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4(6)
1971

USSR ACADEMY OF SCIENCES

S. HARRISON

№ 4(6)

October, November, December 1971

SOCIAL SCIENCES

USSR ACADEMY OF SCIENCES

DEPARTMENT OF SOCIAL SCIENCES, PRESIDIUM OF THE USSR ACADEMY OF SCIENCES

Published Quarterly in English, French and Spanish

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V/O "Mezhdunarodnaya Kniga", G-200, Moscow, USSR

"Social Sciences" Editorial Office, 33/12 Arbat, Moscow, USSR

To the Reader

This issue of *Social Sciences* opens with an article by M. Keldysh, President of the USSR Academy of Sciences, about the tasks facing Soviet scientists in the light of the decisions of the 24th CPSU Congress, which ushers in a new important stage in the Soviet people's advance to communism. The role of science in modern society is extremely important, Academician Keldysh stresses, and the multiform complex of problems, ranging from the formation of a world outlook to the fundamentals of material production, rests on the whole system of social and natural sciences. In this connection, as the 24th Party Congress noted, a very important task is to promote in every possibile way cooperation between the natural, technical and social sciences.

Present-day science advances complex and urgent philosophical problems connected with the emergence of new ideas, theories and methods in the natural sciences, with the elaboration of epistemological, methodological and logical aspects of scientific research. The problems of the philosophical generalisation of the achievements scored by the modern natural sciences can be solved only in an alliance of the natural sciences and philosophy, on the basis of comprehensive research which would organically combine the methods of different sciences and their results. The alliance between philosophy and the natural sciences acquires particular importance in the age of the scientific and technological revolution, when the social role of science grows considerably.

At present the philosophy of natural science has entered a new stage characterised by the versatile elaboration of general problems of philosophy, methodology and the history of natural science. The natural sciences today study not only individual objects or forms of movement of matter; they also reveal such features of natural processes which are common to the entire objective world. This stimulates further fruitful elaboration of philosophical problems, materialist dialectics which is the methodological basis of a vast number of concrete scientific concepts and laws. In the light of the aforesaid it becomes clear why the present issue of *Social Sciences* draws the reader's attention to the theme "Philosophical problems of modern natural science". The issue carries a number of articles by Soviet natural scientists in which they convincingly show the

ever growing importance of materialist dialectics for a philosophical understanding of the rapid progress of modern natural science.

With articles on current problems of literary studies and linguistics, as well as material about the various institutes and publications of the Section of Literature and Language, USSR Academy of Sciences, we conclude information on scientific work in the Sections under the Department of Social Sciences. Previous issues of *Social Sciences* carried material about the research work in the institutes of the Sections of History, Economics, Philosophy and Law.

The present issue also carries an interview with Academician N. Inozemtsev, Director of the Institute of World Economy and International Relations, USSR Academy of Sciences, and an article on the problems of industrialisation in the Third World countries. As in previous issues, in the bibliography section the reader will find reviews of a number of new Soviet publications and the list of reviews of foreign books on social sciences published in Soviet scientific journals.

M. KELDYSH,
President of the USSR
Academy of Sciences

The Decisions of the 24th Congress of the CPSU and the Tasks of the USSR Academy of Sciences

The decisions of the 24th CPSU Congress, the Directives on the Five-Year Plan for the development of the Soviet national economy in 1971-1975, mark the beginning of a new and very important stage in the building of communism in the Soviet Union. The programme for the further movement of our country towards communism has the approval and support of the entire Soviet people. The 24th Party Congress, which was constantly in the centre of world attention, demonstrated the cohesion of our Party, and the unity of the Soviet people around it. The speeches made by foreign delegates at the Congress testified to the growing unity of the international communist and working-class movement. The decisions of the Congress strengthen the positions of the progressive forces, inspire the fighters for peace, democracy and socialism all over the world.

The Report of the CPSU Central Committee, made at the Congress by L. Brezhnev, General Secretary of the CC CPSU, the Report on the Directives on the Ninth Five-Year Plan made by A. Kosygin, Chairman of the USSR Council of Ministers, and the speeches made by delegates contained a profound and comprehensive analysis of the key questions of the Party's domestic and foreign policy at the present stage of communist construction. The 24th Congress made a new contribution to Marxist-Leninist theory.

The Report of the Central Committee contains an extensive analysis of the world situation and Soviet foreign policy. The period following the 23rd Congress was marked by the further strengthening of the friendship and cohesion of the socialist countries, by greater coordination of the foreign policy activity of the fraternal parties and states, and by their growing economic cooperation. Owing to the aggravation of the general crisis of capitalism the aggressive tendencies in the policy of the imperialist states have become more pronounced. On the other hand, the progressive forces have intensified their struggle against imperialism. The activity of our Party was of enormous importance to the further cohesion of the international communist and working-class movement, to the peoples fighting for their freedom and independence. A major role was played in this by the International Meeting of Communist and Workers' Parties held in 1969 and by the Lenin Centenary. The peaceloving foreign policy of the Soviet state and the strengthening of its defence capacity have secured peaceful conditions for the building of communism in our country, for checking the aggressive forces of imperialism. The consistent struggle for peace and the security of the peoples has further raised the prestige of the Soviet

Union throughout the world. The Congress approved the Central Committee's programme for the struggle against the aggressive policy of imperialism, for peace, security and social progress.

The successes scored during the past five-year period in the country's economic development, in Soviet society's socio-political advance, have created a sound basis for the further movement towards communism.

The results achieved during the past five-year period testify to the great successes of the Soviet people under the leadership of the Communist Party. During that period the productivity of social labour has grown by 37, the national income–by 41, and the fixed productive assets by 50 per cent. Industrial output has also increased by 50 per cent. The branches decisive to technological progress–the power, chemical and oil chemical, engineering and, especially, the radioelectronic and instrument-making industries have developed at a priority rate. At the same time rapid headway was made also by the light and food industries, and the production of consumer goods increased by 49 per cent for the same period.

The Party has adopted a course aimed at the steady advance of agriculture, which is being achieved through the implementation of important economic measures and the extensive use of scientific achievements. This policy is already bearing fruit. In the past five-year period, the agricultural output increased by 21 per cent. In 1970, the production of grain and cotton reached a record figure.

As a result of the country's successful economic development per capita income has grown by one-third. The material and cultural standards of the working people have considerably risen; in the country's political life, the socialist system has been further consolidated, the ideological and political unity of Soviet society has become stronger, and the Soviet people has rallied still closer around the Communist Party.

The indices characterising the fulfilment of the Eighth Five-Year Plan were, on the whole, considerably higher than those of the preceding plan. The successes in our economic development following the 23rd Party Congress have been attained as a result of the improvement of the economic structure in the country, the rationalisation of the production structure, the priority development of branches decisive to technological progress, the growth in the rates of technological progress through the fuller utilisation of scientific achievements in the economy.

