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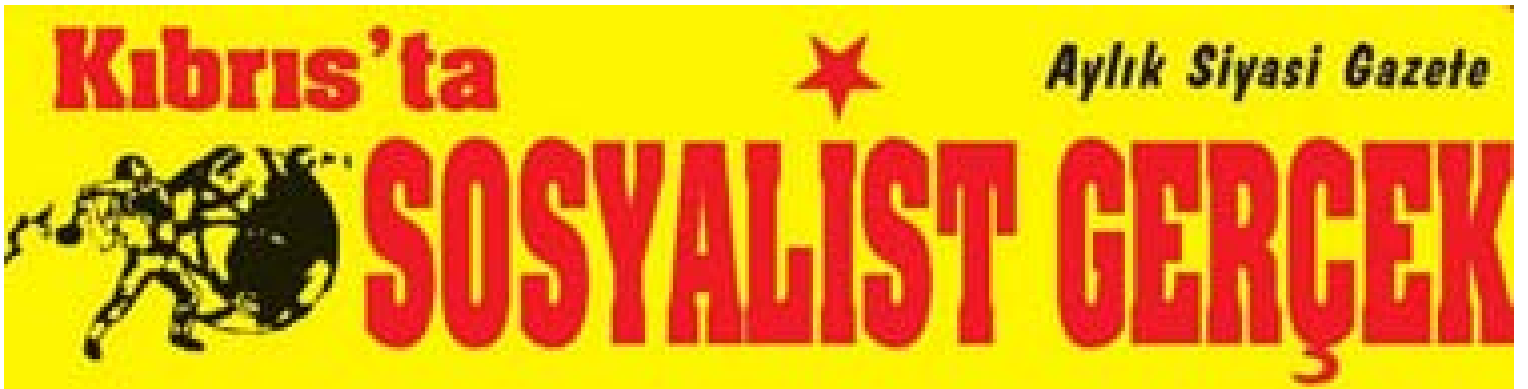

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Minister of Higher and Specialized Secondary Education of the USSR

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Note on the Author

Minister of Higher and Specialized Secondary Education of the USSR Prof. Vyacheslav Petrovich Yelyutin, D. Sc. Tech., Corresponding Member of the USSR Academy of Sciences, Head of Department at the Steel and Alloys Institute, is a noted Soviet metallurgist and educationist, the author of a number of books and treatises.

In this booklet V. Yelutin describes the development of higher education in the USSR, its structure, what specialists are graduated by colleges for the different branches of the economy, science and culture, what is being done to bring liberal arts and technical education more in line with the needs of the day and how the system of training is organized.

Contents

В. ЕЛЮТИН

«Высшее образование в СССР»

на английском языке

Цена 25 коп.

Introduction

Fifty years ago, at the time of the October socialist revolution, Russia was a country of illiterates. The working class lacked people who were qualified to run the state apparatus or the economy.

This obvious fact led bourgeois statesmen to prophesy—some with unconcealed glee but not a few of them sincerely—the imminent downfall of the young Soviet state. How could a system function without competent administrators? How could the economy be run without trained specialists? They could hardly be conjured up out of thin air!

But Lenin believed that the revolution would bring out the people's latent talents, that under Soviet power workers and peasants would learn the art of government and scale the heights of science and technology. And Lenin was right.

In a historically short period the Soviet people led by the Communist Party have not only caught up with the advanced capitalist countries but in some respects have left them far behind. The new

social system, which has made industrialization and cultural revolution possible, has transformed backward agrarian Russia into a leading world power.

In 1913 tsarist Russia's share of world industrial output came to a little over four per cent. In 1920, owing to the devastation caused by World War I and Civil War, the output of heavy industry dropped to one-seventh and agriculture to about two-thirds of the prewar level.

By now, however, Soviet industry accounts for nearly one-fifth of world output, although the country has no more than one-fifteenth of the world's population.

There is no comparing present standards of culture and education with what it was like fifty years ago. Gone is the time when by far the greatest proportion of the people could neither read nor write. A genuinely democratic system of education has been developed. Compulsory eight-year education has been introduced throughout the entire country. The number of gainfully employed specialists with university and junior college qualifications is now 63 times the pre-revolutionary level.

The Soviet Union was the first country in history to send a man in space, which eloquently testifies to the high level of its science, technology and education.

Higher School Before the Revolution

In all the 280 years that pre-revolutionary Russia had higher schools, only 105 institutions of higher education with the total enrolment of 127,000 were opened. In comparison, 22 new colleges and hundreds of new college departments were opened in the Soviet Union during 1958-65. In the same seven years the number of students increased by 1,682,000.

Before the revolution higher education was the privilege of the propertied classes. In 1914, 38.3 per cent of the students of eight Russian universities were from the nobility and families of government officials, 43.2 per cent were of ecclesiastical or bourgeois parentage, 14 per cent were the children of rich farmers, and only 4.5 per cent came from families of workers, peasants or professional people.

As to the national minorities, there was not a single university college on the territory of the present Byelorussian, Lithuanian, Moldavian, Azer-

baijan, Armenian, Kazakh, Uzbek, Turkmen, Tajik and Kirghiz Union Republics.

Women were not admitted to higher school until a few women's colleges were finally opened at the close of the 19th century. They were ridiculously small, with inadequate curricula.

Technical education at university level suffered most from Russia's economic backwardness and despotic rule. Most of the 18 technical colleges were located in St. Petersburg and Moscow. Apart from the Tomsk Technological Institute in Siberia, no other region of immense natural wealth and industrial promise (e.g., the Urals, the Caucasus and Central Asia) had a single technical college.

Though Russia at that time was considered a major agricultural country, very little was done about the training of agronomists. In 1914 there were only 4.6 thousand students attending agricultural colleges of university status.

Possessing one-third of the world's timber resources, Russia had only one Forestry Institute, also in St. Petersburg.

The fine arts fared no better. All in all there were five conservatories and two art schools and not a single theatrical college.

There were about 20 thousand doctors for a population of 150 million. They practised in the central regions of the country and the national outskirts were practically without medical aid: Tajikistan, with one million inhabitants had 13 doctors; Kirghizia had fifteen.

Despite this acute shortage of specialists, nothing was done to step up training of personnel. Colleges were chronically understaffed and ill-equipped. Research was conducted only at some 15 of them, on the personal initiative of faculty members themselves.

Despite such unfavourable circumstances, Russian scientists made a worthy contribution to world science. Of singular importance are Lomonosov's encyclopaedic works, the discovery and development of non-Euclidean geometry by Lobachevsky, the discovery of the photoelectric effect by Stoletov, Zhukovsky's works on aeromechanics and Timiryazev's contributions to botany. The peak of Russian scientific endeavour was the Mendeleyev Table of chemical elements, which opened up tremendous prospects for science and engineering.

Russian higher school accumulated valuable teaching experience and developed new systems of training which won international recognition. The Moscow Higher Technical School (now known as the Bauman School) evolved a new trend based principally on an inherent relation of theoretical and practical training. After the 1872 and 1876 World Fairs in Vienna and Philadelphia this system was widely adopted both in Europe and the United States.

Soviet people are well aware of the valuable contribution made by Russian universities. They carry on these traditions, justly proud of the courageous role played by Russian students and professors in the revolutionary liberation movements.

Education for the People

As soon as it was organized, Soviet Government took vigorous steps to democratize the higher school and ensure its rapid growth.

Education was to be made accessible to the more

gifted regardless of property, social status, nationality, sex, religion or political convictions.

The decree of the Council of People's Commissars of August 2, 1918, signed by Lenin, initiated a radical reform in higher education. For the first time in history the doors of institutions of higher learning were opened to the working people and their children. Not only was tuition at universities made free, but the students were to be provided for by the state. Both teachers and students were to take part in governing the colleges.

Important as they were these initial measures were not enough. Before attending university courses, workers and peasants had to acquire a secondary education. This was provided by "workers' departments", which were, in effect, adult schools preparing students for matriculation at a greatly accelerated pace.

Workers' departments played an important role in helping to create a Soviet intelligentsia. Later on, when the secondary school system was sufficiently developed, they were stopped as no longer necessary.

University education in Soviet Russia got off to a good start right from the beginning. In 1922 the country had 248 university colleges with an enrolment of 217 thousand, practically double the number of colleges in the pre-revolutionary period.

During the first Five-Year plans the Soviet university system was able to provide its own teaching staffs, who came from the ranks of the workers and peasants.

During the first Five-Year plan 204.6 thousand professionals including 76.5 thousand engineers graduated from higher school. The next Five-Year plan enabled the Soviet Union to occupy a leading

place in the world in the number of specialists with a university education.

The 1936 Soviet Constitution was the first document of its kind that stated and guaranteed the right of all citizens to education including university education.

By the time of the nazi invasion (1941) Soviet colleges were providing enough specialists for every branch of the economy and culture.

Despite the difficulties imposed by the war, colleges did not discontinue teaching or research activities even for a day. Though, as established by the Extraordinary Commission of Inquiry, the fascist barbarians ruined 334 Soviet colleges, 302 thousand specialists graduated during the war.

Even during the war they began to rehabilitate the ruined colleges. In the first postwar years the Soviet university system not only recovered from the damage but made great strides forward. In the 1940-41 academic year the country had 811.7 thousand college students. In 1950-51 the number reached 1,247.4 thousand, a 50 per cent increase. By 1966-67 the student population had grown to 4 million 123 thousand or more than five times the 1940 figure.

Care was taken to afford sufficient facilities for training in the more important professions. Engineering, construction, transport and communications colleges increased their student enrolment from 204 thousand (25 per cent of the 1940-41 total enrolment) to 1,855 thousand in 1966 (44 per cent of total enrolment). The number of students at agricultural and forestry colleges increased from 52.1 to 399 thousand, at universities and teacher training colleges from 398.6 to 1,279 thousand, and at medical colleges from 107.6 to 259 thousand. As for the number of students going in for economics

and law, it was 8 times the prewar figure.

The postwar period saw considerable changes in the distribution of colleges throughout the country. The rapid industrial and cultural development of the Eastern regions led to a steady extension of the network of colleges in the Urals, West and East Siberia, the Far East and the Central Asian Republics. In 1966-67 student enrolment there was four times the 1950-51 and eight times the prewar figure.

Universities have been established in the Tajik, Turkmen and Kirghiz Union Republics and the Yakut, Kabardino-Balkarian, Bashkir and Mordovian Autonomous Republics. Kuibyshev and Kaliningrad will now have their own universities. Scores of technical, agricultural, medical and other colleges were opened in the Eastern part of the Soviet Union, viz. the Far-Eastern, Krasnoyarsk, Chelyabinsk, Tajik, Kemerovo, Perm and Karaganda Polytechnics, the Siberian Metallurgical College, the Omsk Engineering College, the oil and aviation colleges at Ufa, the Tomsk College of Construction Engineers, the Bashkir, Magadan, Kulyab and Kokchetav Teachers Training Colleges, the electrotechnical and electrotechnical communication colleges at Novosibirsk, the Samarkand Architecture and Building College, the Urals Electrotechnical Institute of Railway Transport Engineers, the medical colleges in Aktyubinsk, Vladivostok and Tselinograd, the Tyumen and West-Kazakhstan agricultural colleges, the Andijan Cotton Growing Institute, etc.

One of the most remarkable achievements of the Soviet cultural revolution has been the development of higher education in the national republics. Before the revolution there were colleges only in 21 cities, all of them in the central part of Russia.

