one not occupying a position determines the prestige and influence of the shop chief among his subordinates and among hundreds of workers, foremen and engineers.

Vladimir Ivanovich answered my question about this:

"One must understand the simplest truth itself: the strength of a chief is in his subordinates. One must only treat one with justice and skill."

Vladimir Ivanovich grew up at LOMO before becoming chief of the shop, like most managers of the firm, from its own rank and file workers. He entered GOMZ where his grandfather and uncle worked at that time, as an apprentice lathe operator in 1944. Why did he begin as a lathe operator? He didn't know anything at all about this profession but lathe operators were necessary. And in the personnel department they began to talk to the thin blockade teenager very uniquely: "A lathe operator is easy. You turn the handle, switch on the 'self-running' and rest for your health."

The "ease" did not bemuse him. He began to drive a tractor as a student in the evacuation near Vologda, then he replaced the tractor operator who left for the front and worked in the field like all the adults. He worked very hard. Of course, it was not easy at the lathe. It was easier but not as complicated. This he understood immediately as soon as he was given his first seemingly simple operation. Here is a billet and here is plug. Bore the opening so that one end of the plug goes into it and the other doesn't.

Vladimir looked at all his voluntary mentors of ace lathe operators with much respect and almost with worship: Petr Smirnov, Petr Saperov, Nikolay Krutikov and others. And within several years Vladimir Ivanovich Alekseyev was a lathe operator of the highest rank. He completed the technical school. He was assigned the position of foreman of a large mechanical section.

He studied with different machine tool operators of his own section. Now if a debate arose about introduction of any innovation, not only among the lathe operators but about the gear-cutters and polishers, his word carried weight and proof.

And as it always happens, what position was he not appointed to. For example, when he became the senior foreman in assembly of optical instruments. He took up the study of optics and electronics although there were enough specialists in assembly even without him. He could not simply do otherwise. The concept "organize" meant "learn how" for him. And later when the staff and the complexity of the job became much more complicated and the range of problems expanded sharply, he still remained true to his initial principle--know, find out and learn how.

The shop received a new imported revolving machine. They installed it and switched it on. They attached the first billet but the work did not proceed. The friction clutch went out. They could not understand what was wrong. And even the most experienced foreman Sergey Nikolayevich Pynin shrugged his shoulders:

"I don't understand. And this is not the reason that it went out."

Of course, they could call the chief engineer to help. The shop chief was not obligated to adjust and debug machine tools. But he was interested in understanding and analyzing how to find the reason for the failure. And he finally finds the error. The machine tool operates.

Alekseyev himself may have forgotten about this long ago, but people remember. And they talk with pride about their chief: "Vladimir Ivanovich is always aware of what is going on."

But not everything went as smoothly for the shop chief. He did not have enough economic knowledge. How could one manage production and be involved in problems of cost, profitability and profit without them? This means that one must conduct one's affairs blindly under conditions of the new planning and economic incentives system. And he goes to the institute to study.

In 1967 he graduated from the engineering-economic institute by correspondence, defending his diploma with mark of excellent. I asked Vladimir Ivanovich how and what interesting he used from the shop work for his diploma work and he imperceptibly turns the conversation toward a new channel:

"Well, what is a diploma? If I say frankly that the most interesting thing is that you don't have to write anything in diploma work. These are people who are alongside you and on whom everything really depends. And one must find a common language with them and create a friendly, work-capable collective. This is what is important to me. Then everything is all right: both the "shift factor" and the equipment load and all similar indicators. And of course the only authority of a chief," he concluded pensively, " is not to achieve much. What could I have done alone without the party organization and without the shop communists?"

The life of the new shop manager began with acquaintance with the party organization. The party organizer is Ivan Nikolayevich Dmitriyev. The communists have elected him as their leader for 13 years running. He is several years older than Alekseyev. His biography is simple. Before the war he was a timber cutter. He was a master sergeant of a machine gun regiment at the front. He served in the army for 15 years. After demobilization, already being the father of two children, he entered the shop as an apprentice lathe operator. Yevgeniy Il'ich Semenov taught him, a communist and former partisan. When we talked he went into the chief's cabinet and said angrily:

"When will we get order among the casters? What are the technicians thinking about? A billet is an entire mountain but a mouse should move it. No, I do not plan to bury metal any longer. After all, it does not fall from the sky."

No one said anything to the thrifty Semenov: after all, we'll work it out later. And this "later" never happened. And Dmitriyev, exchanging two or three words with Alekseyev, got up immediately and they went with Semenov to the senior technician.

"We have found a common language with Dmitriyev and he helps me a lot. For example, I began to trace the entire route, beginning with drawings, from billets to finished parts. And flaws were found in the intrashop planning."

They had to break it steeply but not everyone always liked this and doubts arose. They soon decided to hold a general meeting and Alekseyev was supposed to give a report. And now the new chief was hardly tempted--there was no time, and he commissioned his deputy to speak to the workers. But it did not turn out. The party organizer insisted: "You must meet person to person with people. Otherwise how can you manage? They have a direct idea about what to think. And what about you concerning them."

Alekseyev listened to the talks attentively. Ivan Nikolayevich introduced him to people in a lower voice. Senior foreman Sergey Nikolayevich Prypin. He had retired long ago. He remained in the shop as an adjuster of automatic machines in order to at the same time teach this occupation to young workers. And now Yakov Leonovich Parfenov--also an adjuster of automatic machines--specialist of the highest class and party group organizer, gives a talk. He was awarded the order of Lenin. He feels that now some tutors of the young formally relate to their duties but more than half of the workers in the shop are young people. And that the new chief should generally take this into account especially.

Semon Kazachkov, a young worker and as Dmitriyev expressed it, "the grandson of Prypin along the party line," also said a word. Because Kazachkov had been taught

his occupation and recommended to the party by Parfenov and he had at one time taught and tutored Prypin and also recommended him at that time to the party.

Senior foreman I. Koltunov and polisher, deputy to the regional Soviet V. Chumakov demanded that he "take a shorter rein" with violations of discipline.

Both the complaints and the proposals were valid but the most important thing, Alekseyev felt joy: the people in the shop were interested in working better. And frequently he got the idea he "commanded" these people--not the best method of management. But to consult with them and make a decision is perhaps the truest and most reliable. Without even talking about the fact that the person with whom he was consulting grows in his own eyes and is ready to take on his own responsibility.

As never before, Alekseyev felt the importance and value of the participation of each one in solving a difficult problem when reconstruction of the production areas, replacement of obsolescent equipment with new more improved equipment, shifting of machine tools and so on was begun in the shop, as in all other shops of the firm.

During the period of reconstruction the shop was given no break but the additional requirement: do not reduce the output of products. And of course so that this was not reflected in the quality and in general fulfillment of all socialist pledges.

This was a real test for the new shop chief and for the entire collective.

Alekseyev suggested to the party organizer that the communists be assembled and that he talk frankly with them. But a general open party meeting is better.

The work was organized into three shifts without specific days off under the clatter of jackhammers. With lighting from temporary wiring. Under construction timbers. On old machine tools which had been hauled from place to place. On new machine tools with program control which still had to be assimilated.

And what didn't the working wit suggest! After all they had to temporarily stop all the milling machines. And what about the footing? This was a long and major job. The milling machine operators Yuriy Aleksandrovich Metelkin and Gennadiy Pavlovich Uvarov suggested the way out themselves: install a channel iron girder and fill it with cement. But what would be suitable for the milling machine operarators would not be suitable for especially precise lathes. How could this be? And lathe operators German Ignat'yevich and Nikolay Makarov suggest their own solution to the shop chief: what if they install the machine tool directly on the vibration supports so as not to lose time in filling it with cement. And what about the vibrations of the machine tool? They also studied this. We will work at low speeds. True, the third shift will have to work harder. But this is a temporary phenomenon--reconstruction is under way!

The shop party bureau followed all the proposals smoothly. An amazing atmosphere of labor enthusiasm and some kind of "unagreed-upon competition" were organized.

Once Alekseyev suggested to the brigade of polishers--Aleksey Fomin, Petr Kuchenov, Valeriy Shchelokov, Valeriy Lutsenko and Feliks Kalashnikov--stay and work on the evening shift: delivery of the billet in the casting shop was delayed. It turned out that they had tickets to the theater, a cultural show. They had planned for a long time to go BDT to go to a beloved show and they would not manage to see it. But the brigade leader said decisievly:

"All right. Once is one thing--we will stop on three. On the evening shift."

They worked sadly. They covered the norms doubly and triply. And in the morning they came to work again. The shop chief expressed his gratitude to them in an order.

The shop chief came to all the Komsomol meetings. He noted the capable, promising youth. The youth had to be taught. They had to be taught beforehand. The concerns were constant. For example, modernization of machine tools. He talked about this many times with technician Valentina Ivanovna Kuznetsova. He talked with the party organizer and they decided to invite as a consultant the best gear cutter Ivan Vasil'yevich Bazunov. They created something resembling a complex brigade. And they achieved and accomplished what they had thought of. The most complex operations are now considered comparatively simple and rank and file machine tool operators now cope successfully with them. And these are mainly young people.

Success inspired them. And on the advice of the shop chief not one but several of these complex brigades were formed, the purpose of which was to develop the technology and accessories so as to utilize the equipment more densely.

The most difficult thing initially was with the new program machine tools. There were many machine tools but who and how would work on them? Talents began to be revealed. For example, the shop chief proposed that adjuster Viktor Britov assimilate this new equipment. Britov was exceptionally capable. He rapidly mastered the machine tool and immediately began to teach others. Foremen, engineers and technicians now came to him for "raising their qualifications" in program machine tools.

The example of Britov attracted other machine tool operators. A competition was organized among them. Dmitriy Petrovich Petrov competes vigorously with Britov and they assist each other. Now each one works on two program machine tools simultaneously. They teach the otehrs.

It was eight months while reconstruction was under way and the shop fulfilled the plan, even producing products above the plan. All this was became of maximum loading of the equipment. And because of increasing the shift factor.

I should like to add a small afterword to this essay. While this book was being prepared for press, Vladimir Ivanovich Alekseyev was appointed to the position of chief technician of the association.

SCIENTIFIC ORGANIZATION OF LABOR AT THE FIRM

As is known, scientific organization of labor arose on the eve of Societ power. Lenin, exposing the notorious "Taylor system" and regarding it as a "refined atrocity of bourgeois exploitation," saw in it "a number of the richest scientific achievements in analysis of mechanical motions during labor, elimination of superfluous and inefficient motions, working out the most correct work procedures, introduction of the best accounting and monitoring systems and so on."* Lenin assumed that everything scientific and progressive from this system should be permanently used in the interests of the Soviet economy and in the interests of the workers to increase their standard of living, well-being and level.

The new, socialist contribution also required the highest labor productivity. And this means the highest organization of it. The party leadership proposed that model enterprises be developed for this and that socialist management be taught on their experience. He felt that scientific organization of labor was the most fundamental and timely problem of all public life.

At that time the first NOT [Scientific organization of labor] cells were born at the plants and factories.

"Scientific organization of labor is the most reliable means of increasing its productivity. Development of a firm itself and development of its most important trends in the field of specialization and mechanization, improvement of the management structure and the main thing of course organization of labor" says general director of LOMO M. P. Panfilov, "is all related to NOT."

One of the veterans Miron Pavlovich Sheynin heads the department of scientific organization of labor and management of the firm. Here in three research laboratories of the department work 28 highly qualified specialists: engineers, physiologists, psychologists and musicologists.

What does the NOT service do?

Businesslike Suggestions

The chief of the machine assembly shop was having a meeting. The occasion was an alarm signal: important parts had not been manufactured by the deadline. To

*V. I. Lenin, "Polnoye sobraniye sochenenive" [Complete Works], Vol 36, pp 189-190.

determine what the situation was, the workers of the planning-shipping office were summoned. Telephone calls were heard from time to time in the office. The shop chief picks up the telephone and answers briefly and decisively. He then again returns to the main question.

The meeting ended. Only one worker in the firm's working smock with a notebook in her hands remained in the empty office besides the chief. She had not taken any participation in the proceedings.

"Well, what would you say, Lyudmila Anatol'yevna?" the shop chief asked her. "Was everything this time according to science or not very much so?"

"I will begin with that which I liked: the speed with which you solve problems. The clearness of instructions. But now you have determined the cause of the delay of parts. You have assigned new deadlines orally. No one writes it down. Protocol is not maintained and the decision has not been recorded in any documents. And how will you check it? Does this mean that a check will be made at the next routine meeting? And then not everyone who was at the meeting has a direct relationship to the matter? Why invite those not related? And one more thing: you were distracted by telephone conversations and this scattered the attention of those attending the meeting and distracted them from the main thing. The secretary who frequently came in with documents for signing also created a distraction. And it is absolutely impermissible that the meeting participants came and went whenever they felt like it. And you sat for a very long time with a break of four hours in overall complexity. And who could decide anything besides the meeting. Let us look at it together."

Lyudmila Anatol'yevna Ivanovna is a worker of the department of scientific organization of labor and the chief of the office. She graduated from the financial-economic institute and was involved with investigation of organization of labor and management. And a broad field of activity was offered to her at LOMO.