At present, objective conditions have been created in our country for accelerated economic advance, for the further development of science, education and culture, for an ever more rapid advance towards communism. This has been reflected in the Directives of the 24th Party Congress on the new Five-Year Plan.

The main task of the Ninth Five-Year Plan is to secure an appreciable upswing in the people's material and cultural standards by a further increasing the development rates of socialist production and raising its effectiveness on the basis of scientific and technological progress, and an acceleration of the growth of labour productivity.

The major aim of the Directives on the Ninth Five-Year Plan is to satisfy the material and cultural requirements of the people. The decisions of the Con-

gress define the economic measures needed for securing a new upsurge of the country's economy and the people's welfare. The Party's course on the substantial increase in the people's material and cultural standards is not confined to the current five-year period, it is a long-term policy.

Proceeding from this main aim, the Directives determine not only general tasks for the entire national economy, but also specific tasks—those aimed at the development of industry, agriculture, transport and communications, capital construction and other key branches. The Directives emphasise that at the present stage special importance is attached to the improvement of management and planning, and to the greater intensification of the whole of social production, to raising its effectiveness on the basis of a substantial acceleration of scientific and technological progress.

The Directives provide for an improvement of the proportions in social production, for a considerable increase in the effectiveness of all branches. The country's national income is to increase during the five years by 37-40 per cent, mainly owing to the growth of labour productivity.

In industry there will be an extension and improvement of its technical basis. Power engineering, machine-building, the chemical, oil chemical and gas industries will develop at a priority rate. There is to be a rapid development of the most effective branches in all industries. Great attention is to be given to raising the growth rates of the branches producing consumer goods. During the five years industrial output is to increase by 42-46 per cent, that of consumer goods is to increase somewhat more rapidly. Labour productivity in industry will grow by 36-40 per cent, thus increasing output by 87-90 per cent. The technological level, economic characteristics and quality of all types of products are to be improved.

The Directives envisage a major growth of capital investments in agriculture, extensive chemicalisation, amelioration and comprehensive mechanisation. Greater attention is given to the development of industrial branches associated with agriculture. The labour productivity in collective and state farms is to grow approximately by 40 per cent. The intensification of agricultural production is to go hand in hand with an improvement of working and living conditions in rural areas.

In the social field, the Directives stipulate an increase in the real per capita income by about 30 per cent, in payments and grants from social consumption funds by about 40 per cent. The wages of industrial and other workers are to increase during the five-year period by an average 20-22 per cent, the remuneration of collective farmers by 30-35 per cent. The stocks of commodities are to increase. Labour and living conditions will improve still more. There is to be more housing construction, and a further extensive development of the health services and education.

The reports read at the 24th Congress speak highly of the achievements of Soviet science, of the contribution it has made to raising the country's economic and defence capacity, to accelerating technological progress. Mention was made of the USSR Academy of Sciences in connection with its efforts to work out the long-term trends of science, to unite the efforts of the country's scientists. At the same time it was justly noted that the research, including that

being carried on by the Academy of Sciences, is still insufficient for the solution of a number of important problems facing scientific and technological progress. Attention was drawn to the shortcomings still found in the activity of our scientific institutions, in the organisation of research, in the choice of research personnel. We are still not taking full advantage of our possibilities to make scientific research more effective, to raise the productivity of the labour of scientists. Questions of raising research to a higher level, of making it more effective are particularly important in connection with the increasing role of science in technological progress and the growing expenditure on its development.

The Congress emphasised the great role of science in the solution of the main economic task of the current five-year period, in further developing the natural and social sciences, in attaining new landmarks in all the leading fields of modern science. Mention was also made of the need for a more rapid and more complete practical utilisation of the achievements of science and technology in the economy.

In our epoch the scientific and technological revolution has an enormous impact on production and social development all over the world. However, only the socialist system makes it possible to use the possibilities opened up by scientific and technological progress to the full. The further profound study on the basis of Marxist-Leninist theory of the economic and social laws of the socialist society's development during the period of transition to communism, the possibilities opened up by the scientific and technological revolution, should become the subject of the concerted efforts both of the social and the natural sciences. When planning the development of science, we must constantly bear in mind that the functions of science in the development of modern society are extremely manifold, and that the comprehensive range of questions (from moulding the world outlook to the fundamentals of material production) is based on the whole system of social and natural sciences. In this connection we should, as the 24th Congress noted, strengthen in every way the interaction between scientists working in the natural, technical and social sciences.

The work of the USSR Academy of Sciences will be successful if we rationally divide our efforts between perspective research of the universe and social development, on the one hand, and the solution of the current problems posed by technological progress, economic and social development, on the other.

The successes of the first socialist state in the world, the formation of the socialist world system, the disintegration of the system of colonialism, the successes of the revolutionary movement throughout the world and, on the other hand, the new forms of struggle applied by imperialism, confront the social sciences with major theoretical problems. The scientific and technological revolution, which is taking place in the world, has a strong impact on these processes. It is therefore necessary to raise the level of research into the problems facing the development of socialist society and its transition to communism, the problems of the world historical process, into the scientific foundations of the struggle for the triumph of socialist ideology.

We are also witnessing the emergence of new revolutionary ideas and discoveries in the natural sciences. Our knowledge of the structure of matter

at all its levels and of its transformations, a knowledge penetrating deep into the essence of things–up to the world of elementary particles–is rapidly expanding. In particular, all this has opened up wide possibilities for the production, conversion and transmission of power. The astounding discoveries of the past decade in astrophysics indicate that there may be new states of matter and this may change our view of the universe. At the same time technological progress has enabled man to travel beyond the confines of the Earth–into space–and this has created new possibilities for the solution of many practical tasks on our planet, for the study of, and penetration into, the solar system, for the development of fundamentally new methods for the study of the Universe.

The utilisation of physico-chemical methods in biology opens up unprecedented possibilities for the purposeful change of living processes.

Computer techniques, which are based on new ideas in mathematics, on electronics and other achievements of modern physics, play a leading role in the modern scientific and technological revolution. They have opened up new possibilities for the research of natural and social processes, the modelling and implementation of control processes on the basis of data obtained by processing vast information. This introduces radical changes into the methods of scientific research, production, economic management and other spheres of human activity.

The rapid increase in the volume of production and the growth of the population make particularly necessary to draw new natural resources into the economy, rationally to utilise and restore the natural wealth. This problem can be resolved only by means of deep fundamental research, and it also demands the development of a number of new trends, such as the study of the abysmal structure of the earth, the world ocean, the working out of a number of problems of climatology and ecology, and also of ways for a more complete processing of raw materials. The range of sciences about environment is at present undergoing deep changes and should increasingly rely on the latest achievements of physics, chemistry and biology.

Alongside with the major scientific trends, being advanced by socio-economic processes and conditioned by the logic of scientific development, our research plans should reflect also the major scientific problems being constantly posed by economic development, the further improvement of our social system, the sharp ideological struggle between the socialist and the capitalist worlds, and economic development, notably in such decisive fields as the power industry, new materials and technological processes, radio-electronics, management, communications and so on. The intensive development of agriculture is also based on the latest scientific achievements.