Today more than 500 towns and cities have colleges and college branches. Every Soviet Republic has a university and other higher schools. There are 132 colleges in the Ukraine (there were 27 there before the Revolution), 28 in Byelorussia, 35 in Uzbekistan, 41 in Kazakhstan, 12 in Azerbaijan, and 27 in the Baltic Republics (Lithuania, Latvia and Estonia).

Even peoples who lacked their own system of writing before the revolution now have their own engineers, agronomists, teachers, doctors, and scientists, writers and other workers in the sphere of culture and education.

I should like to quote the example of the Tajik SSR, which, like so many national republics, had not a single college before the revolution. It had no college graduates and 95.5 per cent of the population were illiterate. Today almost a third of its people (800 thousand out of the total of 2.6 million) are studying in some way. There are 34 thousand students in Tajikistan colleges.

Tajikistan colleges have trained about 43 thousand highly qualified specialists in different spheres of knowledge. In the percentage of students Tajikistan has outstripped many advanced capitalist countries. The Republic has its own Academy of Sciences, incorporating scores of research bodies. The colleges and the Academy of Sciences have more than 3,700 researchers and teachers, 60 of them are Ph. D.'s, about 900 Masters of Science, assistant-professors and senior researchers.

The scope of higher education is such that before World War II Soviet colleges graduated 100-110 thousand specialists annually, compared with 8-10 thousand before the revolution.

In 1966 higher and specialized secondary schools graduated over 1,117 thousand young specialists,

including 431.8 thousand with a higher education. In 1967 another 485.9 thousand specialists will graduate including over 200 thousand engineers, 36 thousand doctors and 140 thousand school teachers.

To sum up, during fifty years of Soviet government university education in the USSR has made gigantic strides. It now provides the country with enough specialists who can competently tackle the most intricate practical and theoretical problems and ensure good results in every branch of the economy.

Here are a few more figures. In pre-revolutionary Russia there were only 200 thousand specialists with a higher and secondary education gainfully employed in the economy. By now the figure has skyrocketed to 13 million such specialists, more than the population of the Netherlands or Australia.

In 49 years of Soviet government about 7.5 million specialists with a higher education and about 12 million specialists with a secondary vocational education have been trained. The USSR has two-odd times as many gainfully employed engineers as the United States, for example. In 1965 the Soviet Union had 1,631 thousand engineers as against 752 thousand in the USA. By 1967 the USSR had nearly 1,800 thousand engineers. At the present stage of development of Soviet society, science and technology play an increasingly important role in the efficiency of production. This calls for higher educational standards. In 1970 the introduction of universal secondary education will be completed, necessitating additional numbers of qualified teachers and improvements in higher and secondary vocational education. An increasing number of specialists will be engaged in heavy industry and agriculture. More economists, light industry engineers and public utility experts will be trained. During 1966-70 the Soviet state university system will turn out 2.7 million specialists. By 1970 at least 7 million specialists will be engaged in the economy.

In the next few years, production personnel patterns are expected to change considerably. Even now industry requires not only those who can deal with practical problems but also theoretical mathematicians, physicists, chemists, biologists, psychologists, economists, etc. And new kinds of specialists are needed—for example those trained in the scientific organization and management of labour.

A continuous improvement of the teaching process is a salient feature of the Soviet university system. Students who wish to extend their knowledge independently are given every encouragement and the necessary wherewithal. Two thousand new college books were published in the past four years or so. Many of them won international approbation and were translated into various languages.

The Structure and Principles of the Higher Education System

As I have already mentioned, education in pre-revolutionary Russia was mainly of a general cultural character, a privilege of the ruling class, the propertied strata of population.

The Soviet state adopted an entirely different attitude, considering education to be a great social, political, economic and cultural factor. Emphasizing the inherent relationship of economic develop-

ment and education, Lenin pointed out as early as 1918 that the educational and cultural upsurge of the people was a significant factor in stepping up labour productivity which ultimately determined the victory of the new social system.

Education in the USSR is naturally connected with the building of a communist society. It helps people to acquire a scientific materialist ideology and provides a basis for the moulding of a harmoniously developed personality.

The Soviet system of education is characterized by continuity at all stages. It is designed to provide education for the millions and train them fully in the light of contemporary scientific, technological, cultural and social requirements.

The diversified nature of the Soviet university system enables it to cope with the demands of economic and cultural development without undue delay. Industrialization of the country and collectivisation of farming, for example, spurred the development of technical and agricultural colleges, while today much attention is given to the training of specialists in the more sophisticated branches of science and technology.

Soviet universities and colleges are state institutions, maintained at state expense. The few exceptions are colleges which belong to a co-operative or public organization (e.g. the Co-operative Institute, the Higher Trade Union School, the Lumumba Friendship University, etc.).

Higher education can be obtained in the USSR at day, evening or correspondence departments (most colleges have all three). Day students are full-time students. Those taking evening and correspondence courses combine study with work. Evening students attend lectures after work, and correspondence students receive assignments and

study aids by post. At the end of each term those studying by correspondence come to the college to do laboratory work, attend seminars and review lectures and take their examinations. Degrees conferred by the department or college are equally valid, regardless of whether the graduate completed a day, evening or correspondence course. (See Appendix I.)

The Soviet education system is founded on the following democratic principles:

All citizens have an equal right to education. Education is compulsory for all children and adolescents;

Secondary and higher education are accessible to all. Tuition is free;

All stages of education and all types of schools (i.e., general, vocational, specialized secondary and higher) form part of a co-ordinated education system;

Education and upbringing are linked with practice, useful work and the building of Communism;

Consistency of instruction and upbringing;

Education is based on science and kept up-to-date to accord with practical needs and growing spiritual requirements;

It combines the principles of Soviet patriotism and socialist internationalism, paying due heed to individual national features. Education is conducted in the native language or there is a choice of language for education;

Education instils the high moral code of the builders of Communism in the young;

Education is secular, that is, separate from the church, and intended to inculcate a scientifically-orientated atheistic outlook.

Education today provides both theoretical knowledge and practical training in a trade, thus com-

bining in a single system a knowledge of science and technology that bears directly on the state of society's productive forces and an awareness of the laws governing the structure and progress of society.

Well-balanced development is assured not only for branches of education that provide specialists for the economy but also the liberal arts courses intended to ensure the cultural upsurge of all Soviet peoples.

Soviet university and college graduates have to their credit scientific and technological achievements that have greatly promoted world development. The development of artificial satellites of the Earth, spaceships, advanced reactor engineering, nuclear power engineering, etc., convincingly demonstrates that the Soviet Union has a body of talented and highly qualified scientists, engineers and technologists.

Socialist construction in the USSR has finally exploded the notion about the presumably eternal division of humanity into those who think, develop science and govern society and those doomed to hard manual work alone.

The introduction of new machine tools and instruments is rapidly doing away with occupations requiring unskilled, arduous manual labour. New jobs are moving into the scene which require not so much the exercise of physical strength as the ability to set and control the machines, to handle sophisticated appliances and instruments and read intricate calculations and blueprints. The operator's work is gradually approaching the functions of an engineer, technician, agronomist or any other specialist which means he must develop the intellectual's creative attitude to work.

Therefore, besides being important economically,

comprehensive automation and mechanization and the introduction of new production processes, including chemical processes, are of great social import in Soviet society. They facilitate labour and radically affect both its nature and patterns, leading to shorter hours and higher standards, cultural as well as technical, making it feasible to narrow the gap between mental and manual work.

In order to bring about comprehensive mechanization and automation, total electrification, intensive application of chemistry in the economy, the application of electronic computers and new sources of energy and foster a Communist attitude to work it is necessary to ensure further progress of science and equip the working people with scientific knowledge.

The correlation of technological and scientific progress, the education of scientists and technologists and improvements of cultural and technical standards of all workers is an objective process which may be greatly accelerated by the purposeful action of both government and social bodies, including the university system.

Being major centres of culture and enlightenment, institutions of higher education play a significant part in providing the countryside with the cultural facilities available in town.

Important in this respect is not only the training of specialists as such and the development of science but also raising the standards of specialists engaged in the economy, education and culture, the establishment of matriculation courses and dissemination of scientific and political knowledge among the people through lecture bureaus, Palaces of Culture and other media.

Many colleges and universities have popular scientific-technological societies. The so-called peo-

ple's universities of latest technical innovation and economic education, operating on a voluntary basis, constitute today a salient feature in public education. One such university affiliated to the Kuibyshev Polytechnical College is attended by technologists, designers, factory operators and foremen. There are lectures on the latest electronic computers, comprehensive automation of production and other elements of technical progress. Engineering Economics Department of the Novosibirsk Electrical Engineering Institute of Communications has set up advanced evening courses in economics for administrative and engineering personnel, shop and department managers, foremen and production team leaders. Thousands of engineers and technicians working at the capital's enterprises attend the Moscow People's University of Technical Progress and Economics.

These and other similar organizations sponsored by universities and colleges provide information on the latest developments in various lines of science and production to those engaged in the work, thereby promoting the progress of production on an up-to-date scientific basis.

Institutions of higher education make a definite contribution to the cultural life of the towns where they are situated. In pre-revolutionary times, too, university towns had a livelier cultural and social atmosphere. Now that such towns have become much more numerous, the colleges exert a far greater influence on the cultural standards and way of life of the townsfolk. People, too, have changed from what they were, say, forty years ago. Nearly a third of all manual workers—two-fifths of them factory workers and over one-fifth collective farmers—have either a higher or secondary education.

That is why present-day Soviet society cannot

be content with universal literacy alone but aspires to high educational standards in science, technology and the humanities for all.

College Patterns

Higher education in the USSR can be obtained at colleges of different kinds, which may be roughly classified into three main groups, ziv., universities, politechnical institutes and specialized institutes.

UNIVERSITIES AND LIBERAL ART COLLEGES

Universities have traditionally shaped up as important scientific centres which carry on diversified research and train qualified specialists for scientific and cultural-educational institutions, industrial enterprises, secondary and higher schools, the state apparatus and public bodies.

The state university system embraces all branches of science and scholarship, including philology, journalism, history, philosophy, economics, law, physics, mathematics, biology, chemistry, geography, geology, etc. The humanities are favoured by the young people. Departments of philology, law, history, philosophy and journalism have the greatest number of applicants for enrolment.

Much attention is paid to the liberal arts in the Soviet Union, as a means of ensuring the harmonious development of the personality.

This explains the number of colleges preparing specialists in the humanities.

The universities, the oldest educational institu-

tions, did much to promote culture and enlightenment in pre-revolutionary Russia. They were centres of development of progressive scientific thought and revolutionary ferment. Mikhail Lomonosov, the great Russian scientist, who founded Moscow University—the first Russian university—insisted on the democratization of university education.

Lenin thought highly of universities because they efficiently combine research and instruction of students and believed that the Soviet state should do everything to develop and improve them. While tsarist Russia had 13 universities with 43 thousand students, the Soviet Union now has 42 universities with a total enrolment of 433 thousand.

Universities occupy a leading position in the USSR, setting the pace for many colleges as regards the standards of teaching and research.

Universities have been set up in all Union Republics and recently in some Autonomous Republics, including the Mordovian, Daghestan, Yakut, Bashkir and Kabardino-Balkarian Republics. Universities have recently been opened in Vladivostok, Donetsk and Novosibirsk.

Novosibirsk University was sponsored by the local branch of the USSR Academy of Sciences. Some of its teachers are eminent scientists directly engaged in research, which serves to tie in teaching and science still closer.