The chief of the machine assembly shop had already long ago established contacts with workers of the NOT department. The senior engineer of this department Igor' Il'ich Bogushevskiy studied planning, accounting and the work of the auxiliary services in the shop. Many improvements were made here upon the recommendations of Bogushevskiy. Take, for example, the storage room in the section. Bogushevskiy suggested that one or another articles not simply begin at piece by piece but that sets be collected together for assembly. The storage room managers were specialized in specific nomenclatures so as to work with knowledge of matters--rapidly and intelligently.

The shop chief was also able to ascertain how not only a reduction of the amount of paperwork but generally of the document workload helped the shop. Only the information required at a given moment began to come into him.

He saw how much workers from the NOT service were doing to help the foreman. How they helped them to correctly distribute their time, how to place people and how to bring order to the working day--in short, to create favorable conditions in the section and to increase labor efficiency.

And there were previously different instructions about the work of the foreman and shop chiefs. But there were general propositions in them.

And how should one proceed in a specific case? Complete parts were not issued in time. The person on which they counted did not come to work. The drawings did not come in on time. The workers of the NOT department work at different versions of production decisions for these cases. Of course, the foreman selects the best ones for himself.

The prestige of the workers of the NOT department slowly increased in the eyes of the shop chief. And once he said to Lyudmila Anatol'yevna:

"Could not NOT help the fate of the shop chief? It must be admitted that the more perfected the system of organization of labor in the shop is, the more acutely you feel your own deficiencies. In any case, the fluctuations bother me. So there is the suggestion--come, observe and study. My working day, my office and my desk is at your disposal. Sit down, spread out all your papers on it and see what is right and what is wrong."

This is a complex matter. We have become accustomed to the term "manager." But "business person"? Yes, exactly! We know many managers who are selflessly devoted to their business and who know it. They work late. They don't even have any rest at night. In general these are real enthusiasts ready to pay any price "to fulfill the plan."

But enthusiasm alone, even if it is reinforced by knowledge, is not enough. This is felt especially in such modern production as LOMO where almost every shop can be compared to an entire enterprise in the volume and complexity of the articles produced.

It is not so simple for a capable engineer who knows production to take the helm of the shop. There are too many concerns: a number of services of the most diverse designation, engineering and technical personnel, hundreds of workers, the plan, quality, realization of production, communication with other shops, wage funds, everday life and educational work.

Ivanova certainly penetrates the work style of the shop chief. Her papers are on the desk. Alas, such a facility cannot be managed without papers and without documents. In order to manage one must know primarily how much information is needed. Every day. All the time and continuously.

Lyudmila Anatol'yevna begins with how to help bring order to the papers on the chief's desk. And she writes in her recommendations on the topic: "Bring order to working with documentation and storage of it. To do this, place the documents in folders according to the designation of the documents and depending on the frequency that they are consulted; store the folders in vertical position and then it will be easier to extract what is required. It is best to have the folders of different colors. For example, a red folder for incoming correspondence not yet considered. Another, let us say white or blue folder for documents sent to executives or for monitoring and a strict reminder. All correspondence must be reviewed on the day of its arrival."

Trying to be unnoticed, Ivanovna persistently observed the work of the shop chief. He is now touring the section with notebook in hand. He listens to complaints and suggestions. He resolves one thing, making notes on one sheet, on another and on a third.

And how will he later check what was done and what was not done? Will he leaf through the entire notebook? Will he make notes on the calendar? And if something is not fulfilled must it be recorded again? Moreover, it is difficult to monitor the fulfillment of orders.

But what about instead of notebooks he takes a card index? And he makes the same notes on individual card indexes. Arranged together in the necessary order and by deadlines for fulfillment, they can always be seen. It makes sense to entrust monitoring for execution to a special worker--a secretary or to someone else. Incidentally, not only the chief needs a secretary but the assistant and reviewer who knows production and knows how to fulfill important commissions.

Observing how the shop chief conducts his own working day, Ivanova easily established that the shop chief essentially has not clear routine. During the entire day numerous workers of different services drop into his office when they need to or want to and he receives them at any time. It seems to the shop chief that otherwise all problems cannot be solved in an operational manner and after all you can't stop production.

NOT department worker Ivanova brought these reflections to the shop chief for a frank conversation.

The shop chief had something to think about. He answered frankness with frankness.

Lyudmila Anatol'yevna step by step followed the shop manager's working day. She then wrote down her own observations, conclusions and outlines of futher recommendations. This is the well-reasoned advice of an expert with respect to the chief of a given, specific shop, with regard to its characteristic features and specifics and with respect to the personality of a manager with quite specific features of character, virtues and deficiencies, habits and tendencies, views and temperament.

She observed how the character and habits of the manager are reflected in preparation of decisions.

And among the notes to be remembered appears this one: "Compile a routine of the working day for the shop chief and for the work of all shop subdivisions, having provided time for work with correspondence, holding meetings, receiving workers of the shop subdivisions on production problems and also on personal matters. Develop a sample plan for the work of the shop chief for the next month, providing in it consideration of questions of a future nature:

a) on questions of a future nature that require preparatory work for decision-making and turning over the appropriate tasks to executors (preparation of drafts of decisions); monitor the execution of assignments;

b) familiarize the shop chief with the literature (a list of books is needed) on organization of management and so on."

These and many other recommendations of the NOT department worker helped to determine the new work style of the shop chief and manager.

I am Writing to You

I was interested in the office:

"How many letters does the firm receive per year?"

"Almost 100,000 letter-telegraph dispatches."

"That means how many answers must be sent?"

"That goes without saying. And we also write letters to many addressees ourselves."

"And is there also interfirm correspondence?"

"And how! They write from the administration to production and from the production to administration. Engineers, designers, shop and department chiefs and planners write. There are reports, requests, official reports, lists and technical documentation. There are approximately 200,000 internal dispatches annually."

How many office workers are needed in the apparatus and how many postal workers and messengers are required! The post office of an entire city must cope with the same thing.

The flow of documents will increase. This is inevitable: the range of problems and tasks which LOMO solves will expand and the range of contacts, including foreign contacts, will increase.

But how will one cope with this flow? Will the business production staff be increased continuously? No. "We must continue to work for further improvement and reducing the cost of the administrative-management apparatus," so it is said about this in the proceedings of the 25th CPSU Congress. They forced the LOMO managers to rethink things with new acuteness and effort. The movement of documents must be ordered. Documents are the basis on which everything is constructed: planning, regulation, coordination and checking of execution.

Organized production begins with clearly compiled documents.

And the following problem was formulated and posed to the NOT service: to reduce labor and time expenditures in fulfilling work on compilation of documents and on their reception, recording, accounting and distribution among executors and delivery.

This problem is not solved immediately. There are no ready models. One must think. Raisa Yefimovna Polina--a worker in the firm office--thought about this. The problem also touched her personally. The flow of documents was flooding the office. Documents frequently duplicated each other. Orders came in every day which should have been delivered immediately to their destination. But many addressees are

several kilometers from each other. And Raisa Yefimovna quite frequently had to expend not only much time on dispersion of papers and not only to analyze the essence of different documents but she also had to deliver them herself to the addressees, performing the duties of a messenger. Sometimes the messengers became the authors of the dispatches themselves--designers, technicians, planners and workers of the accounting office.

Raisa Yefimovna Polina, being a correspondence student, attempted to look at her occupation creatively. Like everyone in the firm, problems of efficiency and improvement of management disturbed her. The serious, weighty suggestions of Polina, related to improving the office service, interested the department of scientific organization of labor and management where Polina is now the senior engineer of one of the laboratories.

Many of her suggestions, realized together with those of other specialists of this laboratory, helped to solve urgent problems.

I am now having a conversation about this with Raisa Yefimovna. And she talks about what their small laboratory has already been able to do.

"First about the letters. It was first necessary to sharply reduce the simplify the number of letters because this in itself is a very laborious process. We qualified the correspondence and worked out standard texts concerning formulation of agreements, supply, technical information, exchange of experience, adoption of orders and so on. The texts and copies were printed in the firm's printing plant. The issue "Collection of Standard Texts for External Correspondence" was used by them for convenience. A fourth of all the letters now sent from LOMO is printed on the firm's forms."

"And do you have many specimens of these letters?"

"About 100."

"But how is data changed in these standard letters?"

"For the convenience of the typists who type only the variable data, copies of the letters are placed under the originals, which together with the originals are bound together into blocks."

As a result the time expenditures on correspondence were reduced by a factor of more than 3.5 after standardization. And the firm not only made up the expenditures on paper and printing expenses, but also saved 10,000 rubles on this. All external correspondence was centralized and any letter is dispatched only through a common department.

And if, for example, the addresses must be written on the envelope. Will this be a trifle? But still it takes one and a half to two minutes. And several tens of letters are sent out per day. This adds up to hours taken from the business production workers, needed for more important matters. And we introduced envelopes with so-called open window on which an address does not have to be written since it is visible on the letter through the transparent insert.

"This is concerning external correspondence. But an enormous circulation of different documentation also goes on inside the firm?"

"Yes. Even more so since enterprises with their own systems and forms of planning, accounting and report writing have been included in the association. We began here with standardization of documents. All their standards were grouped by principle of identical and similar designation into classes and groups. Having studied them, it was decided: 300 forms of different documentation can be replaced without any loss whatever. And standardization of documents made it possible to process them by using computer equipment."

"We have talked with you about the innovations in document processing. What about delivery of them to the addressees? After all, there were several conversations about the fact that designers, technicians and foremen became messengers for an hour."

"Oh, this is already ancient history. We have not needed messengers for more than one office for a long time. Almost all staff messengers have been reduced. A ring post office replaced them. You can see it in action. The pickup will arrive in five minutes."

And precisely, within five minutes I went to the main entrance and saw a small pickup to which the gates were immeidately opened. Two girls sat in the cab. We were soon introduced. These were driver-expediter Nadya Sinel'nik and business production-sorter Natasha Kurga. They are the entire staff of the ring post office. Hundreds of thousands of documents, letters and newspapers pass through their hands. Several times per day, strictly on schedule, the pickup travels between all the subdivisions of the firm, distributing business papers which were previously packed in folders and cases. The driver-messenger places the correspondence into the post boxes belonging to the shops and departments and removes the outgoing mail which was also prepared in time for dispatch by the shop and department mail room workers.

Of course, not everything was smooth at first. It turned out that someone delayed papers and the schedule was not kept. At the suggestion of the girls, the pickup was re-equipped, special compartments were placed in it in order to more easily sort packages and special briefcases were prepared to facilitate delivery. Other innovations were also introduced.

"And can the work of messenger be interesting?"

"And how. But the main thing is how many people we have relieved of superfluous concerns and how much time we have saved for main work."

Why Does Petrova Work Better Than Gerasimova?

"Let's look in on the shop of amateur movie and still camera equipment," suggested Vladimir Nikolayevich Mitrofanov, the chief of the NOT office. "We and you will possibly see something curious."

I had visited this shop several times and it was really remarkable, a modern shop with production and conveyor lines with electronic signalling devices. The shop was large and well-lighted. There are long spans along which an endless conveyor belt slowly moves.

There are well-lighted benches along the conveyor, at which a female worker sits. Each one assembles small parts into assemblies from which an objective for the popular Smena-8 camera, which is in great demand, is finished on the conveyor line.

"Look at these two female workers," said Mitrofanov, pointing to the assemblers working alongside each other, "Petrova and Gerasimova. These are the best assemblers on the operation 'assembly of the shutter base.' But the operation of one of them is more rapid and that of the other is slower. Although both women have identical time of service and experience. They have the identical rank. And generally there is nothing different about them. And both have the great desire to work as good as possible. In short, if there was a difference in physical data--in acuteness of vision, let us say, then everything would be simple and clear for the NOT service."

"Our task is to study and disseminate leading experience. And if it is accurate to develop a method of this study and dissemination. Observe for a little while how they work," suggested Mitrofanov.

"Observe closely. I think that you will hardly notice a difference. And this is perhaps impossible even for a person with a practiced eye."

"Let us say so. However, is the difference so great that it can be determined?"

"The difference is really small externally, counting in seconds and fractions of a second on each individual components of the operation. And there are a lot of them. And the operations are mass types. Imperceptible seconds saved by each assembler per shift is already an additional lot of cameras per day."

"And does this not bring some concern about the intensity of labor to the physical fatigue of workers?"

"Possibly at first glance, but here is something curious: a careful examination showed that the worker who produces more products usually gets tired less."

"Beginning the investigations, we had to arm ourselves with a special camera and chronometer and make a series of continuous sequential photographs. As a result something like a film was obtained, taken by the frame photography method. One of these films could be called, for example, a 'shutter' operation and one could see how worker Gerasimova or Petrova installs the liners and axles in the base of the shutter. Soon much was discovered. Both unique planning of the jobsite near the conveyor itself and the posture of the worker and the sequence of one or another movements."

"It seems to be a trifle how one holds ones hands during work. Petrova rests her elbows on the table and her movements are absolutely precise. The punch grasped by two fingers is inserted in the opening under way. A short stroke with the

hammer and it is riveted. Gerasimova seems to have her elbows suspended and the punch "fumbles" into the opening until it falls into it. Seconds are lost. The muscles are tensed for a longer time. Fatigue begins sooner and work proceeds more slowly. Many fine points were also determined due to which it is harder or easier to work. Gerasimova also revealed her virtues. She was skilled in installing the shutter base into the attachment with both hands simultaneously. This is easier and faster. The experience of the best workers--Gerasimova and Petrova--were studied and synthesized as a result. A special instruction chart was worked out by means of which the most efficient methods of work of those young female workers who had only taken on this occupation could be taught more easily, more rapidly and mainly more clearly."