All decisions of the 24th Congress and the Directives on the Five-Year Plan serve us as a guide for action. In future our research should be guided not only by tasks set directly to the fundamental sciences, but also by socio-economic tasks linked with the development of the various economic branches.

The task of the Academy of Sciences is to find the most perspective trends of technological progress, evolving from the development of science,

and at the same time to resolve key scientific problems advanced by practical needs.

In the current five-year period it is particularly important to use timely the achievements of science in fuller measure in production. We must further generalise and disseminate the experience gained in the successful utilisation of scientific research, seek new ways to accelerate the introduction of scientific discoveries into practice.

I shall now dwell on some concrete questions of scientific development and on questions linked with technological progress in the economy.

As everybody knows mathematics has begun to play a much greater role in many fields: in research, including some of the trends in the social sciences, in designing, in production management, in the economy and in planning. This is largely a result of the development of electronic computer techniques. We must continue to expand theoretical research into all fields of mathematics. Particular attention should be given to the development of the fields which serve as a basis for the solution of problems posed by the theory of management and information, technical cybernetics, physics, technology and economics. Methods of mathematical computation must be further developed; it is particularly important to improve programming and to create better operational systems for computers. Attention should be given to the new fields in which computers, such as the "artificial intellect", can be utilised, to the extensive application of electronic computers in designing, and so on.

Electronic computer techniques have become an important factor for accelerating scientific and technological progress. The Directives on the Ninth Five-Year Plan provide for an increase in the output of electronic computers by 160 per cent. They provide for the extensive introduction of computer techniques and managerial equipment in the economy, technology and research. Therefore, extensive research has to be launched during the current five-year period to develop electronic computer techniques, in particular, research into the development of universal computers, and into their extensive application in all fields. The most important tasks are: to create a series of a standardised combined programme computers, computer equipment for control systems; to improve the outer units of machines and apparatuses for communication channels; to evolve new principles of information processing and new principles for the designing of computers and computer systems. It is essential to extend work connected with the creation of new generations of machines. We must develop research into the creation of logical elements and memory elements for computers. The implementation of this programme will raise computer techniques in our country to a higher level. This sets big and responsible tasks before the Academy of Sciences.

In our time it would be difficult to name a trend in the natural sciences or a field of production in which progress does not depend on the successes of physics.

The results of research into solid-state physics find diverse technical applications. Research into the electronic properties of solid bodies, a study of the connection of their electronic structure with their resilience and plastic properties, research of the real structures and the defects of the crystal latice

create prerequisites for the utilisation of the various physical properties of solid bodies.

One of the most important fields of the application of solid-state physics is the creation of new and the improvement of existing materials. The improvement in the quality of structural materials is a prime condition for the acceleration of technological progress. In the current five-year period it is essential to develop research into the improvement of physical processes involved in the production of high strength, heat-resistant and cold-resistant materials. Complex strengthening methods and new principles must be used to develop high strength materials, notably, composite materials. The study of the influence of small concentrations of admixtures on the mechanical and other properties of materials attaches great importance, as that of the influence of penetrating radiation. At the same time serious attention should be given to the extensive introduction into production of technologies for the production of heat-resistant and high strength steels that have been worked out in past years in the USSR.

It is highly important to extend research and introduce progressive methods for processing materials by means of static and dynamic pressure, electro-magnetic fields and various types of radiation, notably of electronic and laser rays. High pressure makes it possible to change the structure and phase state of materials, to obtain new materials with high mechanical, optical, magnetic and electronic properties. The putting into operation during the current five-year period of the unique 50,000-ton press will make it possible to carry out research with a wide range of pressures and to resolve some important problems of solid-state physics. In particular, this will make it possible to check experimentally the theoretical assumption that there may exist metallic hydrogen, which may turn out to be a super-conductor with a high critical temperature.

The Directives on the Ninth Five-Year Plan provide for the creation of the fundamentals of plasma metallurgical processes. This requires more extensive research into the physics of low temperature plasma, including the problems of its generation, the control of its parameters, the interaction between plasma and matter, and the kinetics of heterogeneous chemical reactions in plasma jets.

In accordance with the Directives of the 24th Congress efforts are to be taken to improve existing and introduce new metallurgical processes, such as electro-slag and electric-arc smelting, and the production of rolled sheets from liquid metals. Serious attention is to be given to the utilisation of means of automation for the control of technological processes.

In the Ninth Five-Year Plan period much attention is to be given to research into the physics of magnetic phenomena. The further development of that trend promises to promote the production of various magnetic materials, and the elaboration of non-destructive control methods.

In recent years the importance of research into the formation and structure of crystals has increased both from the scientific and the technological viewpoints. In the current five-year period the processes of crystallisation, the search for new crystals, work on the creation of new methods for the synthesis of crystals, and method research into their structure and physical

properties are to receive further attention. Research into the mechanics and physics of defects in crystals will promote the creation of a consistent physical theory of the mechanical properties of materails. The results obtained by the Academy of Sciences in the synthesis of crystals (sapphires, rubies, yttrium aluminium garnet and others) help to resolve a number of important scientific and technological problems.

The quantum properties of solid bodies, owing to which crystals can act as a large number of independent physical instruments, are being extensively applied. Research into the quantum theory of solid bodies, notably theoretical and experimental research of their energy spectrum is becoming ever more important for the development of electronic equipment.

Of great importance to the development of means of automation and control, notably of computer techniques, is the research into the physical phenomena taking place in thin semi-conductor films, work to obtain integral, hybrid and functional schemes, and also to make electronic devices more compact. The Presidium of the Academy has recently adopted a decision on the extension of research by institutions of the USSR Academy of Sciences and higher educational establishments into the physical basis of microelectronics. It is to be hoped that the institutes of the Academy will become leaders in that field.

Attention should be given to the working out of elements of optoelectronics for radioelectronics and computer techniques. It is essential to make a deeper study of the electronic and optical properties of organic semi-conductors, which could promote the development of new types of photo-semiconductor devices, memory elements and other devices. Work on semi-conductor photography also holds out great promise.

Research is to be further developed into quantum electronics, including gas and chemical lasers; the creation of new active media; non-linear optics, and the elaboration of new sources for the excitation of lasers. In recent years quantum electronics has made it possible to resolve some important problems in the field of new equipment design, technology and even medicine. A task of the immediate future is the more extensive introduction of methods using quantum radiophysics and laser techniques into practical scientific research, notably of spectroscopy, the use of lasers to stimulate chemical reactions, the use of these methods for working out new devices, new means of communications, location and navigation. There is also to be more intensive research into holography and its applications.

In the field of radiophysics it is essential to master new ranges of electro-magnetic waves (notably millimeter and submillimeter), creation of methods for the generation and control of oscillations in that range. These wave ranges have a high information capacity and also make it possible to influence intricate molecular complexes.