The principal aim of Soviet universities is to give their graduates a solid theoretical background and to combine research and study. The extensive research done at universities is of great theoretical and practical significance. Successes in the natural and exact sciences, like physics, mathematics, chemistry, biology, geology and borderline sciences,

furnish the theoretical basis for technological progress in every branch of the economy. It is at the universities, with their teams of researchers headed by top-notch scientist-educators, that many major discoveries have been made and new fields of human thought and endeavour initiated.

A considerable number of them have merited world recognition.

Universities play an important role in promoting higher education as they provide facilities for training college staffs with both graduate and postgraduate qualifications. A number of technological, medical, teacher-training, economics and other colleges are the outgrowth of University Departments.

University Academic Councils preside over the presentation of theses and confer postgraduate degrees. Some universities (Moscow, Leningrad, Kiev, the Urals, Central Asian, Kazan and others) have lately started teachers' refresher institutes and courses in social science, philology, mathematics and physics.

Soviet universities are well known for scope of training in the different sciences and the humanities. It is greatly to their credit that their students gain profound theoretical knowledge and are taught, at all stages of the course, to carry out independent research.

The humanities are also taught at teachers', librarians', economics, law, and other colleges not to mention numerous conservatories, colleges of theatre arts, art institutes, etc.

Today socialist society has an increasing need of economists; it is also important that engineers, agronomists and other specialists employed in the economy should enhance their knowledge of economics. Facilities are provided at 28 economics colleges, 19 university departments and 140 techni-

cal and agricultural colleges which offer relevant courses.

Legal training is given at four law institutes and 29 university departments whose present enrolment amounts to 60 thousand undergraduates.

As to art education in the Soviet Union, there are now nine times the number of colleges there were in pre-revolutionary Russia, when there were just five conservatories. Today the USSR has 17 conservatories, 10 Colleges of Theatre Art, a Cinematography Institute, an Institute of Architecture, several Art Academies and colleges, Institutes of Applied Arts and Design, Arts, and Crafts schools, and an Institute of Literature with a total enrolment of 40 thousand students. Their faculties include many famous names in literature and the arts.

There is extensive art education in the national republics,the Union Republics benefitting from the active assistance and cooperation of the major centres of Russian artistic culture.

Art colleges cater to the creative aspirations of the youth. They train actors, producers, drama critics, singers, musicians, artists, cameramen, script writers, authors and editors. The colleges admit the more gifted candidates via competitive entrance examinations.

Teachers training colleges may be considered a product of the October Revolution, since all tsarist Russia had were two private colleges. Today there are 206 of them with a total enrolment of about 820 thousand.

The colleges train teachers in all subjects taught at the secondary school, including work instructors and teachers of drawing and technical drawing, physical education, chorus singing, etc.

As a rule, teachers colleges graduate teachers in

two specialities. A student majoring in history, for example, will choose singing or gym or the like as an optional subject. Or he may combine Russian (or another national language) and foreign language, mathematics and physics, mathematics and technical drawing, etc.

A teacher thus equipped will be able to use his energies to the full even if the school is small. This scheme permits the organization of relatively small schools in sparsely populated districts.

Though a teacher who graduates from a university has a better scientific background, a teachers college alumnus has had better training in teaching methods and other educational subjects. Since 1959, however, the educational aspect of university curricula has been considerably enhanced, with more time being allotted for teaching practice at schools.

Besides natural and exact science departments, teachers colleges also have numerous history, philology and education departments. Some of them provide training for teachers at the schools for blind, deaf, deaf-mutes and other handicapped children.

A number of colleges prepare teachers for junior grades. In view of the general cultural importance of the junior school, which instructs its pupils in the principles of knowledge and instils the learning habit, it is essential that it should be provided with teachers who are well educated, well informed about current scientific developments and possess excellent teaching skills.

Soviet people lay great store by education. This can be seen from the fact that many collective farms build excellent day and boarding schools for their children.

Teachers colleges are rather evenly distributed over the republics. Together with the universities they supply the personnel for the secondary schools,

including teachers in all subjects, where classes are conducted in the native languages of the republics.

TECHNOLOGICAL EDUCATION

Tsarist Russia had very few technical specialists. Before World War I there were only about 8,000 graduate engineers working in industry. Russia's 18 technical university colleges provided training in some 20 specialities for 24,900 students.

One of the first concerns of the Soviet Government was to build up its own corps of engineers. The entire system of technological education was revamped in a very short time. Workers, peasants and Red Army men just back from the Civil War fronts turned up in college lecture rooms.

The number of engineers who graduated in 1937, 20 years after Soviet power was established, was 4.5 times as many as existed altogether in tsarist Russia.

Thousands of technical college graduates worked on the projects constructed under the first Five-Year plans: the Dnieper Hydro-power Station, the Urals Engineering Works, the Stalingrad (now Volgograd) Tractor Plant; they built blast furnaces in Magnitogorsk and shipbuilding yards in the Amur taiga; under the supervision of Soviet scientists, they manufactured planes, tanks, artillery guns and other efficient weapons which helped to defeat the nazi army in World War II.

After the war technological education in the Soviet Union assumed even greater scope. During 1958-65 over a million engineers graduated from colleges. Today there are nearly 1,800 thousand in the USSR—twice the number in the United States.

All in all, the number of engineers has increased 225 times during the Soviet period.

There are 227 technical colleges training specialists in about 260 specialities. Some of the graduates are employed at institutes of the USSR Academy of Sciences or specialized research centres and laboratories. The world's first atomic power plant and most powerful proton synchrotron, the latest jet air liners, artificial satellites of the Earth and spaceships are the products of their efforts not to mention thousands of efficient, easy-to-operate machines, machine tools and instruments.

Continuous, rapid technological progress, an inherent part of the socialist system of production, required and uninterrupted growth of the engineering force both in number and standards. The following figures denote the expansion of technological education over the years.

In 1914 engineering students made up 18.1 per cent of the student total, in 1940 the proportion had been upped to 25 per cent; it was 25.8 per cent in 1950, 35 per cent in 1957 and amounts to 45.1 per cent in 1967.

Today the USSR has about five million engineers and technicians. This is 38 per cent of the gainfully employed specialists with either a university or a specialized secondary education.

During the current Five-Year plan (1966-70) more than 1,100 thousand engineers and 2,200 thousand technicians will be trained.

The number of technical colleges, their particular set-up and types of specialized education offered—all denote the tremendous changes the economy has undergone during the Soviet period and illustrate the present needs and prospects for industrial development.

Polytechnical institutes occupy an important place among technical colleges. They have numerous departments training engineers in a variety of professions. The Leningrad Polytechnical Institute, for example, has eight departments (physics and metallurgy, mechanical engineering, electromechanical and hydrotechnical, electronics, etc.) training specialists in 62 specialities. The Tomsk Polytechnical Institute turns out 49 different kinds of specialists; the Tashkent and the Chelyabinsk Polytechnical Institutes provide training in 37 and 51 different engineering specialities respectively. There are also specialized institutes preparing personnel for work in certain industries. They include metallurgical, mining building, chemical engineering transport and similar colleges. Such institutes have fewer departments. For example, the Sverdlovsk Mining Institute training engineers for the coal industry has a Department of Geological Prospecting, a Mining Department, a Geophysical Department and a Department of Mining Engineering. Altogether, the Institute graduates eleven different kinds of engineers. The Kiev Institute of Construction Engineering has six departments, training construction engineers in ten specialities.

Technical colleges are not necessarily either polytechnical or specialized institutes; some are a cross between the two. For example, the Moscow Power Institute is considered to be a specialized college, although it is hardly that with nine departments and 36 different curricula.

The distribution of technical colleges also differs greatly from what it was before the revolution. They are now located in 70 cities and towns instead of nine, and some of them are in new industrial areas with concentrations of relevant enterprises, rather than just in big centres.

SPECIALISTS IN AGRICULTURE

At the end of the twenties, millions of Soviet peasants adopted a new, co-operative way of production thus inaugurating the era of large-scale mechanized agriculture in the Soviet Union. A sizeable body of specialists were needed to put agricultural development on a sound scientific basis.

This meant the system of agricultural colleges had to be greatly expanded. The 14 agricultural colleges in pre-revolutionary Russia with an enrolment of 4.6 thousand have increased to 98 with nearly 400 thousand undergraduates.

Training is provided in agronomy, stock breeding and veterinary surgery and in mechanization of agriculture. The colleges being distributed throughout the country, teaching can be organized to comply with the individual features and needs of each separate area.

Instruction is closely linked with field work, provision for this being made by nearby state farms, which are actually at the disposal of the colleges. The Kostroma College, for example, has the run of the famous Karavaevo stock farm with over 28 thousand acres of land and thousands of dairy cattle of the celebrated Kostroma stock. In this way students are able to get first-hand knowledge of every process instead of being confined to charts and drawings.

Agricultural colleges are steadily developing into scientific centres affording invaluable assistance to collective and state farms.

MEDICAL EDUCATION

In 1914 Russia had six medical colleges, five of them for women, which graduated from 1,000 to

1,500 doctors a year. They were all in the central part of Russia.

Immediately after the revolution the medical colleges were charged with the task of providing enough doctors for all Soviet republics. By 1922 the number of medical colleges had increased to 26 while at present there are 98 medical colleges with 240 thousand students. More than 30 thousand doctors graduate every year. Today medical colleges are also located in remote parts of the country where previously there were neither colleges nor doctors.

Training is offered in therapeutics, pediatrics, surgery, sanitation, stomatology and pharmaceutics, it is a 6-year course. Refresher colleges and courses help doctors to keep abreast of the latest achievements in medical sciences.

A sharp decrease in the incidence of disease, higher birth rates, a lower mortality rate and longer life expectancy are the fruits of free medical service in the Soviet Union.

Higher education in physical culture and sports is provided by 16 colleges for sports doctors and coaches, which are attended by over 20 thousand students.

Evening and Extramural Education

Those who are unable to enrol at a day college (mostly those who are older, with families to support) can still get a higher education at an evening or correspondence college or college department.

Part-time education of any kind was unknown in pre-revolutionary Russia. It is purely a development of Soviet times.

It was first started in the thirties in connection with the rapid development of industry and co-operative farming, when shortage of specialists was keenly felt.

In 1940 there were eight evening and 17 correspondence colleges and 383 departments providing instruction for 253.6 thousand undergraduates (31.3 per cent of the total number of college students). That year they graduated 26.8 thousand specialists (21.5 per cent of the total).

At that time, however, the system suffered from two major drawbacks—the small number of engineering students (15.9 per cent) and the shortage of adequate facilities for part-time education in the Central Asian, Transcaucasian and Baltic Republics, in other words, particularly anywhere outside European Russia.

The picture changed after the war. In 1966-67 there were 23 times as many evening students including 34 times as many engineering students as there were in 1940, whereas the total enrolment of correspondence colleges grew 7.5-fold in that time, the number of engineering students rose 23-fold.

Today the Soviet system of part-time university education consists of 29 correspondence and evening colleges and over a thousand departments with an enrolment of over 2,382 thousand students, i.e. more than half the total number of college students in the Soviet Union. (See Appendix 2.)

Increasing number of bench workers, collective farmers and their children now are benefiting from part-time education. They make up the bulk of students in evening classes and those taking correspondence courses.