Mitrofanov showed me one of these instruction charts for the movie equipment assemblers. This is only a few pages. But a brief, clear description of all operations is contained in them. And there are tens of expressive photographs that illustrate them sequentially by items. The workers are taught from these charts in the schools of advanced experience. Labor productivity in them was increased by an average of 4.5 percent compared to those who had mastered their occupation in their time by the ordinary method.

The NOT department conducts principle investigations, works out recommendations and methods which become a compulsory guide for the shop workers of the association. For example, a special method was developed. It was intended for the NOT engineers in shops and for workers of production-engineering training, consultants of the schools of advanced experience, technicians and production innovators.

The method contains four sections. Selection of operations for study, selection of procedures and methods of labor, compilation of a draft to describe these procedures and methods. And the instruction chart itself which was already discussed.

Everything is significant here and everything is designed with regard to the efficiency of expended efforts and means. For example, the investigator should bear in mind that an operation selected for study should be mass or standard type for one or another shop, no fewer than three workers should be engaged in it simultaneously, the productivity of the operation is not less than three minutes and it is not less than 5-10 days during a month if manual labor comprises no less than half the operational time. This is especially important now when the association has converted to new wage conditions and to new rates.

From the most modest calculations, an additional reserve of labor productivity in mass production alone comprises approximately 6-7 percent annually due to introduction of advanced experience.

The NOT service, being involved with study and introduction of advanced experience, is investigators working hand in hand with innovator workers. They study with them and enrich their experience with the fruits of scientific investigations.

It Seems at First Glance

The reader has already probably noted: when we are talking about NOT one frequently hears the phrase: "At first glance." This is no accident. Because NOT is always discovering something unexpected. But only at first glance.

But in fact, can labor productivity be increased if a worker takes frequent breaks during a shift? If she has more breaks? Do not hurry with your answer. Psychophysiologists, who carefully study the problem of labor on a conveyor and on a production line where fatigue is caused not only by the physical load but by monotony and boredom, did not find it immediately.

What can be done so that the same Gerasimova and Petrova and many tens of their friends working on the conveyor line become less tired and feel stronger and better and are highly productive during their work? What work and rest conditions would be most desirable and beneficial to them?

And the psychophysiologists visit the conveyors again and again. They stand by the conveyor belts and the production lines from the first minute of the working day to the last minute. The pointers of the chronometers flash, the shutters of cameras are heard audibly, graphs are compiled, the slightest changes in the well-being of the workers are recorded and the data are processed statistically.

Analyzing them, the psychophysiologists proceeded from a conclusion already made repeatedly in the experiment: human efficiency is very variable over the course of the day. It is the highest 2 or 3 hours after the beginning of work. It then usually dropped. Something similar happens after the lunch break. Moreover, the fatigue accumulated during the first half of the day makes itself felt during the second half. And therefore, the highest level of labor productivity during the second half of the day is most frequently lower than that during the first half.

As a result the NOT service makes the recommendation: give the first five-minute break about 1 hour 40 minutes after the beginning of work. Give a second 10 minute break (physical exercise) 3 hours 15 minutes after the beginning of the shift. And again give a five-minute rest 1 hour 30 minutes after the lunch break.

The recommendation of NOT was first introduced on the camera assembly line. Moreover, the speed of the conveyor was changed in the photo shop upon the advice of the psychophysiologists. It was changed so that the greatest speed was mainly during the first half of the working day and the slowest speed was during the first and last hour of work. And another recommendation was to alternate the workers in the operations every month or two.

What did this yield? The new work and rest conditions, changing the rhythm of the conveyor and alternating workers in operations sharply improved their well-being and attitude of the workers and labor productivity increased. And it was calculated that these innovations on the conveyor alone produce 10,000 rubles saving annually.

The psychophysiologists of the NOT service, to whose activity many initially were unsure of, became very popular people in the association. Their participation and assistance was requested by many shops. Now the most efficient work and rest modes, developed on the basis of psychophysiological investigations, have now been introduced at more than 1,500 jobsites.

So as you can see, that which seems unexpected and paradoxical at first glance suddenly opens up new opportunities so as to achieve the best results with the least expenditures.

The "Moonlight Waltz" and Labor Productivity

You of course had occasion to observe how at times a person whistles quietly to himself on the job. He whistles in time to his motions. And obviously his work comes out better from this unique accompaniment.

And now soldiers are marching and behind them are tens of kilometers of road. Fatigue has overtaken them. But suddenly an orchestra is heard in front and their legs seem to "walk by themselves" in tune to the cheerful rhythmic marching music. And the fatigue literally disappears! Psychologists and physiologists have long explained this secret of the effect of music on man: sound is related to the sensation of motion. Rhythmic music evokes and maintains stable motor and mental activity. It relieves nervous tension. It is capable of stimulating the physiological processes of the organism. And at the same time it is capable of making them both optimum and economical. And it creates the necessary mood.

And if this is so, then is it possible not to consciously use music, so to say, for purely practical goals--to facilitate one's labor and at the same time to make this labor more productive?

Thus was born the idea of functional music. Long before this term itself became widespread, the first step had been taken at LOMO: before the beginning of the shift when human flows headed across the thresholds to the shops, they were accompanied by cheerful, joyful music coming from loudspeakers.

But it was not so simple to utilize functional music in the shops. Many of the most diverse problems had to be studied and solved. Could it be used everywhere? And where is it primarily necessary? And in what doses? And during what hours of the working shift? And there were as many questions about the nature of the music itself, about the genres, orchestration and rhythm! And about selection of programs!

And a series of experiments was begun by physiologists on one of the large mass production sections for which monotonous labor is especially typical. Careful observations and investigations were conducted day after day. And it was precisely established: how and when fatigue of the central nervous system, the cardiovascular system and the muscular system begins and develops during work. Having determined the hours of the greatest fatigue during the shift, it was possible to compile a schedule of music transmissions.

And not only a schedule.

And what about the musical programs? Who and how would they begin to be selected? It was necessary to consult with the most qualified consultants in the field of music. And the department of scientific organization of labor appealed to the Leningrad Conservatory for assistance.

Not only specialists in the field of optics or electronics, but well-known musicologists first appeared as consultants in the shops of the firm.

The musicologists and psychologists selected the first repertoire. There were 30 programs per month. Loudspeakers were installed at that time in the section. The wires from them extended into the shop assembly for connection to a tape recorder. Each loudspeaker has a switch. If you want to listen, if you don't want to, you switch it off.

When everything was ready, the consultants from the conservatory gave lectures in the shop about how music can always have a favorable effect on man and of course during work. They were convinced not to switch them off.

And it was true. When the music transmissions began no one switched it off initially. Excerpts from classical operas and jazz rhythms were heard.

But there were soon surprises. It turned out that music has far from an identical favorable effect on everyone. Labor productivity decreased for some and some irritably switched off the loudspeaker.

It turned out that the music initially distracts the attention of some people from their work. And after all it should, like the wind pushing a sail, be "unnoticed" but pushing forward with force.

And again there were psychological investigations but now based on primary experience. Practice showed that the greatest effect is gained from music simple in orchestration, primarily cheerful music. Works performed on the piano and on wind and electronic musical instruments were best received on the job.

And again there was a surprise: at the end of the shift they "started" a cheerful, fast melody by an instrument ensemble. It turned out that cheerful rhythms had no benefit at the end of the shift.

Why? The psychologist, physiologist and physician talked to the workers for a long time. They concluded that by the end of the work day the human organism experiences a definite revitalization together with the onset of fatigue. Calming, quiet and slow melodies rather than cheerful rhythms are required at the end of the shift.

As soon as it became clear that functional music is a valuable matter and enjoys very real benefit, the firm created a special studio from which they began to conduct transmissions of functional music to many shops. A record library numbering more than 5,000 works recorded on tape was created. Incidentally, such an extensive musical stock was simply necessary since first experience showed that even the most beloved melodies interfere if they are repeated too frequently.

As you can see, the concern of the NOT department was supplemented with regard to introduction of this innovation. And there was soon a need for the post of "engineer-musicologist," unusual for the firm, who would select musical programs on the recommendation of psychologists and physiologists. These duties were entrusted to a worker of NOT--an engineer having a musical and engineering education, Geliy Fedorovich Sukhanov.

Sukhanov is an enthusiast of this new post and works with animation. He unwillingly made a very remarkable observation. He, a proponent of functional music, most

liked to meet well-organized and established work in the leading shops. There where the musical rhythm could be "hand in hand" with production rhythm.

But in other shops he was first cautious and uncertain about introduction of functional music, especially in those where presses roar and conveyors rumble. If a loudspeaker is switched on here on jobsites, as in the photographic shop, only more noise will actually be heard from the music.

Then he got the idea of using antibackgrounds. Special earphones were given to workers engaged at the presses. They protect them from external noise and make it possible for them to hear the music.

As the first, carefully studied experiment showed, the workers' attention was not distracted and not dispersed. On the contrary, the music, freeing the person from stress caused by the noise, permits better concentration.

And statistics proves this: both injuries and turnover of personnel in the tool and die and other noisy shops were reduced over a period of six months after introduction of functional music. And they were soon interested in the automatic machine shop: "And is it not possible for us to use music? And there is such a noise from the automatic machines."

The question was more than appropriate. The noise level in the automatic machine shop was really high. But how could it help if a worker servicing several machine tools on the same line was in constant motion? He could not drag a cord plugged into the loudspeaker system behind him. But there was a way out. There is a small transistor radio in the top pocket of the ordinary working jacket. And the earphones were connected to it.

Do people like to work to the accompaniment of music?

A questionnaire poll was conducted. Seventy-nine percent of those questioned noted: music reduces fatigue and increases efficiency. Ninety-three percent added to this: it improves the mood and provides good exercise.

In places where functional music has been introduced, labor productivity was increased by three percent. Work quality was improved. And this was no surprise. Good music has an aesthetic effect on man and forces him to be exact toward his labor, to learn more acutely and to more clearly perceive the beautiful.

Moreover, they also call the studio during rest breaks and request: "I would like to hear the 'Moonlight Waltz' of Dunayevskiy again." Or: "And could you play Oginskiy's Polonaise?"

"I Stay Because I Want To"

Young optical grinder Boris N., having gone to the personnel department to formulate his release at his own desire, was ashamed that he wanted to be released so fussily and again dropped into the NOT department.

Regardless, Boris had to submit. He filled out a thorough questionnaire in the NOT department: why did he want to leave and with whom and with what was he dissatisfied. Perhaps the working conditions were unsuitable? Or the work was uninteresting and the wages were too low? And perhaps he had established abnormal relations with the foreman and brigade leader? Are there no prospects for your growth? Is there no opportunity to study?

It turned out strangely: a person had to fill out a detailed questionnaire upon leaving a job rather than upon entering it.

Another conversation was held after the questionnaire was filled out. And it turned out that the grinder wrote the statement: "I request to remain at my own wish."

This was several years ago.

I am in the sociological laboratory. My company is one of its workers, the senior sociologist-engineer.

A question. What is your laboratory involved in?

The answer. We develop problems related to plans of the socioeconomic development of the firm. One of the social problems is personnel turnover. The scientific workers of the Leningrad Financial-Economic Institute helped us here. The first phase is usually study of statistical data. One very significant circumstance was determined. During the years when the investigation was conducted (1968-1969), more than half of those leaving were young people. And we have half of all workers at the firm that are up to 30 years old. The laboratory conducted a survey of one-third of the young workers. Thousands of filled-out questionnaires were processed by a special program on a computer. We received extensive information. For example, one-third of those questioned, in answer to the question whether they were satisfied with the attitudes of the administration, answered "No." It was obvious that almost all the unsatisfied workers were from the procurement and finishing shops. A rather typical attitude toward young workers was determined for a number of shop managers: the young are inexperienced and this means that it is risky to trust him with a good machine tool and tools and we will give him a poor machine tool and we will give him materials last in line. We brought the attention of the managers of the firm to this. Recommendations were worked out--how to proceed so that the novices worked better. The administration established a strict procedure: now all novices are provided with good equipment and a standard set of all necessary tools from the first day on the job and are supplied accurately with materials and parts. It is a simple pattern: the more trust in the young worker, the higher his responsibility is. Piecework for beginning workers was also restricted at our recommendation. Within one or two years the statistics showed that turnover in the procurement and finishing shops had been cut in half.

A question. But this was probably only one of the reasons causing the turnover?

Answer. Of course. A young person who links his fate to the firm should be confident that he will acquire a firm material base here. After all, he will acquire family in the future. This means that he must earn good wages, that is, work well,

and conditions must be created for him to raise his qualifications. But since the shop chiefs and foremen were given our recommendation as a duty to eliminate the reasons interfering with young people working well and earning good wages, there became fewer and fewer young men and women who felt that they were temporary at the firm.

It is not simple to find all this out. Here is an example. A young machine tool worker handed in his intention of leaving. The foreman, without thinking, signed it. When this case was analyzed, the foreman said:

"And why should I bother with him? He spends half his time smoking or strolls around the shop."

But the machine tool operator gives these explanations:

"Yes, it happens that I wander around the shop because the foreman gives me an assignment for a day or for a week. But if he would give me an assignment immediately for a month, I would have no idle time."