Super-conductivity holds out the prospect for a solution of many modern scientific and technological problems, notably for the building extremely economic electric machines and aggregates. Serious attention should therefore be given to theoretical and experimental research aimed at obtaining super-conductors with high critical parameters, at establishing the links between the crystal structure and super-conductivity, and also at utilising super-

conductivity in power engineering, instrument-making and computer techniques. This work holds out great promise and should therefore be intensified.

I shall now dwell on some questions concerned with the development of nuclear physics. The main task in particle physics remains the building of a general theory of elementary particles, of their strong, electromagnetic, weak and gravitational interactions. Much has been done in recent years to develop the experimental basis of high energy physics. One of the main tasks of experimental particle physics during the current five-year period is to utilise most effectively the accelerators built in this country, notaby the proton accelerator at Serpukhov, the electronic accelerators at Yerevan and Kharkov, and also to develop the method of counter beams and the use of other possibilities. There are many specific problems in that field of power engineering which can be resolved with the help of the Serpukhov accelerator: the search for quarks and Dirak's monopole, the check of various correlations between sections obtained on the basis of various conceptions, etc. We hope that new outstanding results will be achieved in that field.

At present, we have the unique possibility of conducting research, with the help of satellite-borne apparatuses, into the interaction between primary cosmic radiation protons and matter up to an energy of 10^{14} electron volts, and also of studying the spectrum of primary cosmic radiation in that energy range. The research into cosmic rays in other aspects should also be extended.

There is as yet no satisfactory theory of the forms of matter and of the regularities revealed by experimental physics, and extensive theoretical research should therefore be conducted in this field.

We should also give great attention to improving the facilities for research into nuclear physics. It is intended to reconstruct the Serpukhov accelerator, in particular, sharply to increase its intensity, to use the accelerator with proton counter-beams having an energy of 23,000 million electron volts. It is essential to consider the designing of accelerators with mu-meson counter-beams. Great attention is to be given to new and cheaper methods of accelerating charged particles, notably to the method of collective acceleration. I think that in the field of the creation and utilisation of accelerator techniques it is essential to strengthen international cooperation, since competition in that field can become a heavy burden for all countries.

A promising trend is the development of neutrino physics. Particularly large possibilities have been opened up by the creation of a neutrino canal on the Serpukhov accelerator and a station for the study of cosmic neutrinos.

Typical of the development of nuclear physics in recent years is the rapid increase in the volume of experimental data and the improvement of the quality of information on the properties of the nucleus. Some recent achievements in the field of medium energies have become possible only because tandem generators have been created in various countries. It should be emphasised that the development of the theory of the nucleus is indissolubly linked with the progress of experimental research in nuclear physics. The development of such researches is therefore impossible without a radical improvement of the state of experimental nuclear physics. In the current five-year pe-

riod we shall have to give greater attention to improving the experimental facilities for nuclear physics of medium energies.

The progress of experimental research in nuclear physics promotes not only the development of the theory and of models of the nucleus, but is also of enormous practical importance. The extensive programme for the development of the nuclear power industry envisaged by the Directives on the Ninth Five-Year Plan sets responsible tasks to nuclear physics. It is also essential to develop various applications of the methods of nuclear physics, notably that of gamma-resonance spectroscopy. The achievements of nuclear physics should be more extensively applied in the associate fields of science and technology and in the national economy.

The Directives of the 24th Party Congress envisage the further priority development of the power industry. They provide for the commissioning, during the five-year period, of power stations with a total capacity of 65-67 million kw. The output of electric power will reach 1,030,000-1,070,000 million kw. Science faces important tasks in that connection. First and foremost, it is essential to resolve questions connected with increasing the capacity of the steam turbine blocks of thermal power stations and of the powerful blocks of reactor-turbine atomic power stations.

The solution of the physical and technical problems of the power industry, linked with the generation and transmission of electric power, demands extensive physical research into the methods of converting energy and the development of new materials for the creation of power blocks with maximum parameters. There is to be a considerable advance in the research into the methods of the direct conversion of thermal and nuclear energy into electric energy. Complex research into the physics of low temperature plasma, magnetic hydrodynamics and super-conductive magnetic systems should be continued in connection with the working out of the magneto-hydrodynamic method of conversion.

Several months ago the Institute of High Temperatures commissioned the world's first pilot-industrial power plant for the direct conversion of thermal energy into electric energy by the magneto-hydrodynamic method with a rated capacity of 25 megawatt. It is important for this installation to reach its rated parameters and to secure its continuous faultless operation.

A nuclear thermal-emission electric installation of a capacity of several kw has recently been successfully tested. Further research is to be carried on in connection with the utilisation of thermal-emission and thermo-electric methods of conversion in autonomous power installations and transport power engineering.

Of great importance, especially for the European part of the USSR, is the further development of atomic power engineering. The Directives on the Five-Year Plan envisage the commissioning of atomic power stations with a total capacity of 6-8 million kw, chiefly with reactors on thermal neutrons. Alongside with the creation and improvement of such atomic power stations, it is essential to resolve important scientific tasks linked with the development of reactors on fast neutrons, reproducing atomic fuel. The building of pilot reactor-multipliers on an industrial scale has already begun. But their large-scale introduction sets major tasks to science.

In recent years, work on high temperature plasmas has successfully developed in the Soviet Union, which is connected with the quest for a solution of the problem of thermo-nuclear synthesis. In this five-year period it is planned to set up installations of the "Tokamak" type with optimal parameters in order to increase the density of particles and the time during which the plasma can be maintained by 2-3 orders, which is an essential condition for the creation of a thermo-nuclear reactor. At the same time research is under way into new methods for heating plasma, including by means of a dense beam of fast electrons and laser rays. The time seems to have come to begin research into the conversion of the energy emitted during thermonuclear synthesis into electric energy.

Research in mechanics is basic to the development of various new machines and of their operating principles, as well as to securing their long-term service. Mechanical methods are at the root of the transition from local physical laws to the study of the global behaviour of media. Mechanics of liquids and gases determine on a growing scale the behaviour of media under the influence of various fields, physical and chemical transformations.

The development of numerical methods and the use of electronic computers has created new possibilities for the solution of the tasks of continuum mechanics–both for an analysis of fundamental questions as well as for the completion of technological tasks. Alongside the solution of new concrete problems, research should be conducted also into new questions, such as the dynamics of rarefied gas and plasma, magnetic hydrodynamics, the application of the laws of liquid mechanics to problems of chemical technology and rheology, the hydrodynamics of explosion and detonation, research into new possibilities of lowering resistance. Numerical methods have opened up new possibilities for a study of complex phenomena in the presence of blast waves and also new approaches to the study of turbulency. Mechanics must contribute to the improvement of the methods of oil and gas extraction and to the research into such complex phenomena as snow avalanches and landslides. The methods of continuum mechanics have begun to play an increased role in the solution of astrophysical problems.