The rapid spread of evening and extramural education and the growing proportion of industrial workers supplementing their education cannot be

wholly attributed to scientific and technological progress, which naturally stimulates the desire for education, or to shorter hours, longer leisure and higher living standards. The Communist labour drive with its precept of mastering knowledge is also a major stimulant. There are now scores of factories and state farms in the country where all workers study and where it is becoming impossible to draw the line between those engaged in mental and manual labour. Soviet society seeks to have all working people, both industrial workers and peasants, highly educated.

Lately evening and extramural university education system has been greatly improved with a view to providing better training.

A recent development has been the organization of new types of educational institutions. They are factory training colleges, state farm colleges, people's universities and studios. Ample experience has been accumulated by factory training colleges at the mammoth Likhachev Automobile Plant, the Leningrad Metal-Working Factory, the Rostov Farm Machinery Works, etc.

A factory training college is both a component part of the factory and a branch of a college. Theoretical training is thus closely connected with production work.

The advantage of such colleges is the regular alternation of study and work, which is easier than combining work and study at the same time. Since the students are generally recruited from the personnel of the factory itself and allied enterprises, it is possible to combine study with useful work. Getting a higher education in this way enables the student, who is a production worker, to go over every process connected with his future work as a graduate.

Factory colleges have quickly become popular among the working youth. They can achieve better standards of training by making maximum use of production facilities.

As far as part-time education is concerned the aim now is to improve the standards of training in general and to provide especially for the preparation of reasonably versatile specialists.

Possessing first-hand knowledge of production, senior students are released from work for a part of the school year during which time they devote themselves to theory, research and designing technique.

Visual aids like films, radio and television are made increasingly available to evening and to correspondence students. More funds are allotted for part-time education and better teachers are provided. Much attention is given to supplying worker-students with up-to-date textbooks, study aids and lecture courses.

Centralized textbook printing in the Soviet Union permits the publication of many new textbooks and other materials every year. Whereas 328 different books of this kind were published in 1955, the number increased to some 800 in 1966 and more than 4,000 different new books have been published in the past four years.

Far from being regarded as the worker's private affair, part-time education is considered to be a very important matter for society. For this reason working students are given every facility for pursuing their studies. They are entitled to annual supplementary paid leaves granted for the time of the laboratory and examination sessions. Part-time students who go over to full-time education receive government grants. Factory and office libraries buy

textbooks for employees taking university courses so that they will not have to pay for them.

It should be noted that at the present stage of social development the higher school can no longer confine itself to specialist training. Today it includes the refresher system, which, in Soviet society, becomes more than a measure to further technological progress: it also helps solve certain social tasks and tie in theory more closely with practice.

Colleges maintain regular contact with the former graduates which helps bring their research programmes more in line with production needs and at the same time to promote the intellectual standards of a section of the working people.

All these developments are conducive to the growth of Soviet intelligentsia.

Education Process

ADMISSION AND SCHOLARSHIPS

Before describing the present system of tuition at Soviet colleges and universities, we shall briefly consider the procedure of admission to colleges, since the level of candidates largely determines the success of the college work.

Rules of Admission to colleges are endorsed every year by the Ministry of Higher and Specialized Secondary Education of the USSR.

Any citizen under 35 can be admitted provided he or she has passed competitive entrance examinations conducted by college commissions composed

of professors and teachers and based on the secondary school syllabus. The aim of the examiners is to see whether the candidate has learned enough at school to cope with the college curriculum and eventually become a competent specialist.

The system of competitive examinations makes it possible to select the more capable, well prepared applicants. The marks received at school are also taken into account.

Enrolment is as follows: if a university or college is to admit 1,000 new students and there are 4,000 applicants—3,000 of them secondary school leavers and 1,000 workers or those who have just served their term in the Army—the Rector shall divide the places in proportion to each category, that is 750 places will go to school leavers and 250 places to the others. In this way 3,000 school leavers will vie for 750 places and 1,000 workers and demobilized servicemen will compete for 250 places.

There are separate competitive examinations for school leavers and production workers, ensuring equal conditions for both categories of applicants. This system is democratic and just as it ensures equal opportunities for all whether they go to college right from school or after the lapse of several years spent in service. Workers recommended officially by their enterprises also have to pass the examinations, just like the others, but in the event of equal marks they are given preference.

Colleges give special courses to prepare entrants for the examinations. Such courses are also organized at enterprises, offices and collective and state farms.

Young people who fail to pass the examinations are employed in industry and agriculture. Many of them go to evening or correspondence colleges or

prepare to try again the following year to enter a day college.

Evening and correspondence colleges or departments are intended primarily for those who already have a good practical knowledge of their future speciality: part-time education is regarded, in effect, as a kind of upgrading. Therefore the rules of admission, especially for technical and agricultural colleges, are such as to give preference to those who will be able to use the knowledge gained in their work.

Privileges are also granted to gold or silver medallists from secondary schools or honour graduates of specialized secondary schools. They have only to pass one major exam and if they score "excellent" they are considered on par with those who obtained "excellent" in all the exams. But if they fail to answer everything perfectly in the exam they must try the other exams. Under this scheme recognition of merit does not prevent a thorough check of the candidates' readiness to cope with college programme.

The number of entrance examinations is limited and they vary, depending on the kind of college and intended profession. In general, at most there are three major subjects exams to be passed.

Young men drafted into the services while at college are reinstated upon discharge in the same year and department during the first semester (first year included) without any additional examination.

It is worth noting that local public, trade union and youth organizations as well as managers of industrial and agricultural enterprises play an increasing role in organizing college recruitment campaigns, which thus become a social function. On the other hand, industrial enterprises, state farms and research centres become a factor in training

and education by sending their workers to study at colleges, paying them grants for the duration of the course and supervising their progress.

The rules ensure admission to colleges of young people who are both capable and well versed in the principles of science and to some extent prepared for practical work. This follows from the very nature of the process of education, which combines higher learning with science and production and implies ever wider contacts between colleges and the constructive endeavour of society as a whole.

Any Soviet citizen (or foreign citizen residing in the Soviet Union) can apply for admission to a college. Workers, collective farmers, professionals, artisans—all strata—are represented at colleges. For example, 55-56 per cent of the students of Tashkent University, one of the largest in the Soviet Union, come from workers' or peasants' families. In specialized colleges of applied sciences the proportion reaches 60-65 per cent while it is still higher at agricultural and other special colleges. Most students are between the ages of 17 and 24 while a small percentage at 25-26, the average age of graduates being 22-24.

Today the overwhelming majority of those working in higher education in all countries believe that any capable person should have the possibility of obtaining a college education. Nevertheless the accessibility of higher education for the people is still a matter of speculation.

Accessibility of higher education in the USSR is ensured by a series of government measures. Institutions of higher education develop successfully when they can draw on the mass of talented people who have the necessary educational background. This possibility is provided by universal eight-year education and will be further enhanced by the in-

troduction of compulsory full secondary school education to be effected by 1970.

The Soviet system of public education has no "dead-end" schools, all stages of the educational system are coordinated. The certificate of any kind of secondary school makes the holder eligible for admission to any kind of college. About 2.6 million finished secondary school in 1966 and nearly 900 thousand, or roughly a third, were enrolled at colleges.

One is admitted to college solely on the strength of one's personal ability. The most capable, the best prepared are enrolled. As previously mentioned there are no restrictions because of nationality, social position or any other reason.

The higher education is accessible because it is free. Students pay no fees for lectures, laboratories, practical work, examinations or the use of the library. They have the free use of textbooks, study aids and literature of all kinds. The same goes for sports facilities and gear. Student canteens and hostels operate below cost, part of the expense being borne by the college. Most students (75 per cent) get outright government grants. Aside from that, college rectors are able to provide material assistance for needy students out of especially allotted funds.

Students enjoy free medical service and many of them go to sanatoria, rest homes and tourist and sports camps for summer and winter vacations. A proportion of the accommodations are provided by trade union and health bodies.

The expenses, which are considerable, are paid out of State revenue.

In a multinational country, language could have been a formidable obstacle to higher education as indeed it was in the tsarist times when Russian

was the sole language in which teaching was conducted at universities, obviously to keep out non-Russians. Today, however, universities and colleges in the national Republics of the Soviet Union conduct their courses in the native languages.

Last but not least, the accessibility of higher education is ensured by the existence of a developed system of part-time education made up of numerous evening and correspondence colleges.

FORMS AND METHODS OF COLLEGE TRAINING

Besides providing specialized training it is up to the colleges and universities to continue the education received at the preceding stages and impart broad, sound knowledge.

The rapidly increasing volume of information concerning the laws of nature and society and the great advances in science and technology make it imperative to keep improving the courses themselves and to perfect teaching methods. True, it is possible to determine adequate periods of training for each profession regardless of the pace of scientific and technological progress. But the college should not be considered the final stage of education after which one can sit back and feel he has learned all he needs to know. The higher school endeavours to impress on the student that though it moulds his scientific world outlook, gives him the necessary professional skills and equips him for independent creative work, he must be prepared to learn as long as he lives.

It calls for a scientific approach in defining the range of subjects to be included in the curricula and selecting the material for the courses, which should stimulate the process of learning and en-

courage the students to do independent work. In other words, it requires a scientific definition of the content of education.

Courses are continually gone over to bring them in line with the latest achievements of science, technology and culture while students are encouraged to work independently and broaden their knowledge as prompted by their individual inclinations and developing interest. In other words, education is individualized as far as it is feasible and advisable.

Colleges give specialists a good general background. Accordingly, differentiation does not begin until after the first two or three years which are commonly devoted to the study of general theoretical subjects. The syllabuses are drafted with an eye to points of continuity in the different specialties whereby general theoretical subjects of common scientific interest to the entire profession may be continued through the senior years thereby extending the horizons and scientific interests of the students.

Theoretical studies are pursued by means of lectures, laboratory work and seminars, which are always part of the timetable whatever the speciality. They vary in extent depending mainly on what the student is going in for. Of 5,200 academic hours reserved for physics at Moscow University, for example, 2,100 consist of lectures, about 1,700, of lab work, and about 1,400, of practical work and seminars. The complete course of the Mechanics and Mathematics Department includes about 2,400 academic hours of lectures in various branches of mathematics, physics and the humanities while laboratory and practical work take up more than 1,600 academic hours.

Those going in for the humanities spend 50 to

60 per cent of the time at lectures. At technical and agricultural colleges lectures take up 35 to 50 per cent of the teaching time.

In a number of courses taught at technical colleges the student must complete a stipulated project as a first test of professional ability. The extent and nature of the work depend on the subject and are determined by the chairs concerned.

Course projects are prepared by the student independently. When consulted, the teacher is careful to give advice so as not to stunt the student's initiative by supplying cut and dried answers or letting him blindly follow the beaten path. On the contrary, the teacher will encourage and support every indication of a pioneering attitude as indispensable to a future specialist.

Students of the humanities prepare course papers in their major subject on one of the topics listed by the chair as work for the term or the year.

Seminars in the liberal arts are conducted as friendly discussions of various problems of interest as well as students' papers. The marks depend on the student's knowledge and ability to apply this knowledge independently to practical problems.

Studies in the arts are, to a great extent, of an individual nature. The main form of study at the Literary Institute, for example, is seminars at which the students analyze Russian and world classics and discuss their own work.

Besides compulsory subjects, colleges and universities also offer various special courses to be taken by students at their discretion, and optional subjects. This system serves to satisfy the students' individual interests and broaden their horizons by introducing them to fresh fields of knowledge.

Curricula are periodically revised to impart knowledge on important new developments in

theoretical and applied research in addition to fundamental knowledge.