These cases prompted the engineer-investigators of the NOT service to become involved in development of important problems. The first was to improve intershop planning and the second was how to eliminate an unconcerned attitude of other administrators to the requests of workers about leaving the firm. Each application should be considered with maximum attention. Why does a person leave? Is there really a telling reason for this? Perhaps it is easy to correct? Perhaps the application to leave was written in anger due to a minor affront?

Question. And how was a way out found?

Answer. Public personnel offices were created in the shops. This same public committee then began to operate on the scale of the firm. The committee included workers and representatives of the administration. The committee tries to determine the reasons for leaving and takes all possible measures to create normal working conditions for the worker.

The following statement has recently been printed on the official forms of applications to leave:

"Comrades! Before making a decision to leave the shop, carefully think about the reasons that caused this and try to correct them with our help."

"If you have still decided to leave, indicate the reasons that interfere with your continuing to work in the shop."

I had occasion to visit one of the meetings of the public committee for personnel of the firm. The committee meets twice a week with the participation of the assistant general director of the firm for personnel. The materials of the shop office are carefully studied here and their work is analyzed and generalized. And here I met grinder Boris who was discussed at the beginning of this chapter. For about an hour and a half he patiently explained his complaints. They summoned the foreman of the section in which Boris worked. And the conflict was resolved.

The public committee for personnel gradually expanded the range of its activity. It participates in the reception of workers to the firm an maintains contact with young workers who have gone into the army. And many of them usually return to their own collectives after demobilization.

I continue my interview.

Question. I have heard quite often recently in your firm: "Potential turnover." What does this mean?

Answer. You see the idea of leaving the enterprise at one's own desire does not appear immediately. A person accumulates affronts, dissatisfaction with his occupation is aggravated and a conflict with a brigade leader or foreman increases. Frequently, as you and I have already seen, the conflict can be resolved in the end. And the public committee for personnel in the shops and the public committee created at our recommendation rendered great assistance here. But all this forced us to think about something else. Would it not be possible to provide beforehand for possible conflicts and to prevent their becoming an application of leaving through one's own wish?

There are many psychological fine points here which one does not immediately catch and one does not immediately read.

Question. Who helps you to analyze these fine points?

Answer. We have in the laboratory specialists--psychologists and physiologists--working with us sociologists. Their assistance is invaluable. We developed together the method and system of questionnaires which are conducted once every 6 months with the participation of the public offices of personnel in the shops. We managed to determine possible, but almost undetectable conflict situations.

For example, the youngest workers in one of the shops, it is true, expressed in ambiguous form dissatisfaction with their job. The foreman was frankly amazed at this. Both their work records were excellent and the working conditions were fine --this was a shop that had been reconstructed.

The psychologists managed to determine the reasons for the dissatisfaction of the young people. It turns out that in manufacturing parts, they have a vague idea of the final product of their labor and their work no longer had any attraction for them.

An excursion to the neighboring shops was organized for them and they were shown the instruments for which they made parts. Their attitude toward work changed appreciable. They felt that they were creators of the latest modern apparatus which are used on all continents and in all corners of the world.

Question. Apparently there is an especially jealous attitude to supporting the labor of young people? What do your psychologists say about this?

Answer. Yes, there is rich material to study this material at the firm. A young man or young woman, coming to us from the PTU, usually has a secondary education.

Many continued to study, combining it with work. And naturally, raising their own educational level, young people gravitate toward interesting work. They are no longer content with simple operations that require only the most elementary skills and mechanical execution.

Question. How do they at the firm attempt to eliminate these contradictions?

Answer. This is not a simple question. A high level of technology is always related to mechanization and automation, that is, to simplification of manual operations. But on the other hand, the need for people with broad technological view increases and adept tuners and adjusters are required. A new technology is born that requires various types of knowledge from a worker, especially in optics. Young people can rapidly acquire several occupations and easily switch to new operations. The advice of psychologists was used in practice in a number of shops when new models of instruments were developed there and complex technology was employed. The education of a worker becomes an additional reserve for labor productivity.

Question. Especially a lot has been said recently about the significance of the microclimate in the production collective, that is, about the effect of personal attitudes toward the results of labor. What can be done here and what are your psychologists doing?

Answer. We compared two seemingly absolutely similar brigades of opticians. Everything was identical in them: the number of people, their qualifications and they performed the same work on the same equipment. But a small difference was found in the results. One of the brigades regularly distinguished itself with high labor productivity (7-10 percent higher than that of its neighbors) and with a minimum percentage of rejection. What is wrong? A different microclimate. The first brigade was a united, friendly collective. There were tense relations and frequent conflicts in the other brigade. A lot of time was lost here on resolving relations.

Question. Perhaps the second brigade was unlucky and incompatible people were assembled there accidentally?

Answer. Of course it happens this way. Incidentally, our psychologists concluded that it is very important in making up brigades to take into account the psychological compatibility of people, the range of their common interests, their needs, life situations, principles and sympathies. Without this there cannot be a real brigade in the sense which we have become accustomed to understanding this. But what is especially important is the personality of the manager and brigade leader.

The brigade leader is appointed by the administration. A very important circumstance was determined when studying this problem. There are usually two leaders in a brigade if the appointment of the manager is unsuccessful. One is the official appointed leader and the other is the unofficial leader. However, the unofficial leader enjoys the greatest influence in view of his businesslike and personal qualities. And this in itself frequently causes an acute situation in a small collective. It is this very situation that developed in the second brigade of opticians under discussion. The brigade leader was soon replaced there at the recommendation of psychologists and everything changed.

Question. This means that it is not so simple to be a brigade leader?

Answer. In any case, it is much more complicated than people think. In forming production brigades, managers frequently underestimate the opinion of psychologists. And some aspects of creating these groups remain outside the field of vision of the managers. For example, should there be a man or woman as a brigade leader? It would seem that a competent man as head of a female brigade is a proper appointment. But if you question a female brigade of painters (the brigade leader is a male) it turned out that this was not so. Half the brigade expressed dissatisfaction with the brigade leader. He was unable to understand the needs and interests of the female workers. Moreover, he was much younger than the members of the brigade. You cannot decide to talk with such a brigade leader about everything bothers you. And without this how then can he be the head?

Upon our recommendation a female brigade leader was appointed and the psychological climate in the brigade improved a lot.

Question. Obviously, the difference in the age between the brigade members is also important?

Answer. Undoubtedly. Study of this problem revealed some fine points which must be taken into account in forming a brigade. An old worker, for example, is especially sensitive to the slightest deficiencies of working conditions in the shop, but is less perceptive to any rough points in relations with the administration. His life and production experience, his high occupational skills and his knowledge of his prestige in the collective evokes a feeling of the incomparable strength of his position. And on the other hand, a young worker responds especially emotionally to each word of the chief. He has his own requirements related to the prospects for growth and raising of rank.

Thus complex psychological problems frequently arise which are inevitably solved by the brigade leaders, foremen and shop chiefs. Brigades and sections must be formed so that people of different ages can supplement each other harmoniously, combining the experience of a veteran with the energy and knowledge of young people. To validly evaluate a person, his character and his possibilities, one just learn how to distinguish the psychological fine points which others try to brush away. But a production organizer of any rank is unthinkable today without this.

We are making the first attempts. Our psychologists and sociologists are working out recommendations based on specific study of one or another brigades and sections. Special topical seminars, lecture cycles and conversations with the participation of our sociologists and psychologists are conducted after this. Exercises are conducted with the brigade leaders, foremen and senior foremen on topics related to problems of the person in the collective and management of the collective.

Our firm is a collective of communist labor. This places special responsibilities on us. We have to become our own type of laboratory where clearly new relations in the labor collective are formed.

Electronic Assistants

The telephone rings:

"They are calling from the supply department. Be so kind and prepare data in which articles steel pipe is now used at the firm and in what quantities and of what diameter. And how many of them are needed during the first quarter of next year. And we also need data on."

The request was listened to carefully and written down.

"Everything is clear. You will receive all the data in a few minutes."

"All the data within a few minutes?" But who can know about this and remember how to answer suddenly to an unexpected question? These very pipes are used in the most diverse shops and for the most diverse instruments, of which a countless number is produced. Yes, of course the data which they request can be assembled. But the shops must be questioned and one must dig into an enormous card file and make complex calculations. This is generally a week or week and a half of work for an entire group of qualified people.

But the supply workers receive the answer immediately. Without any wires. And within several minutes. The operator enters the assignment in a machine and the machine prints out an exhaustive answer. Its magnetic memory is unlimited.

And there is no need for card files. There is no need to load down planners and economists with boxes of desks full of swollen folders with very extensive information. Ninety-five percent of the entire information service has subscribed to the computer center, which has become the nucleus of a future ASU--automated control system.

The computer center is the same age as the firm and was born together with it. And they could not get along without it. At one time a "low-power" machine calculating station was located here. The firm was immediately able to acquire entire computer complexes. One of the enthusiasts of creating the firm--its first director for production and economics Ivan Ivanovich Vasil'yev--headed a group which from the very beginning "taught" the computer not only to serve the engineers and designers in their creativity, but of also assisting all the services in their extremely complicated work of management. In the complex plan for the socioeconomic development of the firm for the 10th Five-Year Plan, it was immediately provided to develop an automated production management system on the basis of a computer center.

In the lighted rooms of the computer center people converse silently with machines in the language of algorithms. To each question they receive exhaustive, precise answers, advice, instructions and warnings from their interlocutors.

The chief of the computer center of LOMO candidate of economic sciences Yakov Iosifovich Pivovarov relates beforehand the following story:

"The well-known academician Trapeznikov somehow calculated that the entire adult population of the USSR would be required by 1980 to work in the sphere of managing our production."

It would be required if there were no computers among the other means of mechanization.

It sounds fantastic. But let us take the "very smallest." Approximately 250 million parts are manufactured annually in the shops of the LOMO firm. Several different operations are required for manufacture of each of them. This means that we have already calculated new millions. And not for the sake of counting. One must determine precisely how much and what materials are required, the priority of their manufacture by deadlines, the priority of sending them for assembly, one must calculate the need for materials and equipment, the number of workers, the cost of expenditures and so on and so on.

And now imagine what staff should be made up of engineers, technicians, normalizers, economists and other specialists for calculating these data (among others) if they are armed only with an ordinary slide rule and an adding machine. And how much time they would spend on this. If you calculate, continued Pivovarov, such a parameter as the equipment load. One Leningrad economist, having studied our production, determined how many equipment load versions can be under the simplest condition. But 40 parts must be machined on at least 15 machine tools. Do you know how many? Ten to the 28th power! And we have thousands of them of the most diverse designation from which the best and most profitable version must be selected. And all this concerns in the given case only one problem: efficient loading of equipment at the firm.

But let us take an even smaller scale, continued the chief of the computer center, a shop or even a section for which a foreman is responsible. Investigators have established that the foreman should operate with information 3.6-fold greater than that which he can perceive in such a complex production enterprise as ours.

Computers have now freed the foremen of needless concerns. He first receives a form on which everything is scheduled and everything is taken into account from the computer center for each day.

And the machine takes on the "technical" functions in almost each management link. The machine memory provides unanimity in planning, control, accounting and analysis of the activity of each subdivision and of the entire firm as a whole. The computer helps to select the optimum version when solving any creative problem, regardless of what it concerns--equipment, technology or finances.

Yakov Iosifovich leads me to a wall consisting of files.

"Information from the shops, departments and design offices," he explains, "is gathered in them. A half million bits of information in the form of alphanumeric characters on the most diverse problems comes to us here every month. The 'electronic brain' immediately processes it."

"Undoubtedly there is no amount of people who could calculate "manually" and could "overtake" the computer. But from the viewpoint, for example, of selecting the optimum versions."

Pivovarov laughed:

"I see that you also must overcome the 'psychological barrier' of mistrust of the computer, which we have already encountered ourselves. I can cite an example, having already become a reader. Once we checked an experiment with dispersion of equipment. A group of the most experienced engineers and computers solved the problem. The engineers proposed an excellent, well-thought-out version. But when they found out that their assignment was duplicated by a computer, they were hurt. Some of them began to speak ironically. Well, we already see what the computer has 'thought up.'" And intentionally! When they compared the two versions it turned out that the machine, free of traditions and templates, had proposed a new, unexpected version. They checked its version and it turned out that, because of it, the path of the parts between two machine tools is reduced by a factor of 1.5 compared to the version proposed by the most experienced specialists. The computer does not make the slightest deviation from established order. Once a foreman tried to 'go around the instruction' of the machine and violated the priority of the operation in processing and began to do operation '2' instead of the last operation '3.' But the machine knows that operation '3' is the final one. If it is fulfilled that means that the part is finished. And it immediately sent a new assignment to the section."

Management using computers does not tolerate the slightest violations of production discipline. It in itself is a powerful stimulus to increasing production skills.

We are walking through the rooms past many computer, keypunch-calculating and special production recording devices. This engineering complex--the electronic brain--became the basis of the ASUP [Automated production management system] connected to all shops and sections and the planning system for most production sections, detailed calculation of production assignments and automatic monitoring of their fulfillment and so on is now introduced at the firm with its assistance. And all this is in addition to the thousands and thousands of the most complex engineering and design calculations. Thus accumulated experience made it possible to convert from solution of special problems to development of a complex automated management system.