The tendency towards the intensification of the operating conditions of machines and towards the creation of economical structures sets major new tasks to the theory of strength. Efforts must be aimed at developing a theory of plasticity, creepage and continuous strength, strength under variable and pulse influences, as well as temperature strength. Great attention must be given to problems of the strength of new materials, polymers, composite materials and so on. Research into the strength of materials should to an increasing extent be linked up with the study of their physical properties.

General mechanics will have to solve many questions in connection with space research, and will also have to help in creating new devices.

Engineering serves as the basis for the introduction of new technological processes evolved by scientific achievements. In its turn, machine design must to an increasing extent avail itself of the new possibilities opened up by science. It is essential to improve coordination in the working out of such questions as the automation of the operation of machines and machine systems,

notably of machine tools by using computer techniques; the utilisation of new scientific achievements in technology; the application of the latest means of analysis and measurement; the automation of work connected with the designing of machines and their testing. In connection with the growth of the capacity and operating speed of machines and mechanisms, the question of the reliability and longevity of machines becomes highly important, as does also that of their greater precision. It is therefore important to develop a scientific basis for the use of extra strong materials in engineering, to study the possibility of extending their application in practical design work. The Department of Mechanics and Control Processes of the USSR Academy of Sciences should become a body, linking the natural sciences with so important a field as engineering.

The achievements of the natural sciences make it possible constantly to improve existing methods of measurement and to create new ones. Accurate methods of analysis and control based on recent scientific achievements are gaining importance. In this connection it is essential to develop research aimed at improving radio-spectroscopic methods. Among the immediate tasks is the creation of new instruments and methods for measurements by optic spectroscopy, electronic paramagnetic, nuclear magnetic and gamma-resonance, the utilisation of super-conductivity and of the methods of coherent optics. The utilisation of these methods, alongside with the achievements of mechanics, electronics and radio-engineering, will help considerably to produce much more precise measuring equipment. The Directives on the Five-Year Plan envisage high development rate for instrument building. Science is to play a greater role in raising the quality of instrument building. The creation of new principles for analyses and measurements is an important task of our institutes.

The Directives of the 24th Congress provide for the development of chemistry at a high rate. It is hardly necessary to mention that the chemical industry has now become an important field providing materials for practically all fields of industry and agriculture, playing an enormous role in the production of household articles and in medicine. Even though the country's chemical industry has made rapid headway during the past ten years, it is essential still further to raise the level of chemicalisation in the economy. The rapid rate at which the chemical industry is to expand and the increase in its effectiveness, envisaged by the Directives, can be achieved only by an extensive utilisation of new techniques and technology. Chemical science is to play a leading role in this.

Let us examine some of the key problems facing the further development of chemistry.

The plans for the further development of chemistry provide for an increase in the share of research into the theories of chemical structures and reactive capacity, the dependence of the physical and chemical properties of materials on their chemical structure, into the field of chemical kinetics, chemical thermodynamics, the theoretical basis of organic chemistry, catalysis, electrochemistry, high energy chemistry, including radiation chemistry, the chemistry of plasmas, and other new trends. These researches will raise the level of our work directed at creating new materials and improving chemical technology.

The development of theoretical research will be based on the use of new ideas and methods in physics. In some fields of theoretical chemistry research is to become deeper and more extensive. This applies in particular to research into quantum chemistry, which should rely on powerful computer techniques.

Chemical kinetics should be used more extensively as a basis for new technological processes. It is essential to intensify research linked with the transition from the study of the elementary characteristics of chemical processes to the integral study of these processes, including research in macrokinetics. Serious attention should be given to the hydrodynamic and thermodynamic principles of modelling chemical processes and the utilisation of computer techniques.

The requirements of the economy make it necessary constantly to improve the structure of the oil chemical industry. In the current five-year period we should give greater attention to the development of new trends in oil chemistry in order to improve the structure of that industry, to create new processes for the refining of raw oil by means of effective catalytic reactions.

The chemistry of polymers, the theory of their structure and the technology of their production, the synthesis of new heat-resistant and highly durable polymers, too, sets new tasks to science. Of great importance is the development of research into the processes of the destruction and ageing of polymers.

The development of work connected with the utilisation of mathematical modelling methods and the application of electronic computer techniques to research into technological processes has made it possible in many cases to improve technology and to cut the time it takes to elaborate it. In particular, it has furnished good results in the designing of catalytic processes. However, work directed at the creation of highly effective catalysts for many industrial processes should be expanded.

All research into chemical technology should, I think, be considerably intensified.

Research into electro-chemistry is to help in the solution of a number of important problems facing the national economy. Efforts should be made to secure an extensive application of radiation-chemical and plasma-chemical technology in industry.

Let us look into a few of the many tasks facing organic chemistry.

Hetero-organic chemistry faces important tasks linked with the creation of diversified new materials, including highly effective catalysts and regulators for burning, selectively working integrators and sorbents, heat-resistant polymers and low molecular derivatives–the basis for heat-resistant structural materials, heat-resistant oil and lubricants and other auxiliary materials for new equipment, physiologically active materials–insecticides and therapeutical preparations for a wide range of uses.

Of major interest is the work directed at the fixation of atmospheric nitrogen. It has already been proved that a catalytic synthesis of ammonia is possible, and new systems have been found for recuperating molecular nitrogen in water and in acqueous-alcoholic solutions at room temperature and atmospheric pressures.

In the current five-year period major attention will be given to the industry of fine organic synthesis, which is producing a wide range of stabili-

sers, plastifiers and other admixtures for polymers, admixtures for oil products and physiologically active materials. In the field of fine organic synthesis science has to create numerous materials with new properties–new types of medicines, new products for the chemicalisation of agriculture, dyes, materials for new equipment. Typical of the "light" chemical industry is the very rapid change of articles produced by it and of the technologies used. This makes new demands upon that branch of industry. To develop this important branch it is essential to improve the coordination among the relevant industries subordinated to different authorities.

Biology is assuming ever greater importance owing to the major discoveries in that science, notably in molecular biology. The establishment of the complete chemical structure and spatial configuration of many proteins, the artificial synthesis of ferment, the synthesis of the gene and so on, are among the greatest achievements of world science. These fundamental discoveries have made it possible to approach the study of the whole range of biological phenomena from entirely new positions.

Typical of modern biology is the study of life at all levels of its organisation: the molecular, the cellular, at the level of the entire organism, and also the study of the symbiosis of vegetative and animal organisms, and their evolution. All these problems are of great scientific and practical importance.

In recent years much attention has been given in our country to the development of molecular biology. We have founded the Institute of Molecular Biology, the Institute of the Chemistry of Natural Compounds, and a Biological Centre at Pushchino and molecular-biological research has been intensified at the Institutes of Atomic Energy, of General Genetics, of the Biology of Development and others, in the Academies of Sciences of the Union republics, and at universities. We have to continue to take all necessary steps to promote the development of new trends in biology.