The patterns of study, order of succession and correlation of subjects are all stipulated in the syllabus. It is usually comprised of 30 to 40 subjects, that come under three main headings—socio-economic, general theoretical and professional. In some technical colleges a general engineering cycle, of considerable importance for the would-be engineer, is also included.

Let us consider the curricula in some natural science and engineering courses.

For the first three or three and a half years general theoretical subjects are studied to obtain a basis for further studies in the relevant branch of science and technology. At this first stage chemistry departments and colleges offer courses in inorganic, organic, physical, colloid and analytical chemistry, mathematics and physics and later, when the student decides on his speciality, he studies high-molecular substances, radiochemistry, chemistry of proteins, etc.

To ensure the training of versatile specialists the syllabus reserves considerable teaching time for general technological subjects. In a technical college, up to 40 per cent of the teaching time is reserved for general theory; 25-40 per cent for general technology; 20-25 per cent for special subjects; 7 per cent for socio-economic subjects; and up to 3 per cent for sports. In some colleges (e.g., construction engineering) special subjects take up about 40 per cent of the entire teaching time.

The curriculum for radio engineers designates 390 academic hours for social sciences (history of the CPSU, political economy, philosophy, scientific Communism), made up of 200 hours of lectures and 190 hours of seminars. General theoretical subjects

like higher mathematics, physics, chemistry, theoretical mechanics, applied mechanics, descriptive geometry, technical drawing, electrical engineering, etc., occupy over 2,500 academic hours; 1,100 hours of lectures and the rest for laboratory and practical work and course projects and papers). Special studies (thermionic instruments, electrical and radio materials, radio device power supply, pulse technique, radio receiving units, etc.) take up 1,600 hours, including about 940 hours of lectures and about 670 hours of laboratory and practical work and course papers.

To complete the course, the student takes final examinations or presents a diploma project, depending on the type of college. From 16 to 20 weeks are allotted for this.

Topics suggested for diploma projects are sufficiently varied. As a rule the student is asked to design some complex unit like a diesel locomotive, an automobile, an airplane, a factory or a factory shop, mine or power plant.

In some specialities (such as those taught at universities) a diploma paper represents independent research done by the student. At technical colleges, however, preference is given to engineering designs.

Diploma projects are prepared by students independently, their supervisers—college teachers or, more often, specialists engaged in industry—act as consultants only.

On occasion experimental research may be accepted in place of a design.

Graduation designs and papers are presented to a State Examining Commission which includes representatives of the industries concerned.

Though diploma theses are regarded primarily as part of the student's training, they bear directly on current problems of industry, transport, con-

struction, communications, etc. As often as not they are put to use and prove to be well worthwhile.

Scientifically based educational principles ensure high standards of teaching and stimulate the student's interest in research. There are, nevertheless, certain difficulties imposed by the rapidly growing volume of information and the consequent need to revamp and bring the curricula up to date without unduly protracting the course.

Soviet colleges and universities offer courses in 320 specialities which in total make up 27 groups.

Each of these groups has subdivisions providing instruction in more specialized subjects that appeal to the student's developing scientific interests.

Scientific and technological progress has meant an increase in the number of specialities. Those recently introduced at colleges include: cybernetics of electric systems, physical electronics, electrophysical engineering, industrial automation and mechanization, chemical cybernetics, economic cybernetics, mechanical processing of economic information, manufacture of nonwoven textiles, machinery and technology of manufacturing goods from polymer materials, etc.

The colleges stress the importance of practical training linked directly with production. The topics suggested for course and graduation projects have an increasing bearing on production problems involving the application of advanced scientific knowledge. It is essential for students to acquire certain practical skills and a working knowledge of production processes. Theory is closely tied in with practical training in all branches of higher education.

The merging of theory and practice is a fundamental characteristic of the Soviet higher school giving students a thorough grasp of the knowledge acquired.

Practical training at all colleges except those connected with seasonal branches of the economy has been shifted from junior to senior years beginning, as a rule, after the third year of study—at the most receptive stage of training.

Much has been done to improve practical training and much remains to be done in this regard.

The syllabuses and programmes of the technical colleges include subjects and whole sections pertaining to recent developments of science, technology and practice. The course of mathematics includes computer programming; new chapters have been added to the physics course and such important subjects as industrial electronics, semi-conductors, and atomic energy for peaceful purposes have been included. The chemistry course now includes the study of new synthetic and other chemical materials used in engineering. Automation and comprehensive mechanization of production occupy a prominent place in the training of engineers.

In recent years a decided effort has been made to give engineers, agricultural specialists, etc. a better knowledge of economics and production management. Engineering students now spend more time on the theory of probability, mathematical statistics, machine strength and durability, automation of production processes, a series of subjects on economics, etc. All this is directly tied in with finding the best ways of solving concrete production problems.

All chairs co-operate in determining the amount of economics needed to give the students a well-rounded background along with training in chosen speciality.

Improvement of the training process implies a search for new and more effective methods of teaching. In order to find the most efficient ways of

presenting the material the Soviet colleges make a profound psychological study of the teaching process to develop a relevant logical-mathematical theory. Many teaching machines have been designed in this connection.

Interesting research in this sphere is conducted by the Moscow Power Institute and the Kiev Institute of Construction Engineering where ingenious teaching and examining machines have been developed. At Moscow University they are doing research on the psychological and educational aspects of some problems of programmed teaching.

The use of new methods helps to individualize to some extent modern collective forms of training, ensures logical order, introduces the necessary factors for controlling the assimilation of material, provides favourable conditions for using various technical aids, which in the long run makes the teaching process more manageable and effective.

Colleges widely employ such technical aids as films, film strips, television and radio programmes, etc.

Technical aids are an important adjunct of part-time education. For those who study while keeping on with their jobs, technical aids serve to compensate to some extent for the lack of personal contact with the teacher, helping the student to understand the material.

Television has a great future in respect to education. It extends the walls of the college classroom permitting students anywhere to hear lectures by noted scientists and specialists. The programmes are compiled with the help of prominent educationists and specialists in teaching methods and include parts of films, animated cartoons, popular science films, demonstrations of experiments making use of the vast possibilities of presenting material that

modern television possesses. With the help of mobile TV units some colleges have direct transmissions from laboratories and research centres, from designing offices conducting some experiment, from factory shops, etc.

Television is becoming an indispensable part of teaching. A force of TV lecturers is forming rapidly: the students become accustomed to TV lectures, find them very convenient.

At present classrooms and lecture rooms especially are being fitted out with film projectors, closed-circuit television and other technical facilities.

The aim is to train versatile specialists with a truly scientific approach. This is the guiding spirit of the entire process of instruction and education at Soviet colleges, which is so arranged as to enable the students to master the principal laws of the development of nature and society, to interpret and employ them correctly.

On the one hand, there is a definite minimum expected of a prospective graduate: he must cover a stated range of subjects included in the syllabus; his knowledge of the subjects he is majoring in must be up to the programme requirements or he will not be passed. On the other hand, the professors and teachers do everything to encourage young talent to continue to develop and not be content with the required minimum.

The proper balance between a broad scientific background and profound knowledge of one's speciality has always been the concern of the higher school. The importance of this problem lies in the fact that while modern industries have branched out in different directions each nevertheless requires knowledge in several sciences. The use of the electronic computer technique in engineering and radio-

active radiation in the antibiotics industry are cases in point.

Knowing more and more about less and less is not what makes a first-rate specialist. As broad social issues impgine upon the natural sciences and technology, a specialist who is not well versed in the history, structure and laws of development of society is in no position to take responsible decisions. To prevent this state of affairs Soviet colleges offer courses in economics, philosophy and some historical subjects and—more recently—optional courses in ethics, aesthetics and scientific atheism. This gives the student an opportunity to widen his mental horizons and prevents one-sided development. A broad liberal arts education stimulates the quest for comprehensive knowledge regardless of the student's speciality.

The proportion of teaching time spent on the humanities in engineering colleges has already been mentioned. Chemistry, biology, geology, physics and mathematics institutes spend 12 to 15 per cent of the teaching time on this.

Conversely, much attention is given to scientific education of those going in for the humanities. For just as engineers and natural scientists must have a good grasp of the social sciences so must those studying the liberal arts be conversant with what is happening in science. The impact of the natural sciences on everyday life is so great, they have become an important social factor.

Another important consideration is that a number of Soviet philosophers, economists, lawyers, historians, etc. have become statesmen, executives or public leaders. As such, they require an understanding of science and technology since it affects every sphere of activity. Certainly the significance of the natural sciences varies insofar as the liberal profes-

sions are concerned. Economics, for example, has more to do with nature than law, etc. Therefore the share of the natural sciences in the syllabuses of different liberal arts colleges varies. Let us consider what proportion of the curriculum for those taking liberal arts course at Moscow University concerns the natural sciences. The Law Department and the Department of Journalism have a course in formal logic with elements of mathematical logic. The section of theoretical and applied linguistics of the Philological Department has a course on the principles of higher mathematics. Mathematics and cybernetics are important for those studing economics, especially with regard to econometrics. The courses include higher mathematics (analysis and algebra), operations theory (linear programming), theory of probability, and theoretical statistics and take up about 30 per cent of the total teaching time.

In the political economy section students are offered courses in higher mathematics, theoretical statistics and a course of mathematics for economic calculations and planning (up to 10 per cent of the total teaching time).

The Philosophy Department offers a wide range of natural science and mathematical subjects. The Department has three sections: philosophy, logic and psychology.

In the philosophy section, higher mathematics, physics, chemistry, biology and physiology of higher nervous activity are compulsory subjects taking up some 14 per cent of the total teaching time.

The logic section offers a course in higher mathematics and the main course of mathematical logic (up to 60 per cent of total teaching time); besides, there is an optional course of mathematical logic for approximately 400 academic hours.

The psychology section has the greatest number of courses in the natural sciences and mathematics. They are seven: higher mathematics, the fundamentals of biology, human physiology, anatomy and evolution of the nervous system, the physiology of higher nervous activity, neurological principles of psychology and anthropology. Related to them is the course on using mathematical methods in psychology, consisting of certain aspects of the theory of probability and theory of information. Over 20 per cent of the total teaching time is spent on these subjects.

The patterns are similar at other universities and corresponding colleges.

To complete the description we must mention the immediate targets of the higher schools as defined by the 23rd CPSU Congress and the Government and Party resolution of September 3, 1966. The major conditions for improving the process of higher education are scientifically grounded planning, rational employment of students' and teachers' time, better teaching methods and more technical aids.

Extracurricular activities have their place in college education. They consist of varied social activities and club work.

Many colleges set up young lecturers' schools, social workers' departments, debating societies, professional clubs, "interesting meeting" clubs, interest groups, etc. Thousands of undergraduates give lectures and talks on scientific and social topics at factories, building sites, state and collective farms. In the past four years students of the Plekhanov Institute of the Economy in Moscow delivered 3,500 public lectures on various topics.

Choirs, music, literary and drama groups, music appreciation evenings, films, readings and poetry recitations, group excursions to museums and art

shows—this has all become part of college life.

Amateur art activities are an indispensable component of Soviet cultural life. Together with the professional stage it is an excellent means of aesthetic education. Recent years have seen the emergence of numerous student amateur theatres, universities of culture, symphony orchestras, choirs, opera and ballet groups, many of them on a professional level.