Under new conditions of economic planning and incentives, the firm receives from the ministry and main administration only the basic nomenclature rather than a finished plan. The firm itself determines the remaining extensive nomenclature of articles on the basis of what brings in the greatest advantage and highest profit. And to produce what is most advantageous and what is most profitable is indicated to the firm by an electronic economist. Because of the computer, the number of engineering and technical personnel at the firm was reduced by 167 persons, those in the planning departments were reduced by 58 persons and those in bookkeeping and finance departments were reduced by 73 persons.

But this does not mean that the computer generally forces a person out of here. The main thing is that the machine releases the valuable time of a person from everything that can distract him from direct creativity.

Do you know what the day of a rank and file engineer frequently begins with at LOMO? With a telephone call. Yes, yes. He is interested in which latest information innovations have come in in that field of engineering in which he is involved. And he immediately receives an exhaustive answer previously recorded on tape--the computer memory.

If a designer needs systematized information on a strictly specific problem in a narrowly specialized field, the computer helps him to find a complete list of the literature with which he must become familiar. The books are recorded in its memory.

The creators of future instruments can determine beforehand the optimum capabilities of one or another designs by means of a computer.

But this is only the beginning. We will soon be able to plan precisely and beforehand by periods each phase of birth of each new instrument, from the very initial stage, from the designer's thought, from the initial sketch to a detail plan, from the first drawings to a mockup and from a mockup to an experimental model and putting into serial production. And a strict schedule of preparing the production for each element of the design will be compiled beforehand. The ASU only needs beforehand a general annotation for the future instrument. Designers, technicians, investigators and testers will know precisely beforehand when and by which calendar deadline they should begin or end.

"I am confident," states Yakov Iosifovich, "that this will be a weighty contribution to the success of Leningrad firms: to reduce the deadlines for development and introduction of new equipment into production and to raise product quality. And this is the main thing today."

From a modernized nighttable to an automated production management system and from the attitude of an individual worker to problems of a communist attitude toward labor in an entire multiperson collective--this is the range of problems of the NOT service at the firm.

FOCAL POINT OF COMMUNIST EDUCATION

There is a building on the territory of LOMO which in no way reminds one of a production site. Moreover, it is here that you can meet any workers of the firm--workers, engineers, scientists and young workers only beginning their working life and gray-haired veterans who have given tens of years to production.

And each one comes here with his own concerns and suggestions, with his questions and thoughts and comes for advice and assistance.

The pulse of the social life of the association beats continuously here. In this building is concentrated a unique staff of all the social organizations of the firm engaged in communist education of workers: the party committee, trade-union committee, Komsomol committee and editorial office of the weekly ZNAMYA PROGRESSA.

"There were many significant changes in the work of the party, trade-union and Komsomol organizations with creation of the firm and with introduction of the new form of production management," says secretary of the LOMO party committee Anatoliy Ivanovich Kirsanov.

Creation of a large production association opens up new and very favorable opportunities for ideological and political work among the collective and permits dissemination of leading experience on a wider basis, faster and with greater effect. And it operates more confidently, clearly and more goal-oriented, solving the most important problems. We have many hundreds of communists in the party organization --a real guard which is capable of anything. The LOMO party committee, according to the bylaws of the CPSU, enjoyed the rights of a regional party committee. It has 55 persons in its expanded composition. Current affairs are solved by the office of the party committee.

Who is included in the party committee? Well, primarily these are 30 of the leading, most active workers from the different shops, leading specialists and managers of the main subdivisions and representatives of all large party organizations of the association. All this makes it possible for this party committee to more universally and more deeply analyze the firm's activity and to consider in detail and with total competency the questions brought up for discussion. After all, the members of this expanded party committee are closely related directly in their work section with the primary party organization and know and judge the situation by the facts of life itself which they encounter in the daily work rather than from summaries.

And of course the members of the party committee can under these conditions inform communists and all workers of the firm more operationally and more fully about the decisions and decrees of the party committee, thoroughly explaining them at party and workers' meetings. And this is important. After all it is one thing to read some decree to people and quite another if the person who participated in its development, discussion and adoption himself talks about it himself and answers questions which may arise convincingly and exhaustively. This also increases the personal responsibility of each member of the party committee and more fully determines its role as a collective body of the party management.

A real opportunity appeared under the new conditions to devote attention to better thought-out, scientific approach to party work and to substantiation of the efficiency and results of any measure which we plan to implement. One of the conditions of this scientific approach was development of a future plan of party work for the long term. These plans are closely tied to plans of the socioeconomic development of the firm for each five-year plan.

This plan was developed at the initiative and with the participation of the party committee for the 10th Five-Year Plan--a five-year plan of efficiency and quality, as the 25th Party Congress and General Secretary of the CPSU Central Committee Leonid Il'ich Brezhnev defined it. Of course this definition became our main reference point in all work of the party organization and for all its sections--from the party committee to party groups.

The materials of the congress are being universally studied at LOMO after the 25th CPSU Congress and moreover in all exercises which propagandists are conducting and they talk in all schools of communist labor and at all party and workers' meetings in detail about the role of our firm in fulfillment of the tasks posed at the 25th CPSU Congress. After all, one of the features of LOMO is that its production is required by practically all sectors of the national economy. The success of other fields of science and technology largely depends on the quality of instruments made here.

The party committee organized special theoretical and methodical seminars for propagandists and political information specialists and prepared for them reference materials which would help them more clearly, more specifically and more convincingly talk to the students, which is now required of workers of each subdivision of the firm.

The work of the committees of the party committee in monitoring the economic activity of the administration, in development of technical progress and in economic and social development became more animated after the 25th CPSU Congress.

The committees render invaluable assistance to the party committee in solving the most fundamental problems related to the role of communists in reconstruction and in mechanization and automation of production processes.

The LOMO party committee proceeds on the basis that success in fulfilling the decisions of the 25th CPSU Congress depends primarily on the skill of communists who head political and organizing work directly in the shops, in the production sections, in departments and laboratories, from shop party organizations and from each communist separately.

Discussion of the materials of the 25th Congress at the firm aroused each communist seemingly to again ask himself: have I done everything so as to justify the high rank of fighter of Lenin's party in full measure? Here are several interviews at the jobsites.

Optician, supervisor of the brigade imeni 25th CPSU Congress, K. Yakovlev is speaking:

"The workers of our brigade, like all Soviet people, received the Annual Report of the CPSU Central Committee to the 25th Party Congress with enormous interest and warm approval."

"When you read between the lines of this most important document, you think about its propositions and conclusions and gain a feeling of deep gratitude to our party, which purposefully and sequentially leads our country along the path indicated by Lenin.

We answer a worker about the concern of the party and government: work with doubled energy. We have the conditions for this. Even more progressive machine tools are now being developed for opticians and diamond tools will be introduced for the first time in fine polishing operations. This will permit a significant increase of labor productivity during the 10th Five-Year Plan and will improve product quality.

Our opticians have converted to the brigade method of work. There were 42 brigades in 1976 and each worked on a single detail. Five of them were young brigades headed by a brigade leader-mentor. This is also new since it appeared quite recently in the practice of our shop.

Our brigade stood a shock watch during the work of the 25th Party Congress. We cover our shift assignments daily and the quality of work is good. But it will be even better!"

Senior foreman communist V. Spitsin:

"Our mechanical section coped successfully with their pledges taken in honor of the 25th Party Congress."

"The section was the victor from the results of the 25th 10-day labor watch and it was awarded a certificate and the challenge red banner."

"The brigade of boring lathe operators, which is headed by young Komsomol Vladimir Romanyuta, also won first place. And he himself raised his own rank to third rank during this time."

"It is not easy to head a young workers' collective. There is little experience among the young machine tool operators and it happens that some of them violate labor discipline and it is hard to make demands on young people, they do not always understand you at first and try to do something on their own. Now here I appeal to the party groups and to communists for assistance."

"I never weaken contact with them. I rely on the party group both in organizing and in educational work. For example, here is how we together control rejects."

"Someone conceals a sin and one of the young people spoils a part or turns in several flawed parts. A signal comes from the OTK and I as the direct representative go to one of the communists, most frequently to party group organizer Nikolay Semenovich Matyukha. Help so and so, I say, to turn the fellow onto the correct path."

"And this was not immediately in my practice that they refused this request to me, saying that they were busy or that were some more important reasons. Without any superfluous words, that same Nikolay Semenovich switches off his machine tool, for example, and heads to the jobsite of the guilty party. I look from the side and there is a serious conversation under way: the reason for the rejects have been found and Nikolay Semenovich shows how to correct it and then sees whether everything is okay. Training, both occupational and purely human, for a young person provided a clear lesson in mutual help."

"My proposals always find support among communists and the section has become the leader probably due to our cooperation."

Milling machine operator Yu. Vasil'yev, an innovator, mentor and member of the party committee of the association:

"The word 'quality' is now in the ears of everyone but I also think that the struggle for labor quality begins with education of the working conscience of the young worker who of course desires to master his skills. One is inseparable from the other."

"And when you think about the thousands of young workers who will determine the appearance of the firm at the end of the 10th Five-Year Plan, you understand what responsibility has now been laid on us, the veterans. That is why both the party organization and the trade-union committee devote ever more attention to development of apprenticeship and to the remarkable, most noble movement which was born in Leningrad."

There are now 800 mentors at LOMO. The party and trade-union organizations have selected the most experienced workers from an enormous number of the best--communist and non-party, ready to share selflessly and unsparingly their skills with young people and mainly to educate in their wards working pride and a feeling of high moral responsibility for their labor and for all their behavior."

"Seminars of mentors are held at the firm, they visit special lectures and exchange experience."

"The party committee and the trade-union committee is always seeking newer, more flexible and more effective forms of tutorship."

"And if the labor discipline was recently improved among young workers and if most of our wards won the right to enter the Komsomol and become worthy members of the LOMO collective, then undoubtedly this is due to the important labor of the tutors."

"And if a tutor was skillful in teaching his ward to love his occupation, to respect labor and to value working friendship, then let he himself teach his comrade to follow the same principles--principles which the party organization of the firm teaches in the LOMO collective and which find their fullest and clearest embodiment in the daily life and work of the communists of the association."

"The right hand of the party committee is the trade-union committee. The trade-union organization combines thousands of workers, scientists, engineers and salaried employees at the LOMO firm. Working under the supervision of the party committee and in close contact with it, it widely recruits all workers of the firm to participate in production management and to participate in the mass competition to fulfill the five-year plans ahead of schedule and for high product quality."

"Much has been done among the shop committees the permanently acting production meetings, the advice of innovators, VOIR and other creative organizations which the trade-union committee of the firm supervises, to develop an effective mass competition. The LOMO collective was one of the first to support the patriotic call of the workers of the Association Kirovskiy Zavod, who came out with the initiative to fulfill each production five-day task within four days. The trade-union organizations of the shops helped each of the participants of this competition to work out his own plan-pledge and the complex plan for increasing labor productivity at each jobsite. Being true to the slogan 'Complete a five-day task within four days' makes it possible to regularly evaluate the personal contribution of the competitors to the success of the collective."

"The trade-union organization of the firm warmly supported and disseminated the call of the Moscow workers 'Give a worker's guarantee to each article.' And to do this, they organized even more widely the competitions that have become traditional for the firm and which provide for awarding the honorary ranks: 'Best worker of the shop (association) in occupation,' 'Best young worker' and so on."

"These are those who are irreproachable on the job and in everyday life and these are those who showed the highest labor productivity and achieved the highest results in occupational skills, in innovation and in economizing of metals and raw material. These are those who transferred the 'secrets' of their success to the greatest number of their own comrades in their occupation."

Competitions by occupations have become a powerful stimulus for the movement for communist labor in which the absolute majority of LOMO workers participates."

"'From high work quality of each one to high labor efficiency of the collective' is the main direction in the activity of all public organizations of the firm."

YOUNG COMMUNISTS

A conversation broke out in the party committee: with what and when does education of a young communist begin? From that memorable moment when he is handed his party card? From that party meeting at which he excitedly hears the words: 'I request that so and so by accepted'?" Or perhaps, even earlier?

"Of course it is much earlier," so says secretary of the party organization of the LOMO firm.

"It is much earlier," he repeats with confidence. "It should begin from the very day when the young man or woman first crosses the threshold of the enterprise. Of course not all of them will become party members in the future. It is felt that this is very important: so that they feel a moral atmosphere such as an 'ideological' climate where their dream to become a party fighter is born of itself from the first minute that they are among a new collective of workers."

When you become more familiar with the multifaceted life of the LOMO firm, you begin to understand: this is not only a creative laboratory of new progressive forms of production organization and management. This is a unique laboratory of communist education whose activity is closely tied to the concern of the party committee about supplementing the party ranks and with education and with ideological tempering of young communists.

Incidentally, an average of 150 workers become party members here in the multithousand collective of the firm. You become acquainted with them and you see that these are actually the best young workers and young foremen, the young engineers and designers--the future of the firm.

Recently the party committee secretary in a solemn occasion handed a party card to one of them--young lathe operator of the astronomical shop Nikolay Nikolayev.

And now I am in the astronomical shop where specialists of the highest class, highest not only in level of qualifications but in the degree of the responsibility with which a person relates to a matter, develop the most complex optical instruments. It is a complex task to name the best one among them. And even so they name Nikolayev immediately.