The development of biology has now placed on the agenda research into such major problems as the nature of heredity and its control, the mechanisms for regulating the biosynthesis of proteins and nucleic acids in the cell, their chemical and enzymatic synthesis, the mechanisms of the action of various ferment systems, the interaction between viruses and cells, and so on. The solution of these problems will not only help to reveal the very essence of vital processes, to work out a number of problems of evolutionary biochemistry and the origin of life, but will also create conditions for the control of the productivity of agricultural crops, animals and useful micro-organisms, and serve as a basis for the development of new methods to fight diseases.

Closely linked with the successes of molecular biology are the main trends in the efforts to fight malignant tumours, and also in the research linked with the control of immunity reactions, notably with overcoming the incompatibility of organs and tissues during transplantations. The research into the molecular structure of viruses and the processes of their biosynthesis has become a vital matter. New research in genetics, particularly the study of the molecular basis of the mutation process, shows the way for the prophylaxis and treatment of hereditary diseases, and also of allergic diseases, which are becoming increasingly widespread throughout the world.

The development of modern medicine is also based on the achievements of

physiology. In recent years successes have been scored in the physiology of kidneys and the water and salt metabolism, digestion. There has been more extensive research into the physiology of the blood circulation, the endocrine system, the physiology of hearing and sight. Of great importance is also work in the field of experimental pathology and the therapy of higher nervous activity, the physiology of respiration, and the physiology of the cell.

Work on the technological synthesis of biologically important proteins, notably of ferments and hormones, is becoming more topical now. Controlled changes of their properties during the synthesis outside the cell would make it possible sharply to extend their use in medicine, agriculture and industry. Much has still to be done to establish the principles of biological catalysis and the molecular mechanisms of the action of ferments, which will help to create new types of highly effective catalysts for the chemical industry. These efforts are to be greatly intensified during the current five-year period.

Biochemistry is to improve the quality of raw materials of vegetable and animal origin, to work out basic principles to fight losses during harvesting and storage, to improve technological processes in the light and food industries.

The Directives on the Five-Year Plan envisage the development of research into the microbiological synthesis of biologically active materials, and also of food proteins, notably of cheap non-food raw materials. Of great importance is the improvement of the technology of microbiological synthesis through the creation of rational regimes for fermentation processes and the application of highly productive cultures of micro-organisms, particularly those created by genetic methods. This demands an early setting up under the Academy of Sciences of an all-Union collection of micro-organisms on the basis of the Museum of Cultures of the Institute of Microbiology.

The Directives of the 24th Congress set important tasks to science in the fields of crop farming and stock-breeding. The task of selectors is to evolve new varieties with a high content of valuable proteins, fats and hydrocarbons, varieties that are resistant to unfavourable weather conditions, to various pests and diseases. Certain successes have been achieved in this respect and they are widely known. However, much has still to be done, notably to create varieties of weat resistant against stem rust and drought, and cold-resistant varieties of grains for the Volga basin, the Urals, Kazakhstan and Siberia. In addition to hybridisation, ever greater importance is acquired in this work by such methods as regulated heterosis, experimental polyploidy, radiation and chemical mutagenesis, and so on.

Of great importance to the intensification of agricultural production is research into the metabolism, photosynthesis, mineral nourishment and water regime of plants. This will help to expand the theoretical basis for the directed control of the productivity of agricultural crops, to use chemical means more rationally and extensively.

The question of using natural resources thriftily and rationally has assumed cardinal importance in our days. This sets new tasks to science and gives emergence to new trends in science.

Complex ecological research of the biosphere is to promote a more rational utilisation and extended reproduction of natural resources. The solution

of the problems of preserving the vegetative and animal world, the purification and preservation in a satisfactory condition of the water reservoirs, the atmosphere, the soil, the creation of pesticides that are easily destroyed biologically and do not exert undesirable toxic influence on the environment, and many other problems demand the attention of scientists of all specialities.

The Directives of the Congress provide for the further rapid extension of the mineral raw material basis. The task in this connection is to carry out geological prospecting of minerals at greater depth and to make it more effective. This task should be resolved on the basis of the intensive development of fundamental research in geology and the improvement of the prospecting and surveying methods.

In the current five-year period the USSR Academy of Sciences and the USSR Ministry of Geology will begin to work on scientific and technological problems connected with the comprehensive study of the abysmal structure, the composition and development of the Earth crust and the upper mantle and their interrelation so as to establish the regularities underlying the formation and distribution of mineral resources. It is to be hoped that this will greatly expand our knowledge about the Earth crust, will give us a deeper insight into the modern theory of geophysical fields, will make it possible to develop the forecasting of concentrations of mineral raw materials, and to evaluate the resources of abysmal heat and the prospects of their utilisation.

Our plans in the geographic field provide for the working out of a scientific basis for the economic appraisal of natural resources and of methods for the forecasting of their availability. To draw new resources into the economic turnover it is necessary to intensify complex regional research on the development of arid, taiga, and mountainous districts, on the extension of land reclamation and irrigation.

It is highly important to create in the nearest future a scientific programme for the comprehensive utilisation and safeguarding of the country's water resources, to secure a lowering of water consumption, and also to work out new and highly effective methods for the purification and desalination of water. New technological processes with minimum water consumption have also to be worked out.

Ever greater importance is being attached to utilisation of the resources of the oceans and seas. The extensive development of fishery makes it necessary to create a scientific basis for the rational utilisation of marine products, to secure the natural reproduction of their reserves. The geological prospecting of shelf zones and of processes of sediment formation in oceans is important to the development of mineral resources, notably of oil and gas deposits and placers of heavy metals on the continental shallows.

The rational utilisation of natural resources depends greatly on the comprehensive utilisation of raw materials, since we are still wasting many valuable components of mineral as well as biological raw materials, and the value of these components is determined by our scientific knowledge, by the degree to which they are processed.

The national economy, especially agriculture and the development of aviation and navigation, make it more urgent to study climate, meteorology and the physics of the ocean. The development of this research becomes ever

more significant not only for the solution of current problems but also for forecasting the influence of technological progress on the evolution of our planet.

Such destructive processes as earthquakes, landslides, avalanches, soil erosion, etc., must also be studied in order to prevent their harmful consequences. In particular, recent research holds out hopes that it may become possible to foretell violent earthquakes.

The new views on the structure of matter, that have emerged with the development of physics, the possibility of observing ever broader fields of the spectrum of electromagnetic radiation, the development of the techniques of space research, have a major impact on the study of the Universe and have lead to many epochmaking discoveries. Space research has vastly expanded our ideas about the Moon and the neighbouring planets of the solar system, about inner space, and have revealed new factors of cosmic influences on the Earth. Space research exerts an ever deeper influence on scientific and technological progress. Systems of remote TV and radio-telephone communications by means of artificial earth satellites are now widely used; and such satellites are also extensively used for meteorological purposes. The Directives of the 24th Party Congress provide for the further study of outer space for scientific purposes and for the development of communications, meteorological services, the study of natural resources, geological, geographical and oceanological research, for the solution of other national economic tasks.