The amateur art groups of Tartu University, the Kiev and Tbilisi Polytechnical Institutes, the Moscow Power Institute, the Moscow Institutes of Chemical Engineering, Physical Engineering, Aviation and others are very popular. The Moscow Textile Institute has a student Club of Interesting Meetings and Discussions. Educational concerts are well liked by students.

Moscow University has 15 amateur art groups, the student opera theatre, drama theatre which has staged several serious performances. The film and art studios have won prises at Moscow and all-Union shows. The ballroom and modern dance group has a big attendance.

Every year Moscow University's amateur art groups give more than a hundred concerts for students and other audiences, including guest performances in other towns. Visits to the virgin lands and important newly-constructed projects in the Far East, Siberia and the Urals have become traditional. All this helps the student's ideological education.

Films also play an important part in aesthetic education. The University cinema and the Film Fans Club with hundreds of members organize daily film shows, periodical film festivals, show films in foreign languages, films on classical literary subjects, arrange for discussions of newly released fea-

ture films to mention just a few items on their extensive programmes.

These varied systematic activities are of indisputable educational significance, nurturing in students a sense of the beautiful, making them true exponents of advanced culture.

Scientific Work at Colleges

Science and education go together. The higher school has an immense scientific potential. It has over 260 thousand professors and teachers including about 8 thousand Ph. D.'s and about 80 thousand Masters of Science (33 per cent of the country's scientists, over 50 per cent of Ph.D.'s, and 50 per cent of those with an M.A. or M.Sc. degree).

Most of them combine teaching with research. To this should be added 54 thousand postgraduates and hundreds of thousands of senior students doing research under the supervision of their professors and teachers.

The development of research at colleges is equally significant for raising the standards of training and improving the qualifications of teachers, and for solving pressing scientific and technological problems.

Besides being equipped to meet the demands of modern production, science, technology and culture, a Soviet college graduate should also be well aware of the prospects for their development, he must be a creative specialist realizing the aims of his chosen profession and skilled in contemporary methods of research.

All students are expected to develop scientific

skills. This means that their teachers are in the first place researchers able to tie in science with the teaching process.

The Russian, and then Soviet, higher school has always had many noted scientists who were able researchers and brilliant teachers at the same time. Lomonosov, Mendeleyev, Timiryazev, Zhukovsky and Popov, are just a few of the many illustrious names.

College faculty members have constantly contributed to the progress of science and technology. The colleges are proud of their rich traditions of theoretical research. They are the seats of internationally renowned scientific schools in mathematics, mechanics, astronomy, physics, chemistry, biology and many branches of engineering. Such scientific centres as Moscow, Leningrad, Kazan and Tomsk Universities, the Bauman Higher Technical School in Moscow, the Moscow Power Institute, the Leningrad, Urals, Kiev and Kharkov Polytechnic Institutes, the First Moscow Medical Institute, the Timiryazev Agricultural Academy (Moscow), are highly reputed as carriers of progress.

Scientists of Moscow, Leningrad, Tartu and other Soviet Universities have a series of significant discoveries in physics to their credit. The discovery of the outer radiation belt of the Earth, new data on cosmic physics, radio astronomy, space physics and planetary astronomy, the solution of the reverse Galois problem, the development of the "secondary quantization" technique are just a few.

College scientists have synthesized superstrong, antimicrobial, chemically stable, non-inflammable, non-crushable fibres. They have developed essentially new methods of obtaining certain materials which combine the properties of glass with the durability of metals. The development of synthetic

acids has saved thousands of tons of edibles for direct consumption.

There are numerous examples of colleges that do not stop solving important scientific problems but carry them on to the blueprint stage, ready for use in industry.

Even if we disregard the far-reaching educational value of college research, it still stands to reason that this great force of highly competent experts should be provided with every facility for fruitful endeavour.

Work conducted by colleges is a major component of state research and development plans. At the Moscow Higher Technical School and some other colleges they are successfully working on new gas turbine and steam-and-gas units for thermal power plants; new-type power plant, power transmission facilities, automatic control devices, etc., are being developed at a number of power engineering and polytechnic institutes, etc.

A growing proportion of research and development work is done under contract for enterprises. The colleges are doing eight times as much industrial research as a decade ago.

Colleges do a great deal of work on long-term, comprehensive and inter-industry development. Under the state economic plan, in 1966, colleges were to do applied research on 500 major problems in natural science.

Extensive contacts between colleges and enterprises help improve higher education and promote the role of science in production. They most definitely enhance the influence of the higher school on society's development and help raise the cultural and technological standards of the people.

In view of the high level of contemporary science, joint research is often necessary. A number of

Soviet colleges are participating in joint projects. For example, the Novosibirsk colleges co-operate with the corresponding research centres of the Siberian Branch of the USSR Academy of Sciences. In Kuibyshev colleges have established close ties with enterprises and with their help have set up laboratories for research on problems pertaining to certain industries.

In recent years colleges have begun to develop research centres, designing bureaus and laboratories for theoretical and applied research on automation problems.

A specialized laboratory of the Ordzhonikidze Institute of Engineering Economics (Moscow) developed an electronic computer efficiency control system in a period of five years. Employed at some Moscow enterprises now, the system has meant a saving of 150 million roubles whereas it only cost 1,850 thousand roubles to maintain the laboratory.

Though research centres, laboratories and designing offices are fairly new they have proved to be very worthwhile. The larger colleges now constitute a combination of educational institutions and scientific centres which handle major problems. Many of the laboratories undertake highly responsible jobs for industry, and carry on fundamental theoretical research, in which members of different departments co-operate. Some of these laboratories have become leading coordination centres in their respective fields.

Working in the laboratory students and postgraduates gain invaluable practical experience and develop more quickly into competent researchers. In the 1966-67 academic year about 500 thousand students have been taking part in research conducted by their colleges.

Students develop a taste for independent study

by joining one of the Student Scientific Societies which organize research, excursions and expeditions, take part in conference, competitions, shows, etc. It is only one manifestation of the change taking place at colleges in connection with the Soviet economic reform.

This year (1967) there are 41 research centres and 320 development laboratories attached to colleges, mainly to universities. They carry on important large-scale research. Many of them have already developed into big research organizations.

Of great interest are research institutes functioning on a voluntary basis. As seen from the experience of the Moscow Bauman Higher Technical School, the Leningrad and Tomsk Polytechnics and other colleges, they are highly efficient. Apart from that, there are over 200 specialized research and development laboratories maintained by enterprises. Such laboratories are beacons of science, as it were, as far as enterprises are concerned.

Growing number of factory engineers, technicians and workers are taking part in their activities and the extension of such laboratories will provide even better opportunities for technological progress.

The laboratory at the Kuibyshev Bearing Plant is a convincing enough example. Working together a group of faculty members of the Kuibyshev Politechnic Institute and some engineers, technicians and workers of the plant developed a series of ingenious appliances for speed cutting alloy steel and machining hard-allow tools. These appliances—now used by the plant—have proved very effective.

In one year the specialized laboratories of the Kuibyshev Aivation Institute worked on 34 problems for the industry which meant a profit of 4.5 million roubles, considerably more than the cost of setting up the laboratories themselves.

Student designing bureaus do work for enterprises, which is another way of combining education with practice. There are over 250 such bureaus in Soviet colleges. Needless to say the early introduction to practical activity is of great benefit to the student.

The colleges have an eye to the future, since one does not become a full-fledged specialist in the 4-5 years it takes to complete the course. It takes some 8-10 years for that. It is not so easy to foresee his requirements so far ahead in every detail. Nevertheless it is necessary to assess the tendencies of development indicated by the present state of science and technology and the rate of progress.

The discovery of new laws of the development of nature and society and the appearance of labour-saving automatic devices which also mean a saving in mental labour (especially that which is most time-consuming, exhausting and detracts from creative activities) means that more attention can be paid to the gist of physical, chemical and other phenomena. This tendency extends the specialist's horizons making him essentially a researcher, experimentalist and scientist. It enhances the role of industrial experimental technique and technological training.

Scientific work at colleges in which students participate provides the necessary creative atmosphere by bringing students and teachers closer together and helps to combine knowledge with skill. It may well be that such an atmosphere is the only way to do away with cramming.

Some colleges figure out individual plans of work on an advanced level for the more able students. Interesting in this respect is the experience of the Ulyanov (Lenin) Electrical Engineering Institute (Leningrad) in training research engineers. In such

cases the undergraduate presents a scientific diploma paper. On graduation he is employed by an enterprise to do fundamental research of some scope rather than deal with current production problems in the laboratory. The young engineer has the benefit of the assistance and supervision of his former chair at college.

Practical research is an obligatory part of the course. Students are given more leeway in deciding how to go about solving their problem and analyzing their results than they would otherwise have. It makes them self-reliant.

Student interest groups and designing bureaus often cope with responsible tasks. For example, a student group at the Moscow Power Institute (which later became the Institute Designing Bureau) successfully developed a series of cybernetic instruments and devices. The members' interest extended from some points of engineering to the subject at large, including the general, social and philosophical aspects of cybernetics.

Members of such groups are not content with learning by rote; they go to books for specific information and are inclined to check the data rather than take it for granted.

To promote student participation in research activities, an All-Union Council on Student Research and Design was set up. The resolution of the Party Central Committee and Government passed on September 3, 1966 recommended additional measures be taken to encourage active student participation in research. Members of these groups demonstrate their results at regular exhibitions.

Theoretical and applied research must be stepped up and concentrated on the more promising, most important trends in scientific and technological development in order to fulfil the tasks of the current Five-Year Economic Development Plan (1966-70)—to employ the latest know-how to carry out further industrialization, raise labour efficiency, extend production, intensify agriculture and sharply improve living standards.

This means colleges and universities will have to graduate far more scientists and research engineers.

In view of the changing relation between science and engineering the world "specialist" is coming to be used even now as a synonym of "creative" thinker, innovator, inventor. Prospects for the development of science and industry clearly indicate the need for stepping up and continuing to step up the number of such specialists. In time creative specialists will far exceed the number doing routine work. And before very long science will become one of the main aspects of human endeavour when, as Lenin said, it will become man's second nature, a part of his everyday life.

Teaching Staffs

There were little over 10,000 scientists in prerevolutionary Russia, 6,000 of them on the staff of universities and colleges. Women scientists were the rare exception.

After the revolution postgraduate courses were considerably enlarged and paid leaves and other privileges were granted to postgraduates and others working for advanced degrees.

At present the Soviet Union has 711 thousand scientists of which 263.2 thousand are higher school teachers and lecturers. More than a half of those with advanced degrees (there are 180,000 of them) teach or work at colleges. Women make up 38.4

per cent of all scientists and 32 per cent (43,000) of those with advanced degrees. More than a thousand Members, Corresponding Members of Academies of Sciences and professors and over 10,000 assistant-professors are women.

Especially noteworthy is the increase in the number of scientists in the national republics. In 1966 Kirghizia had eleven times as many scientists of different nationalities as in 1940 and there were twenty times as many Kirghizian scientists. Corresponding figures for other Union Republics are: Tajikistan 10 and 14; Turkmenia 5 and 10; Uzbekistan 3.3 and 8.3; and Kazakhstan 10.5 and 12.2.

Many are scientists with advanced degrees who hold the posts of professors, assistant-professors, senior or junior researchers. It is a matter of pride that a fair proportion of national scientific personnel are women, particularly when one remembers that before the revolution women in those parts were considered as inferior and had virtually no rights. In 1966 there were more than a thousand Uzbek women scientists; 1,200 Kazakh women scientists; about 200 Kirghiz women scientists; 190 Tajik and 150 Turkmen women scientists in the respective republics. (See Appendix 3.)