When the work was ended we became acquainted. And Nikolay Nikolayev almost modestly talks about himself.

"I came to the shop as an apprentice lathe operator. I now understand how much concern the older comrades--communists and non-party workers--showed me until I learned to gain the fine points of the occupation and how they helped me to better understand myself. They helped me with other than speeches and exhortations. I saw how, for example, communists Aleksandr Fedorov, Konstantin Kharlamov and Viktor Smirnov worked. They were the first ones to be interested in me: how I live, who my friends are and what I am interested in. And they seemingly by chance opened up to me newer and newer 'lathe' secrets. I myself did not notice how I gradually gained my occupation and I lost the skill of wandering around the shop and starting any kind of conversations with my section neighbors. It was very good that from the first days such people respected in the shop by all considered me one of their own and I frequently repeated to myself what I heard from them: 'This is a matter, first of all that for which you are responsible.' I tried to do as they did. Moreover, I was even amazed why they treated me so well and so attentively even like my father since I had hardly managed to deserve this. Or perhaps I was simply lucky to be among good people. But later I learned and understood something else. Whether I was lucky or not, a tradition was established in the shop which communists kindly maintain--to give their experience to each novice. This meant not only to teach him their skills but to give him a true party look at everything which he encounters in life. The senior foreman convinced me to graduate from the evening school. I later entered the correspondence division of the institute. It was difficult and I almost dropped my studies, but my neighbors in the section, communists, did not give up and helped to create conditions for normal study."

And could Nikolayev not feel sympathy toward these people who had been so concerned about him? Could he not desire to be something like them himself?

Once, when an urgent but "unsuitable" order came into the section, Nikolay willingly took it on himself. He knew how the communists of the shop would act in similar cases. He took it on and completed it 1.5 times faster than expected. Soon, he, a distinguished worker and young Komsomol, was elected to the Komsomol organization of the shop and later to the shop committee.

Listening to the story about Nikolay Nikolayev, I unwillingly recall the words of the party committee secretary that the education of a young communist begins long before he enters the party.

And now Nikolay Nikolayev is a young communist. He touches with pride his inner pocket of his jacket where his candidate's card is kept. His dream has come true. But Nikolay understands that everything is only beginning. They will now approach him with a new measuring rod and with new demands and a different demand is now on him.

He will soon undergo self analysis before communists: how is he justifying the trust of the collective.

And in fact how? He now looked at himself with different eyes. He approached himself with a different measuring rod. He had now received the assignment of machining a large lot of parts. Having thought it over he decided that all these parts can be converted to casting. It turns out faster and less expensively and both metal can be saved and the machine tool can be freed for more necessary

operations. He consulted with his comrades and they agreed, but warned him: but don't be stopped by trouble." After all, the entire technique has been set up, inscribed and it is not easy to change it. And true he will not get by without having trouble. He then proceeded as the party conscience had guided him.

People now looked at him in a different light and trusted him more and placed greater hopes on him. And now Nikolayev together with experienced lathe operators Smirnov and Fedorov suggest high-speed clamping accessories which would permit the machine tool operator to work easily and quickly. They tested it on Nikolay's machine tool and the result was excellent. But again there is a problem: there are 18 lathe brigades in the shop. And all of them need these accessories. The communists proposed that they be manufactured through the efforts of the collective itself. And they were manufactured!

There is also the expression: "It was not noticed how a person grew."

Everything is excellently noted in the LOMO party organization.

When the deadline approached, Nikolayev was unanimously accepted from among the candidates to membership in the party. And after several months the party bureau recommended Nikolayev as a candidate for the party group organizationof the section. And they were not wrong. Nikolay Nikolayev is now one of the best fighters of the party group organizations, he enjoys prestige and has initiative and is demanding. Everyone in his section shares this opinion.

There is a small grinding shop at LOMO located on the side of the large shops. Various special resins are made here for gluing glass and metal and grinding-polishing micropowders are manufactured for machining optical surfaces. Once the young Nina Kupriyanova--a resin worker--gave a talk at a routine political meeting in the workshop that was devoted to communist morality. Her first specialty--machine tool operator--was cleaner and easier. But they needed someone more as a resin worker in the small workshop and Nina decided to master this difficult occupation as well, which she has not left up to this day. Nina was very adept in her studies, referring to many works of artistic literature. And her female friends in the shop--students of the circle--talked about her selflessness in work and her responsiveness. The strict controller of OTK Yelena Fedorovna Knyazeva said: "If everyone always worked like she does, there would be no need to be concerned about quality." A propagandist told about this in the shop party bureau.

The communists of the section and among them Yelena Fedorovna Knyazeva willingly gave recommendations to the young worker. And now Nina Kupriyanova is yet another fighter in the party organization of the firm. She is really a fighter. Modest, but decisive.

Additional grinding materials were needed to machine the mirrors of a large telescope. She convinced everyone to remain after the shift and was the first to take on a large volume of the work. And for this she gained respect in the shop. It is no accident that every time when foreman Viktor Vladimirovich Karikov goes on detached duty or goes on leave he leaves the section in the hands of Nina Kupriyanova. The foreman is calm. He knows that he can rely on Kupriyanova and it makes no difference that she is the youngest one. They respect her and know that she will solve all problems with skill, justice and in a party manner.

And there is yet another acquaintance: young engineer-researcher Vyacheslav Grechkin from the laboratory of electronic components. He gave an excellent account of himself in difficult and complex investigations related to development of a luminous flux stabilizer and other optical instruments.

Several years ago the investigator was a rank and file radio installer and active trade-union member at LOMO. Later with a pass of the firm he entered the Leningrad Institute of Aviation Instrument Building and returned to the design office as an engineer. They trusted him with working out one of the problems, very important for engineering progress in the optical industry. He coped successfully with it and then gave an interesting report about his research at a conference of young specialists of the firm. Problems of optics was Vyacheslav Grechkin's entire concern. But why then does he devote evenings in the Central Lecture Hall and at seminars in the House of Political Education and which innovations does he constantly seek out at the shops of book stores where they sell political literature? The fact is that Vyacheslav, having become a communist, performs a very important commission in his design office. He is a political information specialist. At first Grechkin was uncertain of himself: designers are themselves educated people and what could he provide new to them? However, now when Vyacheslav Grechkin gives a talk on political information in the design office during the lunch break in the recreation and reading room, almost everyone comes there. And it always turns out that the young designer has the most interesting materials at his disposal regardless of what the discussion is about--about problems of environmental protection or about the situation in the Near East or about the historical visits of Leonid Il'ich Brezhnev abroad related to the struggle for peace. Like most other young communists, Vyacheslav Grechkin is a worthy member of our party and the important service of the mentor communists of the association are responsible for this.

They are engaged on a planned basis and sequentially at LOMO in supplementing the party ranks. This is one of the most important spheres of party committee activity. Special seminars of the party group organizations and meetings with party veterans are devoted to education of young communists. The secretaries of the shop party organizations specially listen to this problem at meetings of the party committee. The personal and daily leadership of communists is very valuable during the entire period of the candidate period of those whom they have recommended. If a candidate for membership in the CPSU has committed some offense, his guarantors are usually summoned to the bureau. The party committee has also organized a special school of party candidates. Besides propagandists, managers of the firm appear at the sessions and they talk about the primary problems of the association which all party members and the entire collective of the firm must resolve.

And it is very important that every young communist be visible in this enormous party organization. Every novice coming to the firm enters a favorable climate where the atmosphere itself generates around him the dream to become a communist. And everything is done here to see that these dreams come true.

A BOOK WHICH HAS A THOUSAND AUTHORS

This is a book of forecasts which I continuously realized. These forecasts are not from the field of fiction. They were predetermined beforehand, calculated beforehand and they have a firm foundation that guarantees that everything written down will be done within the designated deadline. And every person working at LOMO, having looked at this book, can learn what changes will occur at the firm during the next five-year plan and what he himself can firmly count on, bearing in mind the improvement of working conditions, recreation conditions, raising of qualifications, education, provision with housing, medical assistance, an increase of wages, that is, how his living conditions will improve.

This book is the complex plan for the socioeconomic development of LOMO. It was worked out by a special committee of leading specialists of the associacion with the participation of sociologists and is discussed and adopted by all workers of the firm--to coauthors of the plan and its direct executors.

The system of primary measures on mechanization and automation, to increase the technical level, quality and specialization of production and to improve the management system is clearly determined in the book. And here, along with other problems, are invariably everyday social problems.

For example, development of new instruments has an appreciable effect on the occupational-qualification structure of the collective and the association needs people of completely new specialties: engineer-technicians and engineer-investigators to develop hybrid integrated microcircuits, engineer-designers in fiber optics, optical assemblers in fiber optics, operators of electronic units for mathematical modelling of new developments. And they have been trained beforehand. It is clear to everyone that more adjusters with higher and secondary engineering education are needed directly in the shops in adjustment of instruments and that adjustment of complex photoelectronic instruments can be carried out by a worker only with a higher technical education and that the knowledge of qualified workers should approach in their own level the knowledge of diploma specialists.

Vigorous scientific and technical progress caused a serious social problem throughout the world: the need for new measures in the occupational-qualification structure of labor collectives. It was justly decided that the rapid occupational growth of a collective should be the social consequence of technical progress in the association.

In order that each rank and file worker become more qualified, a special academic combine was created at the firm in complete accord with the plan for social development. A total of 5,000 workers and engineering and technical personnel study annually in an enormous building with an area of 2,000 square meters. Each auditorium and each office are supplied with the most modern equipment up to electronic systems for programmed teaching.

Who studies here and what do they study?

All new workers (except those who have completed the PTU at the firm) are taught the theory and practice of any occupation chosen by them. Everything that a lathe operator or milling machine operator or optical engineer should know, let us say, in theory is learned in the classes. Everything in practice is learned in special training-production shops.

Courses are taught here to raise the qualifications of even the most experienced workers, courses of "goal designation": timely training of workers to master the assembly of instruments which the firm must manufacture in the near future.

Every worker can obtain a secondary, related occupation here. Moreover, the leading experience of the best production innovators is constantly studied in this training combine. It is felt that the saving from a planned increase of qualifications of workers of the firm comprises 112,000 rubles annually. The source of this income is a rapid increase of labor productivity.

There is a special class of "simulators." The occupational suitability of a person for one or another specialty which the firm needs is determined here by means of instruments and tests.

Seminars are held continuously in the training combine of the firm to raise the qualifications and creative growth of foremen, engineers, technicians and designers. Many of them combine production work with scientific activity. The future scientists have the opportunity to pass the candidate minimum in philosophy and a foreign language in the training combine.

There is a two-shift school of young workers here where they obtain a complete secondary education. For those who plan to obtain higher education without interruption from production, a vuz preparatory group has been created. An academic consultation office has been created for correspondence students. There is a technical school at the firm where young workers or the children of workers of the association also mainly study.

And now among those who develop the latest optical instruments at LOMO are more than 3,000 graduates of the young workers' school and more than a thousand graduates of the technical school and hundreds of workers who have achieved a higher education.

It became possible to place more than 600 workers who achieved a secondary technical education with the assistance of the firm in assembly, debugging, regulation and installation of the most complex instruments.

Special groups of engineers in adjustment of electronic and optical systems were created and work here in six mechanical assembly shops. People with higher education were taken to perform the most crucial production operations where diverse and extensive theoretical training is required.

The complex plans for socioeconomic development stimulate the mutual interests of the firm and of its collective for the successful results of labor.

This mutual interest was expressed, specifically, in such indisputable facts: labor productivity was doubled during the Ninth Five-Year Plan and almost the entire growth of product volume (98 percent) was achieved due to this. The wages of workers increased an average of 27 percent and that of machine tool operators increased by 40 percent. The additional, 13th wage comprised 75 percent of the average monthly wages. The material incentives fund of the workers more than doubled during the five-year period.

The firm spends millions of rubles every five-year period on housing construction, recreation, therapy, education, on construction of health resorts, tourist bases, sports structures, pioneer camps and kindergardens.

The personal incentives of each worker, employee and engineer in the success of his own firm increase with each year. The people of LOMO are convinced in their own experience of the inseparability of the firm's interests and those of each one working at it.

I have related in this chapter only some of the items of the complex plan for socioeconomic development that have already been implemented.

"The House Where We Live"

Improving the housing conditions of the LOMO workers is one of the most important directions of the complex plan for the socioeconomic development of the association.

The firm is building an apartment building.

New residents from LOMO can more and more frequently be found in the most diverse rayons of the city. And almost entire quarters are populated by workers of the firm at Vyborskaya Stornoa. LOMO now has more than 100 of their own apartment buildings. They are comfortable with all the conveniences of modern apartments. These apartment buildings are carefully appointed and are equipped with mechanized laundries and service shops have been organized. The firm expended more than 1.5 million rubles during the Ninth Five-Year Plan on repair and appointment of their own apartment buildings.

More than half of all the LOMO workers live in apartment buildings belonging to the association. Moreover, the firm now participates in participatory construction of a number of apartment buildings which the city is undertaking. It appropriates hundreds of thousands of rubles for this construction from the social development fund. And this means that tens of families of many workers and employees of the association will receive new apartments.

Yet Another Facet

Yes, the complex plan of the firm is multifaceted. But there is a human being behind every line of it. A human personality with his own secular demands, passions, attractions and interests. Yes, it is really a human personality. They are persistently and uniformly concerned here about the harmonious development of each worker, about his ideological and general cultural outlook and about acquiring the treasure of all social riches which literature, music, movies and generally any artistic creativity can provide for man.