In the current five-year period there will be extensive work to create piloted orbital stations, the beginning of which was marked by the orbiting of the scientific station "Salute". The creation of permanent orbital stations opens up extensive prospects for the development of astronomy beyond our atmosphere, which is likely to lead to further progress in extra-galactic astronomy, the physics of the Sun and, as we already said, opens up new possibilities for the development of high energy particle physics. Permanent orbital stations are also to be widely used for economic purposes.

Research into the physics of the Sun, notably the study of the influence of solar processes on the Earth, is becoming more important and will be conducted with the help of terrestrial and cosmic apparatuses.

The research of the Moon and the planets with the help of automatic space apparatuses will be further extended in the next few years. The successful flights of the automatic stations "Venera", "Luna-16" and "Luna-17" have demonstrated the enormous possibility of robots for the study of the planets of the solar system. These researches will be extensively developed and will, undoubtedly, contribute greatly to our knowledge of the planets. The results of space research and the achievements of space rocket techniques open up possibilities for future interplanetary travelling. However, many complicated scientific and technological tasks have to be solved before this can be achieved.

It will be remembered that in recent years there have been major events in astronomy. The discovery of such remarkable objects as pulsars and quasars, the discovery of relict radiation, the infrared radiation of galaxies and X-ray sources have given a major impetus to intensive research into the structure and evolution of the universe, the galaxies and stars, to the discovery of

processes which may be connected with new forms of the existence of matter and laws of its transformation. It is essential to give every support to these researches: they are of major scientific interest and may eventually open up fundamentally new possibilities for the utilisation of the laws of nature. The research of our astronomers will be greatly facilitated by the utilisation of such new means as the six-metre optic telescope, the unique RATAN radiotelescope, means of extra-atmospheric astronomy, the station for the study of cosmic neutrino. Efforts should be concentrated on the utilisation of these facilities. I do not think that we should exclude further development of the experimental basis of astronomy, however, it should be developed only when the proposed projects open up fundamentally new possibilities. I feel that at present it is most important to concentrate efforts on key trends and to raise theoretical and experimental research to a higher level in order to make fundamentally new astronomical discoveries.

The 24th Congress of the CPSU emphasised once more the first-rank importance of the social sciences. An enormous role in their development belongs to the 20th and all subsequent Party congresses. The 24th Congress of the CPSU noted that in the past five-year period the Party's theoretical thought had been enriched by new conclusions and propositions on such important matters as the ways of creating the material and technical basis of communism, the raising of the effectiveness of production, the management of the national economy, and agrarian policy. Major attention was given to the development of the teaching about the Party. Fundamental questions pertaining to the development of the world socialist system have been worked out in collaboration with the fraternal parties, and new phenomena in modern capitalist society have been studied. The Congress emphasised the need for the further elaboration of topical problems of modern social development, notably of the questions of communist construction.

The Congress decisions summarised the theoretical activity of the Party, made a new major contribution to the development of Marxist-Leninist theory and outlined a broad programme of work in the sphere of the social sciences.

The network of establishments conducting research in the social sciences has greatly expanded in recent years. Our humanities institutes have conducted scientific research notably into the subjects enumerated in the decision of the Party CC of August 14, 1967 "On Measures for the Further Development of the Social Sciences and the Heightening of Their Role in Communist Construction". Developing chiefly these trends, the social scientists are to elaborate the topical problems of modern social development, defined by the 24th Congress, and to actively promote the solution of the economic, socio-political and ideological tasks laid down in the Directives.

Soviet economic science participated in working out questions linked with the extensive work carried out by the Party's Central Committee after the 23rd Congress to improve the management of the economy. The 24th Congress of the CPSU has declared that it is essential to continue the policy of improving the forms of economic management, of making plans more scientific, balanced and optimal. The Report of the CPSU Central Committee emphasised the responsibility of economic science in connection with the rapid development of our national economy, the new tasks Soviet economy has to

tackle to attain greater intensification. They make it necessary more fully to use material and moral stimuli for production development, to accelerate scientific and technological progress, to attain a growth in labour productivity and to improve the quality of output. Economic levers are to be more fully used to mobilise all available reserves, to promote a further improvement of the new system of planning and economic incentives.

The working out of economic problems linked with the increase in the rate of technological progress is of first-rank importance. The creation of conditions for more rapid technological progress makes it essential for economic science to solve such questions as the improvement in the structure of the national economy, the balance of plans, questions or priceformation, rent for natural resources, the system of crediting. Prices must to a greater extent stimulate the introduction of new equipment, the full implementation of the credit measures provided for in the decisions of the September (1965) Plenary Meeting of the CC CPSU. Conditions should be created that will make enterprises, as Comrade Leonid Brezhnev said, "literally hunt for scientific and technological innovations".

Recently the Academy of Sciences has intensified work in the field of long-term forecasting. Forecasts have been worked out for the development of a number of promising trends in science and technology in close connection with the development of the branches of industry. This is extremely important for national economic planning, for utilisation of the possibilities opened up by technological progress. Now it is necessary to give special attention to the working out of methods for the long-term forecasting of the country's general socio-economic development. Economic science should also concentrate its efforts on problems of the economic integration of the socialist countries, and of the economic and scientific and technological competition of the two world systems.

One of the most important prerequisites for the further success in the development of economic science is the extensive application of the latest mathematical methods and computor techniques to economic research.

Our philosophers, experts in judicial science and other social sciences face new tasks in connection with the important social changes in communist construction brought about by the unfolding scientific and technological revolution. They must rely first and foremost on concrete social research which should be considerably improved. The question of organising at the Academy of Sciences research on psychology, which also holds an important place among those problems, has yet to be resolved.

The extensive programme of socio-political measures, outlined in the Directives of the 24th Party Congress, will require an intensification of research work connected with the further improvement of the Soviet state and society, with the development of socialist democracy, with the carrying out of the proposed measures in the labour, educational and cultural spheres. One of the key tasks is to study the process drawing town and country together, and to work out scientific recommendations promoting the quickest elimination of the social and economic distinctions between them. Major tasks face the social sciences in connection with the need for an intensification of ideological work, as was noted by the 24th Congress of the CPSU. The social sciences,

first and foremost, philosophy and history, must expand research into questions of the Marxist-Leninist world outlook, ethics and the history of our country. It is essential to ensure a deep knowledge of history and the present state of affairs in all countries of the world, and of the processes at work in them and general tendencies of the world historical development.

The Congress emphasised the importance of literature and the arts at the modern stage of communist construction. This means that literary research and literary criticism should be closely linked with the solution of the social problems of today. Specialists in literature should give more attention to making their work more accessible and interesting to the general reader.