Of late college staffs have come to include more specialists in engineering, physics, mathematics, chemistry, biology and other major sciences that have a decided effect on technological progress whereas in 1950 there were 41.5 thousand teachers of technological subjects, 17.6 thousand of them working at colleges, by 1960 the figures had swelled to 130 and 35.3 thousand, and by 1966 to 300 thousand. The same is true of the natural and other sciences.

At the present level of industry and science there is as great a need for trained personnel to work

in industry, especially designers, as required by research centres and colleges. Consequently an all-out effort is being made to provide a steady supply of qualified personnel.

Postgraduate work at a college or research centre is one of ways of training scientists. Postgraduate students are usually recruited from among the more capable university and college graduates as well as graduate engineers interested in research.

During the three-year course postgraduates study some major subjects in their line, mathematics, philosophy and a foreign language. They brush up their knowledge of scientific theories, do some practice teaching and do research in their line. The course terminates with the presentation of a thesis Half of those obtaining M. Sc. degrees every year are postgraduates.

Laboratory assistants, demonstrators and junior researchers are given opportunities at their places of work (i. e., college chairs or research institutes) to prepare their theses and obtain advanced degrees.

In 1966 there were over 90 thousand postgraduates, 30 times as many as in 1930 and five times the 1940 figure. More than 53 thousand of them (59 per cent) were doing postgraduate work at colleges and more than 37 thousand (42 per cent) at research institutes. Part-time postgraduate education has been extended. In 1940 part-time postgraduate students made up 14 per cent of the total. By 1966 they accounted for 42 per cent of all postgraduates.

The scope of advanced work is necessitated by the growing need for scientists and college teachers. All in all, from 1945-66 meanly 150 thousand finished postgraduate courses—16.3 thousand in the first five years after the war (1946-50); 31.5 thousand from 1951-55; 34.6 thousand from 1956 to

1960; 60.2 thousand from 1961 to 1965 and 25 thousand in 1966.

Part-time postgraduates, as already mentioned, are recruited from young assistants, teachers and researchers holding jobs at colleges or research institutes; and also from practising engineers, economists, teachers, lawyers, agronomists, doctors and others.

Major colleges and scientific bodies also offer postgraduate courses for those recommended by various colleges, enterprises or Union Republic bodies. Under this system scores of highly qualified specialists have been prepared for the Union Republics.

Other opportunities include paid leaves granted to enable the postgraduates to complete their theses; exemption from teaching for a term of two years for those working for a doctorate, and so on. Of the first thousand who availed themselves of this opportunity, 627 have either presented their theses or are about to do so.

In the Soviet Union advanced degrees must be endorsed by the Higher Certifying Commission instituted in 1937. Since then the Commission has certified 17.2 thousand Ph.D.'s and 196.8 thousand M.A.'s and M.Sc.'s of which 15.5 and 176.4 respectively were awarded between 1945 and 1966.

The numerous papers are examined by especially authorized Academic Boards of 359 colleges and universities and 533 research bodies. Before endorsement, the theses are widely discussed by specialists and all interested parties. The 11 sections of the Higher Certifying Commission enlist the voluntary services of 408 noted scientists including 195 Members and Corresponding Members of Academies of Sciences. Aside from this, the Higher Certifying Commission can obtain the advice of any of the

1,400 eminent scientists who form (also on a voluntary basis) 70 commissions of experts in almost every branch of science.

The certification system is designed to provide the necessary conditions for creative development for those who are able. In place of a thesis one can submit one or more published papers of comparable value. The authors of major inventions are also eligible for advanced degrees. This extends the range of talented people going in for research beyond the academic circles.

The Higher Certifying Commission can—if solicited by Academic Councils of colleges—award the title of professor or assistant-professor to college teachers with distinguished records and published papers to their credit.

A dissertation on applied research must be reviewed by an authoritative enterprise in that field.

Though much has been achieved, the increasing demands on the college teachers and the scientists requires a constant improvement of their training. The September 1966 decision of the Central Committee of the CPSU and the Council of Ministers "On Measures for Improving the Training of Specialists and Perfecting the Guidance of Higher and Specialized Secondary Education in the USSR" stated that a permanent system of refresher courses should be set up to enable every specialist to take a refresher course at least once every five years. The system includes refresher colleges and departments for teachers of the social sciences, etc., periods of practical work at up-to-date enterprises, specialized colleges and research centres for those giving instruction in the sciences and technology and likewise varied courses and permanently functioning seminars.

Refresher education departments for teachers

have been started in 1967. Refresher colleges for social science lecturers have been set up at Leningrad, Rostov, Tashkent and the Urals Universities. Teachers' practical work at enterprises, colleges and research centres has also been organized.

Noted scientists and educators are invited to teach at refresher departments. Their students are acquainted with what is new in science, technology and culture and get to know about contemporary computational mathematics and computers, present-day problems of scientific labour organization, planning and management, psychology, education and physiology.

Permanent Higher Education Courses have been started this year by the USSR Academy of Education to enable university and teachers' college lecturers to brush up on educational subjects.

Seminars, conferences and symposia on various questions of science and methodology are being continued.

The main task of the Soviet higher school is to see to the training and further improvement of numerous scientific and technological personnel capable of dealing with the most intricate problems of science and technology.

International Contacts

The Soviet higher school seeks to establish broad international contacts.

Today about 400 Soviet universities and colleges are actively involved in the exchange of students and teaching staff. About 16 thousand professors and lecturers have visited more than 100 countries

for various terms to teach at local colleges, assist in training specialists, attend scientific conferences and study local experience.

There is extensive cooperation between colleges in the Soviet Union and other socialist countries, including exchange of papers, literature and experience, exchange visits of teachers, joint research and exchange of students, postgraduates and those obtaining practical experience. Every year about 1,500 representatives of the Soviet colleges visit the socialist countries. Return visits are also conducted on a considerable scale.

From 1945 on citizens of the socialist countries have been able to get an education in the USSR. In that time Soviet colleges have graduated over 27 thousand specialists. At present, over 11 thousand undergraduates or graduate students from these countries are either receiving an education or taking refresher courses in the Soviet Union.

There are regular student exchanges for periods of practical work. In 1967 about eight thousand Soviet students are to do their practical work in the socialist countries and vice versa.

Extensive ties are also maintained with the developing countries. Soviet aid to these countries is based on fraternal friendship, mutual benefit and humane reasons. The USSR regards this as an internationalist duty. The Soviet Union itself had to traverse the difficult path of liberation struggles; to defend her existence as a nation against the deadly peril of the nazi invasion. It required a colossal all-out effort to overcome economic and cultural backwardness and Soviet people know just what heroism in wartime and peacetime means.

That is why their sympathies are with national-liberation movement in Asia, Africa and Latin America; that is why they give these peoples moral

and material support in their struggle for social progress.

Soviet people are happy that the hard times of colonial oppression and national inequality are becoming a thing of the past. Every people and every race can contribute to overall progress, to the development of economy, culture and science.

Soviet co-opreation is effected in many ways. Major industrial projects constructed with the help of the Soviet Union are well known. The Aswan Dam and other masterpieces of advanced engineering and science are enduring monuments symbolizing the power of knowledge, skill and the fruits of peaceful co-operation among peoples.

Some of the finest colleges in the developing countries have been set up with the active participation of Soviet colleges. Of the 22 colleges built with Soviet aid many are already functioning (the Burma Technological College, the Bombay Technological College, the Polytechnic Institute in Guinea, the Oil and Gas College in Algeria, etc.). Many colleges abroad are using Soviet textbooks, syllabuses and other educational schemes. Some of them invite lecturers over from the Soviet Union.

To help Asian, African and Latin American countries solve the personnel problem, the Soviet universities and colleges welcome students from these countries. Today about 24 thousand citizens of 130 foreign countries, including over 11 thousand Asians, Africans and Latin Americans, are students at Soviet educational institutions.

In 1967 about 3.5 thousand foreign citizens completed their education in the Soviet Union and returned home as fully qualified specialists. Altogether more than 35 thousand graduate personnel, some of them with the highest qualifications, have received instruction at Soviet higher schools. Mos-

cow University became the alma mater of about 2,000 students from abroad, including more than 400 postgraduates who obtained their M.Sc. there. About 700 foreign students graduated from the Moscow Power Institute, more than 300 completed the course of the Moscow Institute of Railway Engineers. M.Sc. theses were successfully presented by some 60 UAR citizens and a large group of Indian, Iranians and others. Over 70 Somali medical specialists have completed their probationary work periods at home.

Many foreign graduates of Soviet colleges have now become top government officials, public figures, college heads and senior lecturers, industrial managers, etc.

Soviet universities and colleges have every reason to be proud of their graduates.

Exchanges in the sphere of science, culture and education are considered of great importance. Foreign citizens getting a college education in the Soviet Union are given every facility, including preliminary training in Russian. To make up for possible deficiencies in earlier education, individual consultation is provided besides regular classes. Over a thousand foreign students study Russian every year.

College libraries provide free textbooks and study aids of all kinds. Up-to-date equipment is made available for practical and laboratory work (also free of charge). Foreign students are welcome at student scientific societies and many of them do experimental research at different chair laboratories, read their papers at student society meetings and take part in student scientific conferences.

Courses are mapped out with an eye to the climatic, economic and other specific conditions of countries where the graduates will go to work.

In 1960, in response to numerous requests from Soviet and foreign public organizations and individual citizens the Soviet Government decided to set up a People's Friendship University in Moscow that would contribute to the training of national graduate personnel for the developing countries of Asia, Africa and Latin America. The idea was to enable young people to obtain a university education, particularly those from families of working people.

The idea and functions of the University are expressions of the brotherhood and friendship of peoples the world over, of confidence in the creative potential of Asians, Africans and Latin Americans, and of sympathy with their aspirations for economic and social progress.

The Government has allotted considerable funds to provide up-to-date equipment and accommodation. The University is now being extended.

Soviet universities and colleges helped staff the University and generally did a great deal to organize this first-rate institution in such a very short space of time.

Foreign visitors are invariably astonished to find that it only took a few years to form a strong competent faculty with a creditable record of scientific work and high teaching standards—and even with an educational tradition of its own. Quite plausibly, the University may be the prototype of international colleges of the future.

The University's present enrolment of foreign students is in excess of 3,000; nearly one thousand have already graduated. The guiding principle of the student community is mutual respect and its watchword is peace, democracy and social progress.

In recent years contacts between Soviet colleges and those of some advanced capitalist countries

have been stepped up. Today contacts are maintained with 18 countries, including Britain, France, Italy, the United States and Canada. Every year 350-400 Soviet college teachers are exchanged with foreign colleges, specialists are sent for practical training, foreign language teachers join courses abroad, Russian philologists teach Russian at foreign universities. Scientists attend international conferences abroad, or deliver lecture courses. Educators exchange teams studying each other's education systems. Every year 150-170 young scientists are sent to do practical work and research at more than a hundred major universities and colleges abroad.

Each year about 150 professors, assistant professors and researchers visit capitalist countries to take part in various congresses and symposia. Foreign scientists, in turn, attend international congresses of oceanographers, crystallographers, microbiologists, psychologists, mathematicians,and conferences on corrosion of metals and on cryogenics which were held in the Soviet Union in 1966.