Let us take a look at the House of Culture Progress, which is not really a house but a combine of culture. It immediately combines three enormous clubs, reconstructed and equipped on a modern basis, which is required for any type of recreation which one prefers.

Two peoples' universities regularly work here with 11 faculties in different fields of knowledge, 14 clubs "for interests"--amateur music, movie excursions, tourism, collecting, photography and so on.

More than half of the workers at LOMO are actively involved in 52 artistic collectives!

The library has 150,000 volumes. Select any book--classics, Russian and foreign, any works of Soviet literature and all journals--literary, social-political and engineering.

It is calculated that more than 300,000 persons visit the House of Culture during a year. They come because they are interested! I frequently met workers and engineers here whom I had met at the firm, gathering material for this book. I saw some at concerts of the wind ensemble preparing a new program. I met others in the vocal class and still others in the choreography studio. I saw how the instrument ensemble attentively studied new works. I observed how assemblers of movie cameras, tool and die workers and operators of the computer center carefully work out each step in the school of ballroom dancing. Moreover, LOMO can be rightfully proud of its ensemble Kristall, that has become popular far beyond the firm. Kristall propagandizes modern ballroom dances and helps young workers to gain a deeper feeling for music and to develop good taste.

Incidentally, the young people devote special attention here: colorful occasions of young wives and holidays for young parents are arranged here. A young family club has been created. The members of this club meet with teachers, physicians, sociologists and other specialists for frank discussions and consultations on questions concerning them.

Those who come here with children need have no concern with whom they leave them. A special room has been especially allocated for young people where the children can play at any games. Experienced teachers arrange jolly amusements, theatrical meetings with heroes of fables and show them animated films.

Incidentally, no one is left without attention here. Old female workers can comfortably sit in the company of their spouses at their knitting and can listen to

music or can improve their dressmaking. Veterans of World War II give reminiscences to young workers. Heroes of Labor meet with their own young shift. Frequent and desired guests of this House of Culture are well-known Soviet writers, composers, artists and painters. They acquaint the opticians with their own new works and make creative plans for the future.

Meetings with interesting people whom workers of LOMO love so are not only meetings with well-known guests but with their own "firm" workers. Is it not interesting to meet, let us say, with metalworker Boris Nikolayevich Anisimov--a foreman in manufacture of mockups of new movie cameras and simultaneously a painter--landscapist and portraitist and participant of many exhibitions? Or to hear the amazing story and see the films taken by underwater swimming amateur in the depths of the sea, optical engineer Aleksandr Mikhaylov, or to visit an evening of poetry arranged by worker-poets from the lithography association of the firm?

There are 1,500 athletes involved in 22 sports sections at LOMO. Among them are 178 masters of sport and thousands of ranked athletes. A total of 30 masters of sport of the USSR, 4 candidates for master and 50 athletes of first rank were educated in one section of track athletics alone. Many of the students of the sports sections are participants and winners at the All-Union Spartikads and in the Olympic Games. The supervisor of the school of higher sports skills at the firm is V. I. Alekseyev--a multiple champion of the USSR in track and his students have established 39 world records. Highly qualified specialists conduct exercises with amateur athletes. Among them are 10 meritorious trainers of the USSR and RSFSR.

From year to year the firm allocates tens of thousands of rubles to development of physical culture and sport in their own collective. LOMO workers have at their disposal an excellent stadium with total complex of sports equipment and stands for spectators, a rowing and bicycling-skiing base and a shooting range. Construction of an enormous new sports complex with central sports club, two soccer training fields, a swimming pool and other structures has begun.

This is only one line from the plan for socioeconomic development!

The Lunch Table of the Firm

"How did they feed you today?" A machine tool operator or optical engineer, having returned to his jobsite after the lunch break, frequently hears this question.

Both his foremen and shop chief and the general director himself if he is nearby asks him about this. Not to mention the managers of the party or trade-union organization.

A good lunch is important. If one wishes, this is most of all an additional reserve of labor productivity. After all, this additional reserve is not only in new equipment or in innovative experience. It is also born at the lunch table and in the workers' dining hall.

Therefore, the firm considers all dining halls in the association, whether they are formally subordinate to it or not, as one of the most important subdivisions in the plant.

This vital (in the literal sense) question has arisen repeatedly at meetings of the most active party members of the firm and at trade-union conferences. Thus in time was born the idea of creating a public catering combine that combined all the various dining halls. And this made it possible to mechanize the work processes in preparation of food, to improve its quality and to see that each one could each lunch with pleasure and rapidly. Of course it is easy to say "rapidly." The combine had to prepare tens of thousands of dishes daily.

The firm took on itself expenditures on mechanization and similar conversions. And allocations from the profits for construction and reconstruction of the dining halls are also provided in the complex plan for socioeconomic development of LOMO.

Everything changed within one year alone. The large dining halls, beautifully draped windows, restful painting of the walls and the soft color of the fluorescent lights. Comfortable furniture and clean, fresh air.

The partitions everywhere are made of glass panels in the kitchens, bakery and in the pantries, the walls are panelled and ceramic tile is on the floor. Restful and convenient cloakrooms have been equipped for the service personnel.

And the main thing is that equipment that facilitates the work of the cooks has been installed at each step. Snack bars supplied with modern equipment appeared in the shops. And in each of them one could obtain steaks, fish, shashliks, hot tea, coffee, fresh milk, cream, kafir, fruit juices, eggs and pastries.

A new, beautiful building appeared on the territory of the enterprise. This is the culinary store constructed by the firm which also operates as an ordinary cafeteria. One can drop in here for a slice of bread and butter, can eat hot sausages, can purchase a cup of coffee or cocoa with a pastry, pie or puff-pastry. And after the shift the women, so as not to lose time after the work day standing in lines in stores, can purchase semi-finished products here.

When summer begins and the bushes begin to bloom in the plant yard, an open-air cafe begins to operate in the shadow of young trees. One can have a good meal here and at the same time can watch the performance of participants of artistic endeavors, listen to a short lecture or learn interesting news.

The combine now has at its disposal a first-class factory kitchen, confectionery, family of dining halls and excellent snack bars in each shop.

And the time when a machine tool operator or metalworker, sensing the approach of lunchtime looked anxiously at his watch, has been forgotten at the firm. And another time, switching off his machine tool "ahead of schedule," he hurried to get into line into the dining hall. Everyone now has lunch as they wish and what they want. There is also time to breathe in the fresh air on a garden bench, to look through a fresh journal or to listen to the radio.

If a diet has been prescribed, don't worry. Diet nutrition organization is the subject of the most careful concern at the firm. There is now a special dining hall for 640 persons here. And there are special diet tables in all the other

dining halls of the combine. Any worker of the firm, if he has a doctor's prescription, is fully provided with the necessary treatment and dietetic nourishment.

Incidentally, hundreds of people receive dietetic nourishment at a discount here and many receive it absolutely free due to social insurance.

The physicians of the LOMO polyclinic felt that, due to therapeutic nourishment, the periods of loss of capacity due to illnesses related to the digestive organs were reduced by one-third.

Yes, of course, it is not a simple and easy task to feed many thousands of people well and with taste who are engaged in two shifts in the shops of the enterprise and even more so the young people relaxing in Pioneer camps, plust the many dacha dwellers in Tarasovo village and other places.

And outside the city in Tarasovo village, the LOMO firm has yet another unique "enterprise." It is both pastures, orchards and potato fields and berry plantations. Herds of cattle, hundreds of swine feeding and an enormous poultry house can be seen here. The auxiliary farm, like everything related to the firm, is well-appointed, mechanized and supplied with modern equipment.

Its own auxiliary farm, well-set-up and profitable, is a guarantee of the highest quality of products to the firm's dining table.

Good Health to You!

These words are from the letter of Anna Vlasovna P., a worker in the optical shop, to the LOMO hospital.

She fell ill suddenly and they took her directly from home to the hospital. Not to the regular city hospital but to her own "firm" hospital on Chugunnaya Ulitsa. Anna Vlasovna's condition was serious. Moreover, it was critical. A complex operation related to trepanation of the skull was required. Only the most neurosurgeons could save the female worker. And only in a clinic supplied with the most modern medical equipment.

And all this was in "its own" hospital attached to the firm.

A complicated operation was immediately carried out on Anna Vlasovna. They cared for the female worker carefully after the operation until she was completely on her feet. And now she is again working as before in the optical shop.

Here is a note from her book of reminiscences and wishes:

"They performed an operation on me which they could not do at the institute on Bronnitskaya Ulitsa. I am now walking around at home like a healthy person. My respects to you! A. Pikovskaya."

"I am happy that S. Zlotnikov performed the operation on me. All the patients admire your great skills, enormous love of labor and kindness. P. Korchagin, 81 years old."

"You cannot even imagine how I am happy that we have such a sanitary unit. They could never help me in any sanitorium as they do here, especially the manganese and carbon baths. Foundry worker Ivanenko."

Letters, letters and enthusiastic reviews. From those who have been saved, from those extracted from severe circumstances and from those to whom health, vitality and joy of life has been returned.

Valentina Georgiyevna Terent'yeva, the chief physician of the medical-sanitation service of LOMO, pridefully shows off her "facilities." Two polyclinics, four excellently organized health stations and a hospital. And the laboratories--a clinical, biological, microbiological, functional diagnostics, physical therapy department with large, excellently appointed offices for light and electronic therapy, mud baths for taking paraffin baths and pools in which patients with especially severe forms of radiculitis are treated. We visited with her in the pulmonological office, in the physical culture treatment office and in the dental and otorhenological office.

The real palace of health preservation is the new, main building of the LOMO hospital, constructed quite recently. From afar an enormous white building surrounded by a chorus of trees is visible. The wide reflecting windows flash in the sun like gold. The large rooms, laboratories, operating and recovery rooms and the comfortable wards impress one with their cleanliness and breathe with an air of quiet. There are 200 beds in the new building. New wards have been opened--nerve, otorhenological and special surgical wards.

In one year alone the firm spent more than 100,000 rubles to acquire the latest medical equipment--Soviet and imported. There are also instruments in this hospital which are being used for the first time in medical practice and incidentally developed here at the firm.

I met not only "their own" staff specialists in this hospital but also professors of the First Medical Institute and the Military Medical Academy. They see patients here, perform operations, are involved in scientific research, improve the method of operation on the chest and abdominal organs, use the latest methods of rehabilitation and carry out qualified postoperative observation. They help the hospital medical workers to master modern operations on the vessels of the lungs.

The medical workers have at their disposal excellent equipment, modern wards, including rehabilitation wards with the latest electronic apparatus, an endoscope office with the most modern instruments for optical diagnosis.

Everything advanced and new is being introduced in the treatment center of the firm, like at the firm itself, and neither effort nor funds are spared on this.

The concern about the health of workers is an inseparable part of the extensive program for economic and social development of the collective.

"The Resort Shop"

"I don't need to go to the Crimea or to the Caucasus. I would like to go to Tarasovo."

One can frequently hear these words now in the trade-union committee of LOMO.

What kind of place is this to which many, very many workers, engineers and employees of the Leningrad Optical-Mechanical Association are ready to pass up the golden beaches of the Black Sea and the mountain air of the Caucasus? This place is on the Karelia peninsula.

Perhaps, the definition "corner" is not quite accurate for such a large, well-appointed recreation zone. Everything in the center of this forest village is like that in a real city: a post office, House of Culture and dispensary. Everything is also in modern style. There is also a department store with reflective show windows and neon signs.

And around it are located many comfortable cottages painted in the most diverse colors in groves of lilacs, in the gold of cactus plants and in the floating fires of peonies. Entire families relax at these dachas, constructed by the firm for its workers. The inhabitants of each cottage have at their disposal furniture and everything required. Here nearby, a special store sells a large quantity of semi-finished products of meat, vegetables and dairy products.

And if you don't want to cook at home, you can enjoy an excellent cafe. This is a beautiful and comfortable structure. It is an airy, brightly painted room, appointed with light, plastic-covered tables and chairs. There is everything here for a good mood. And it becomes even better when the steaming dishes, shashliks and aromatic meals appear on the tables.

I met in this cafe with the Mikhaylov family, LOMO workers, with whom I had come in the firm's bus. They invited me to their table. Cool dry wine and fruits appeared. Pavel Yevseyevich, an old milling machine operator, sharing a bottle of Cynandal on the occasion of "a successful move to new quarters," said:

"There is relaxation and there is relaxation. And when I come here with my wife then let my Anna Matveyevna be freed from the kitchen. But I am uncomfortable here. We work identically: I at a machine tool and Anna Matveyevna on the conveyor. And should she work here as well--no. It's true, during this season we wanted to cook ourselves and my wife is the foreman on this account. But we came here once or twice simply out of curiosity. We liked it. We had breakfast, lunch and dinner in any form. If you want dairy products or if you want meat dishes they are here. The diet is whatever you require. There are salads and desserts of whatever you like. And if you love Caucasian dishes, then of course you can find them here. There is enough and it is tasty. So we decided to take our meals here."

It was easy for Mikhaylov to convince me to do this. Especially after I had myself "tested" the breakfast, lunch and dinner here. The cafe's popularity was not born of itself.