Many Soviet scientists and college students are active members of international unions, conferences, meetings, symposia, etc. A number of them have been elected to the governing bodies of international scientific organizations, foreign Academies of Science, universities and scientific societies. In turn, some foreign scientists and prominent public figures have been made honorary professors and doctors of Moscow University.

Much literature is exchanged. The library of Moscow University, for example, exchanges books with 270 different scientific institutions in over 50 countries. Soviet college libraries have helped foreign colleges to build up book funds of their own. The libraries of Moscow, Leningrad, Central Asian

and other Soviet universities have presented books to universities in Afghanistan, India, Vietnam, Burma, Sudan and other countries.

These contacts serve to develop science and education for the benefit of the peoples and actively promote friendship, progress and co-operation for the sake of lasting world peace.

Conclusion

The Soviet colleges and universities, as seen from facts and figures, have made great progress.

But there is still much to be done in the immediate future for the construction of the material and technological basis of communism in the Soviet Union.

"To train highly qualified specialists with a broad theoretical and political viewpoint," is the task of the Soviet colleges, as stated in the Programme of the Communist Party of the Soviet Union.

It is in this direction that the Soviet higher school is now developing. Full secondary education for all children of school age—to be carried out by 1970—will provide a good knowledge of the principles of science and all-round training (technical, political,

aesthetic and physical) in keeping with the needs of society.

The Soviet schools can cope with the task. They have accumulated immense experience. They have educated several generations of builders of a new life, bold creative scientists, engineers, agronomists and others whose efforts have placed the Soviet Union at the head of the progressive forces of the world.

By 1970 Soviet colleges will have trained 2,700 thousand new specialists, and in 1980 there will be eight million undergraduates, about twice the 1967 figure. The standards of training will be raised and the students will have a good understanding of the laws of historic development to enable them to grasp all that human thought can offer.

The Soviet colleges see their task as ensuring for every member of society the possibility of enjoying both the spiritual as well as the material blessings.

There are tremendous prospects for the Soviet higher schools. The time is not far off when every person will have a specialized education even at the highest level. Clever machines will do away with arduous jobs; work will become a necessity and a pleasure. It will take man very little effort to procure the means of existence and he will be able to spend most of his time learning, going in for art and other intellectual pursuits.

All barriers to knowledge will fall away. All will be able to explore the secrets of nature and place nature at the service of man.

Appendix No. 1

Organizational Framework of the Higher School

ROLE OF MINISTRIES AND BOARDS IN GOVERNING THE HIGHER SCHOOLS

Many higher schools of the Soviet Union are managed and maintained by the Union Republics. Every republic has a Ministry or Committee in charge of colleges located on its territory. Besides universities they have jurisdiction over the following institutes: polytechnics, industrial colleges, power engineering, electrical engineering, radio engineering, physical engineering, machine-building, instrument-making, shipbuilding, aviation, polygraphy, machine-tool, mechanical, geological, peat-industry, chemical engineering, food, fish, textiles, construction engineering, geodesy, economics, law, architectural colleges and colleges related to industry.

Some colleges come under specific Ministries, viz., trasport colleges are under the USSR Ministry

of Transport; communications colleges are under the USSR Ministry of Communications; agricultural and forestry colleges under the Republican Ministries of Agriculture, medical colleges and teachers training colleges (the latter with the exception of the Byelorussian SSR where they are under the Ministry of Higher, Specialized Secondary and Vocational Education) are under relevant Republican Ministries; art colleges are under the Ministry of Culture, and trade colleges under the Ministry of Trade.

Union Republican and all-Union bodies supervise all aspects of college administration—viz., finance, enrolment, teaching and research, allocation of jobs, postgraduate courses, etc. The independence of Union Republics in this respect enables the higher school to become a school of the nationality of the republic.

The work of the colleges is co-ordinated on a national scale by the USSR Ministry of Higher and Specialized Secondary Education which sees that scientific and educational standards are maintained and also is directly responsible for 29 major colleges.

The main functions of the Ministry are: to elaborate and endorse syllabuses; to plan the publication of textbooks and other college aids for students and teachers; to approve textbooks for publication; to plan and co-ordinate college research; to co-operate with the Gosplan (State Planning Committee) in drafting current and long-term plans for the development of university education (enrolment, graduation, training of scientists); to organize exchanges with foreign countries, etc.

It must be noted that the status of a college may change depending on developments in industry, science or culture in the best interest of the public.

INTERNAL ADMINISTRATION

In governing the colleges one-man authority is combined with collective leadership.

A College is managed by a *Rector* who has three assistants, in charge of the studies, scientific work and maintenance. The *Rector* presides over the *Academic Council* which is composed of study and research directors (assistants to the Head), the Deans, department heads, some of the teachers, representatives of the social bodies of the college and also representatives of enterprises, institutions and organizations in the same line.

Academic Councils consider current developments concerning programmes and teaching methods, sum up the experience of the different chairs, departments and the entire college, decide on promotions and conferring the title of assistant professor and professor on staff members. Some of the larger colleges are authorized to confer Ph.D. and M.Sc. degrees (subject to endorsement by the Higher Certifying Commission).

The Rector approves the plan of scientific work which embraces general theoretical problems and pressing problems pertaining to technological progress in industry and other branches of the economy and sees that the results of the research are made available to industry.

Colleges publish scientific papers of work done by the staff, lecture courses, practical and laboratory hand books, problems books, teaching method guides and aids, summaries, popular brochures, etc.

A Department my offer courses in one or in several related professions. It is headed by a Dean, who is elected by professors conducting courses in the major subjects taught at the department. The Dean supervises the work of the chairs with respect

to teaching and research. It is up to him to see that the syllabus and programmes are carried out. He organizes the teaching and education process, sees to the timetable, is responsible for discipline and makes arrangements for the students' practical work.

Major colleges have Department Councils presided over by the Deans. Some of them are entitled to have dissertations presented to them.

The Chair is the primary unit of the college. It conducts work in teaching, method development and scientific research with respect to one or several related subjects.

The Head of the Chair must be a professor. He supervises the work of the laboratories and study rooms, delivers lectures in the main courses, advises the professors, assistant professors and teachers on their work, checks on the quality of their lectures, seminars, etc. and supervises student work, postgraduate progress and sees that members of the chair improve their qualifications.

Aside from professors, assistant professors, teachers and junior teachers a chair has ancillary personnel (lab and study-room attendants, etc.).

When the post of Head or Professor of a Chair is vacant it is filled by one of the professors or Ph.D.'s who applies for the post. Assistant professors are similarly elected by Department or College Councils from among docents or M.A.'s of M.Sc.'s.

During the year, a chair has to pursue a plan endorsed by the Rector of the college. The plan includes the work to be done in teaching, research and improving teaching technique, compilation of new textbooks and study aids, supervision of student societies, and guidance of postgraduates. Much attention is paid to having teachers and professors improve their scientific qualifications.

Chair meetings, held once or twice a month, discuss how studies are progressing, hear papers on scientific topics and teaching methods, discuss the results of research conducted by chair members, review manuscripts of textbooks, consider the detailed plans of lectures to be delivered on more important aspects of the course. Improvement of laboratory and study-room service may also come under consideration. The chair meeting has to approve the plans of postgraduate students and hear their reports on the work done.

As often as not chair meetings are addressed by chief engineers and technologists of major enterprises in a related sphere, or heads of factory laboratories, or, as the case may be, by agronomists from state and collective farms or agricultural experimental stations, etc. Sometimes the talk will be given by an innovator sharing his practical experience with the teachers (and on occasion with students, too).

In turn professors and teachers help out at enterprises. They take part in research and development conducted at the factory, lend a hand in, or completely supervise, the developing of new production processes, new machine and instrument designs, etc.

Industrial economics colleges take an active part in the improvement of production on the basis of the most recent know-how, in finding ways to cut costs in manufacture and construction, in the exploration and exploitation of the natural wealth of the economic region where the college is situated, etc.

This permits active cooperation between chairs and enterprises. This cooperation between scientists and production workers has greatly expanded since the war.

Every institution of higher education has various public organizations uniting students, professors, teachers and other personnel.

Appendix No. 2

In 1967 Soviet colleges will graduate a minimum of 230.000 specialists trained at evening or correspondence colleges and departments.

After the war the number of part-time students in the eastern regions of the USSR, Central Asian Republics and other Union Republics increased considerably.

Many consultation points have been opened in the Republics by central Correspondence Colleges.

Graduates of Evening and Correspondence Colleges
(thousands)

Year	Evening	Corresp.
1940	4.4	22.4
1950	1.8	27.7
1957	7.2	67.6
1960	15.4	99.2
1966	56.0	146.7

Part-time College Students
(thousands)

	1940/41	1950/51	1956/57	1966/67
Total (USSR East)	29.5	84.4	161.9	600.0
Including:				
Uzbek SSR	3.0	11.4	26.8	108.6
Kazakh SSR	3.5	11.2	24.6	85.2
Kirghiz SSR	1.1	3.9	6.0	18.9
Tajik SSR	1.0	3.2	7.1	18.4
Turkmen SSR	1.2	3.0	5.4	9.9

Appendix No. 3

Researchers and University Teachers
(thousands)

	1940	1950	1958	1960	1964	1965	Jan. 1, 1967
National total	98.3	162.5	284.0	354.2	612.0	664.4	711.5
Including:							
college teachers	61.4	86.5	135.7	146.9	206.3	221.8	263.2
researchers	26.4	70.5	141.0	200.1	356.7	390.4	395.9

Those Having Advanced Degrees and Titles
(thousands)

	1950	1958	1960	1964	1965	Jan. 1, 1967
Total	162.5	284.0	354.2	612.0	664.6	711.5
Ph.D.'s	8.3	10.3	10.9	13.7	14.8	16.6
M.Sc.'s	45.5	90.0	98.3	123.9	134.4	152.3
Member or Corresponding Member of the Academy or Professor	8.9	9.6	9.9	12.0	12.5	13.5
Assistant Professor	21.8	32.7	36.2	46.0	48.6	52.7
Senior Researcher	11.4	17.2	20.3	27.2	28.7	30.2
Junior Researcher or Assistant Lecturer	19.6	23.6	26.7	48.2	48.9	47.5

Distribution of Scientists and Researchers Among the Union Republics

	1940	1950	1960	Jan. 1, 1967		
				Total	Ph.D.'s	M.Sc.'s
USSR	98,315	162,508	354,158	711,552	16,591	152,272
RSFSR	61,872	111,699	242,872	488,364	11,584	100,305
Ukrainian SSR	19,304	22,363	46,657	98,410	2,138	21,796
Byelorussian SSR	2,227	2,629	6,840	16,168	301	3,600
Uzbek SSR	3,024	4,541	10,329	17,827	344	4,383
Kazakh SSR	1,727	3,305	9,623	20,325	253	3,880
Georgian SSR	3,513	4,843	9,137	14,988	708	4,455
Azerbaijan SSR	1,933	3,364	7,226	14,068	418	3,592
Lithuanian SSR	633	1,402	3,320	6,541	82	1,466
Moldavian SSR	180	745	1,999	4,420	75	1,115
Latvian SSR	1,128	2,184	3,348	6,651	93	1,505
Kirghiz SSR	323	841	2,315	4,151	85	1,026
Tajik SSR	353	715	2,154	3,853	60	868
Armenian SSR	1,067	2,000	4,275	9,112	309	2,347
Turkmen SSR	487	656	1,836	2,940	44	713
Estonian SSR	544	1,221	2,227	3,734	88	1,112