First, the very best products from their own auxiliary farm are served here. Second, the most experienced and most inventive cooks are sent to this cafe from the food combine during the vacation season. And third, LOMO has outfitted the kitchen unit of the cafe with the most modern culinary equipment.

Coming out of this cafe, one can go into the cafe-ice cream pavilion if one desires.

Generally there is a place to eat and a place to satisfy one's sweet tooth. On this day at Tarasovo I also met another acquaintance--assembler of optical equipment Sergey Vladimirovich Smirnov. He had gone to the lake with his wife and two children. The parents were holding fishing rods in their hand and the children were holding a pail for the forthcoming catch. The Smirnovs had arranged themselves in a special pension together with their children, not interfering with anyone. Forty families take their vacation simultaneously in this pension.

"This is so comfortable," says Smirnov, "comfortable and quiet. The children are with you where you can see them and when can you be with them at other times? So that you can be free of any 'current' concerns."

"But do they not get bored with you here?"

"What do you mean! There is everything here for the young people--a sports area, swings, any type of attractions, soccer, volleyball, competitions, excursions and special daily movies. But now we are going together to the lake with our fishing rods."

We walked along a forest road and then through a flowering meadow, again through the forest and suddenly in front flashed far-off, blinking in the sun with gold lights, a cool and large mountain lake which had attracted almost the entire "population" of the village on this hot day. Hundreds of vacationers, especially young ones, were sunbathing on the beach, swimming in the lake and playing ball. The beach at Tarasovo has been equipped as lovingly and carefully as those of the best resorts: comfortable dressing cubicles, sun-protective umbrellas and lounge chairs.

After some time I again saw them with their fishing rods in a boat, far beyond the buoys surrounding the safety zone for swimming.

They were not alone on the lake. The firm has constructed a boating station at Tarasovo and any person can if he desires take the oars and travel around the picturesque lake or simply fish a little bit, dropping his anchor in a beloved spot.

It would take more than a day to cover every corner here. There are approximately 100 new country cottages here. Some are in the deep forest, others are somewhere on the slope of a hill and still others are in a grove near the brook. Everywhere there is space, freedom, quiet and calmness.

But if you go a kilometer or two in the other direction, you can unexpectedly hear a guitar from far off. Happy melodies are replaced by sad ones, sad ones by happy ones or suddenly you hear popular singing among several voices. There is a tent village in the space among the forest trees. This is the firm's young people's camp. Athletes and tourists travel here in entire companies. Attractive walks along short and long paths and among forests, lakes and waterfalls begin here.

Not far from the tent village is an entire sports complex: tennis players battle on an excellent court and teams formed from the vacationers compete on the volleyball and basketball courts. The endless battles of skittles players proceed on a specially equipped area.

Young sisters Anna and Lidiya Poyarkova are workers from the tool and die shop.

"I and Anna," says Lidiya, "spend almost all our days off here at the two-day vacation base if only we can receive passes."

And she added:

"You can judge yourself what can be better, especially here, in summer on a day off, you have no concerns about eating and you are ready for anything. And of course it attracts you. You can go to dances in the evening--there are dance areas in the open air here. There is a brass band here. And if the weather is bad you can go to the library or to the movies. And what a movie theater there is in the club! And the films such as Nevskiy are first rate. Or you can go to a concert. Or to an amateur evening. You are not bored here. You return to the shop and it's as if you have been born again--you are fresh and the work is incomparably easier. In general, Tarasovo is Tarasovo!"

And everyone whom I met here talked with enthusiasm about their "own" Tarasovo. Quite recently here at the firm's resort the new and without any exaggeration the most excellent pension Dubki became operational here. Its construction, like development of the entire "resort shop," was also provided in the plan for socio-economic development of LOMO for the Ninth Five-Year Plan. And as stipulated, the firm did not spare expenditures. And the hundreds of thousands of rubles which it selflessly allocated from its own profits to create Dubki were worth it. I am now convinced of this myself.

It is enormous with magical outlines of the banks of ponds. Along the shore stretched a long, light and very unique three-story building with wide entrances. The tall and luxuriant crowns of the young oaks and poplars, birches and maples surrounded it in a green ring. You have only to open the doors of the wide entrance and you immediately enter an atmosphere of the most complete comfort, beauty, elegance and quiet. The interiors of the chess hall, dining hall, guest rooms, libraries and dance floors have been done with such fine artistic taste and skill. But the main thing is that the residential apartments, each of which is designed for two vacationers, are good and comfortable. The comfortable and beautiful furniture, mirrors, soft rugs and flowers. One can, having freely arranged oneself in a comfortable and soft chair turn on the stereophonic receiver and listen to music. Or one can see a television set in this comfortable and beautiful room or one can refresh oneself with a shower in the evening before going to bed or in the morning after an exercise. Everything has been carefully provided here--from soft slippers near the doors of your room to fresh flowers on the table. If you wish to play chess you can always find a partner and "defender" in the chess pavilion. If you with to compete at billiards then do so, a billiards pavilion has been constructed alongside the pension.

And if the evening is a little warm and you are tired of walking and do not wish to sit in your room, you don't have to. Lights flash in the evening on the green stage and there will undoubtedly be something there interesting for you: a meeting with a writer, a concert or simply happy, amusing games at which one can relax.

Everything is harmonious at Dubki, where approximately 2,000 persons now take their vacation every year, and everything has been combined successfully--both restful nature and the skills of the builders and artists and the caring hands of the managers.

Moreover, the first good traditions have already arisen at Dubki: the birthdays of the vacationers who come for a vacation in the pension are recognized collectively and solemnly and with happy arrangement. On the day when I had occasion to visit the dining hall there, they were congratulating four workers of the firm at lunch on their birthdays. They were seated at the same table and the chief cook set a large, steaming holiday pie, baked with his own hands, in their honor on a large tray to general applause.

The day that I spent at Tarasovo will be long remembered. I recall not only the magical--beautiful places and the excellent structures, but also the small emblem which you always see on the facades of the dachas, stores, cafe and pensions--everywhere. This is the LOMO emblem. The firm's mark.

LOMO DURING THE 10TH FIVE-YEAR PLAN

LOMO has confidently stepped across the threshold of the 10th Five-Year Plan, raising itself to a new level, having fulfilled all tasks of the Ninth Five-Year Plan ahead of schedule and having provided the country many million rubles' worth of products about the plan.

Behind is one of the most important phases of technical development: 13 of the largest shops were reconstructed during the past five-year plan and approximately 1,000 of the latest highly productive machine tools were installed. The wages of workers, engineers and employees were increased by an average of 17 percent. Their material incentives in the total success of the firm was increased.

The volume of industrial production during the past five-year plan increased by 79 percent and primarily due to an increase of labor productivity. A total of 360 completely new types of instruments meeting all modern requirements was developed and manufactured. The output of consumer goods, including movie cameras, movie projectors and still cameras, was almost doubled.

The collective of the firm produced additional products with more than one million rubles during the days of the watch prior to the Party Congress alone.

And of course, the warm, hearty congratulations of General Secretary of the CPSU Leonid Il'ich Brezhnev was the very highest mark of the association's labor and of all the collectives and organizations that participated in creation and introduction of the world's largest astronomical telescope with main mirror six meters in diameter.

LOMO entered the 10th Five-Year Plan with this "baggage," full of resolve to fulfill it ahead of schedule. In their letter on the eve of the 25th CPSU Congress, the Leningrad opticians wrote to the General Secretary of the CPSU Central Commit-Committee:

"Having entered a new phase in the struggle for further production efficiency and quality of labor at each jobsite in the name of the most rapid increase of the economy and standard of living, we Leningrad opticians have adopted increased socialist pledges and counterplans for 1976 and have concentrated our efforts in providing the highest growth rates of labor productivity, improvement of production and management and in a continuous rise of the technical level of products produced and of the economy both large and small."

How will this be implemented in practice? This is discussed in the second interview with the general director of the firm, Hero of Socialist Labor, winner of the State Prize, delegate to the 25th CPSU Congress Mikhail Panfilovich Panfilov:

"The main thing for us today is to solve the tasks posed by the 25th CPSU Congress. The collective of our association is faced with making a contribution to solution of the problem of raising the technical level and of increasing the output of instruments of various designation."

"During the new five-year plan we should provide a further increase in the volume of production by no less than 65 percent, mainly due to an increase of labor productivity. The output of articles, most important for the national economy and science--spectral measuring instruments and microscopes--will be more than doubled."

As one of the main tasks, the 25th Congress posed an increase of output of consumer goods with a simultaneous improvement of its quality and variety. Therefore, we must develop the production of consumer goods at accelerated rates.

The most important direction of our work during the Ninth Five-Year Plan will be to increase the technical level and quality of products produced. More than 300 nomenclatures of experimental models and new unique instruments should be manufactured during the five-year plan and more than 120 articles should be put into serial production.

We plan to increase 2.5-fold the specific weight of products of the highest category of quality, to present 57 articles for the emblem of quality and to achieve a situation so that our instruments meet these requirements from the first phases of development. It is not sufficient today to pose the task of achieving the level of the leading foreign firms. We can and should develop our own, Soviet level and produce articles of the highest world class."

"The opticians generally have the broadest prospects for development," continues Mikhail Panfilovich. "And this is natural because both today and in the future scientific and technical progress is impossible in any field without it. Take, for example, the prospects for development of measuring instruments. I think that within several years almost all our measuring instruments will operate jointly with computers of various designation that provide rapid receipt of information and also high-speed data processing."

"The use of computers to process information permits not only a significant increase of the labor productivity of the investigator but also replacement of subjective analyses of investigators with more precise and stricter analyses."

"We have already put into serial production new spectrophotometers for express analysis of alloys in metallurgical production that provide acceleration of the processes and increase the quality of metals, new quantometers to analyze impurities in motor oil that permit elimination of premature wear of them and make it possible to extend the operating cycles between repairs."

"The saving from using the new spectral instruments in the metallurgical and chemical industry alone and in transport comprises tens of millions of rubles."

"Because of extensive unification and standardization, new families of biological, fluorescent and polarization microscopes are being developed and put into production. New equipment has now been developed and already put into serial production to illuminate television centers that transmit color pictures."

"We feel another direction of our work is very important--to develop microscopes that provide live investigation of biological objects. We plan in the future to produce microscope-photometers which will permit our scientists to rapidly obtain information about the structural and different physicochemical properties of living cells."

"The future of the firm is also related to the output of the latest spectral instruments used in the most diverse fields of scientific research and production; our spectral instruments used in the chemical and metallurgical industry for express analysis will multiply their functions and will not only be used as automatic analyzers but will also be able to control the most complex production processes."

"Incidentally, medicine is now very interested in using our instruments to determine the content of rare-earth metals in the blood. This will permit much more refined diagnosis of one or another diseases and determination of the absolutely precise dosage of medicines."

"Much could be said about those telescopes, still and movie cameras and equipment for movies and television which we now produce and which we will produce in the future. But if I talk about everything you would need too many new pages."

"After all, the specifics of our plant itself forces us all the time to seemingly feel the pulse of technical progress and all the time to look constantly ahead so as not to lag behind the requirements of time by one iota."

"General Secretary of the CPSU Central Committee L. I. Brezhnev named the 10th Five-Year Plan one of quality. And this means that we should struggle with still greater efforts to produce an excellent product, to win the personal mark for even more of our workers and to increase responsibility of each one for the quality of the articles produced. Moreover, we are planning to present 57 new instruments for the certificate of emblem of quality. But by 1980 we must bring the weight of this production up to 34 percent, in other words, to considerably exceed the indicators which we achieved during the Ninth Five-Year Plan. Moreover, I would like to note that each of us should strive to fulfill the task to increase the guaranteed service life of a considerable number of instruments approximately 1.5-fold."

"Further expansion of production capacities will also be continued. Primarily, the builders will erect a new optical building and by the end of the five-year plan we should put into operation yet another building of 80,000 square meters. We will continue reconstruction and specialization of production. A number of new mechanized shops, warehouses and highly mechanized sections will be opened and additional automatic and conveyor lines will be introduced. And new highly productive equipment, including industrial robots, will be installed to carry out further mechanization of the shops."

"The primary task is to increase production efficiency. The increasing role of capital investments in technical re-equipping and reconstruction of existing production is being provided for this purpose in the basic directions for development of the national economy."

"The problem of increasing the output of products with each ruble of basic funds is being placed on this basis."

"We also plan during the 10th Five-Year Plan to increase the volume of production, mainly due to further reconstruction and technical re-equipping of the shops and sections. For example, it is planned in our five-year plan of socioeconomic development to mechanize an additional five shops and 11 sections in a complex manner. The number of machine tools with program control will be doubled."

The struggle for production efficiency and quality is unthinkable without continuous improvement of personnel. And the firm has constructed a new training center--a multistoried building supplied with all modern teaching hardware, especially to train and retrain their own personnel."

"A total of 2,000 young men and women of 11 occupations will be trained in this center in only one PTU. Besides the occupations, each student of the PTU will receive a diploma of graduation from secondary school. They will all link their future to the firm."

"Generally, everything is going according to plan and according to the plan for socioeconomic development of the firm for the 10th Five-Year Plan. Much has been provided according to this plan to further improve working conditions, everyday life and recreation of the workers."

"As you can see, new horizons are being opened to the firm during the 10th Five-Year Plan and we are confident that we shall fulfill everything planned by the 25th Party Congress!"

- END -

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