The Report of the CC CPSU says that some attempts to evalute the historical road of the Soviet people from non-party, non-class positions, to belittle the importance of its socialist gains, have been justly critisised. At the same time criticism was levelled also against dogmatic views, ignoring the great positive social changes in recent years. The experience of the past convincingly confirms that the overcoming of the consequences of the personality cult, and also of subjectivist mistakes, have had a favourable influence on the general political and, notably, on the ideological situation in our country.

At present a sharp ideological struggle is being waged in the world between imperialist reaction and the revolutionary progressive forces. Our social sciences must participate even more actively in the struggle for the victory of communist ideology throughout the world, against bourgeois ideology, hostile theories, such as the theory of convergence, against anticommunism and various revisionist trends. The Party has always emphasised that our struggle against bourgeois ideology must not be defensive but offensive.

I have touched here only on some of the tasks facing the social sciences. In order to successfully fulfill all the great tasks set to them by the 24th Congress we must raise humanitarian research to a higher level.

In the past five-year period the Party and the Government adopted a number of important decisions on the development of science. Among them is the decision to create new scientific centres in the Russian Federation. The Siberian branch of the Academy of Sciences already plays a major role in the development of Soviet science. In recent years the first steps have been taken to create a Far Eastern and Urals scientific centres, but much has still to be done to unfold the activity of the institutions in these scientific centres. It is extremely important to staff them with expert personnel. These centres must take a befitting place among our country's research institutions. The question is being discussed now of the measures that need to be taken in order to coordinate scientific research in the North-West of the country. At the same time we have to strengthen and improve the ties with the republican Academies.

The Decision of the CC CPSU and Council of Ministers of the USSR on questions of the effectiveness of science adopted in September 1968 is of great importance for raising the effectiveness of research and implementing its results in production as quick as possible. We should continue to concentrate our efforts on the solution of key problems.

There should be constant work to improve the qualificational standards of scientists, and a more critical approach should be adopted to the selec-

tion of personnel; we should make greater demands on our scientists and give more attention to raising their skills. The Congress spoke of shortcomings in that respect. More effective use should be made of competitions and the recertifying of personnel in order to improve the staffing of our institutes. This will be effective if a critical and principled approach is adopted. We should also train more scientific personnel at the post-graduate courses of the Academy of Sciences in order to staff research establishments in the provinces, branch institutes and higher educational establishments.

In recent years closer links have been formed between the institutes of the Academy of Sciences and industry. They are cooperating with factories and ministries in a number of programmes aimed at the solution of big scientific and technological problems.

I cannot fail to mention scientific instrument building—one of the decisive conditions for scientific success. Of late the work connected with the creation of new instruments has considerably intensified and greater facilities have been provided to scientific instrument building in our country. However, the development of that branch of industry still has many problems to resolve. This has been reflected in the Directives of the Congress.

We have scored definite successes in automating research. Automation is particularly developed in physical experimentation. Computerised experimental installations work in the institutes at Dubna, Serpukhov, in the Physico-Technical and Physical Institutes, in the Institutes of Crystallography and Biophysics, in a number of institutes of the Siberian branch, and so on. Owing to the great diversity of research, it is essential to create a unified system of standard units which will make it possible to combine computer installations with measuring apparatuses. The automation of research should constantly be given attention.

The decision of the Congress, that primary party organisations of research institutes, design offices and design organisations are to be granted the authority to control the administration, will greatly promote all research work. We hope that it will improve this work, raise its effectiveness and accelerate the practical utilisation of the results of scientific research.

The supreme aim of our Party's policy is to ensure a steady growth of the Soviet people's welfare. The extensive programme for the further development of the national economy on the basis of accelerated technological progress and the social and cultural measures envisaged by the Directives on the Ninth Five-Year Plan is directed towards the achievement of that aim.

The 24th Congress of the CPSU was an outstanding event in the life of our country, its decisions are of paramount importance to strengthening the positions of socialism, the international communist and working-class movement, to strengthening the progressive forces all over the world. The Decisions of the Congress are a new important landmark in our country's advance towards communism.

The Capitalist World: Its Basic Contradictions at the Present Stage. Interview with Academician N. Inozemtsev

As the 24th Congress of the CPSU noted, it is becoming even more obvious at the present stage that imperialism has no historical prospects. Capitalism's attempts to adapt itself to the new conditions are not leading to its stabilisation as a social system. On the contrary, the general crisis of capitalism continues to deepen; its basic contradictions are becoming sharper, the anti-monopoly struggle, the struggle against the entire system of exploitation and oppression, and for the revolutionary remaking of society is intensifying.

In an interview given to our correspondent, Academician N. Inozemtsev, a distinguished Soviet scholar known for his fundamental research on imperialism, discussed some questions concerning imperialism: its place in history, the specific features of the present development of state-monopoly capitalism, its basic contradictions which are becoming more and more apparent in the conditions of the scientific and technological revolution.

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Question: As is generally known, Lenin's profound, truly dialectical analysis of the changes in the economic and political character of capitalism at the monopoly stage of development led him to the conclusion that imperialism is the eve of the socialist revolution of the proletariat. He wrote in this connection: "Imperialism is a specific historical stage of capitalism. Its specific character is three-fold: imperialism is (1) monopoly capitalism; (2) parasitic, or decaying capitalism; (3) moribund capitalism." [1] Does present-day imperialism retain this three-fold character?

Answer: It certainly does. The monopoly nature of modern imperialism is even more evident today. Lenin's conclusion about imperialism's destiny is a striking instance of revolutionary optimism, of profound belief in the progressive character of social development, features that are intrinsic in Marxist theory. It was clear to Marxists that once capitalism's development on the ascending line was being replaced by its development on the descending line, that once over-ripe capitalism had become an obstacle to social progress, had plunged many countries and peoples into acute social crises,

[1] V. I. Lenin, *Collected Works*, Moscow, Vol. 23, p. 105.

into a world war with its attendant sacrifices and deprivations, this did not mean that mankind had come to an impasse. It meant that the historically obsolete socio-economic order, embodied in the system of capitalist relations, had come to a dead-end, that capitalism would inevitably be replaced by socialism.

The breach in the imperialist chain made by the Russian proletariat and its allies, under the leadership of the Bolshevik Party, the triumphal advance of the Soviet power, the victory of socialism in our country put an end for all time to the epoch of the complete and undivided rule of capitalism. Imperialism as a system was struck a blow from which it could not recover; there began the general crisis of imperialism. The most profound and graphic expression of this crisis is the coexistence, the competition, the struggle between the two world systems—the socialist and the capitalist. The facts show that this struggle exerted, and continues to exert, a strong influence on all the internal processes in the capitalist world, on the social and political antagonisms inherent in it; the cardinal changes in the balance of forces of the two world systems—this is the main thing that predetermined the main stages in the development of the general crisis of capitalism.

In our time the revolutionising impact of world socialism is closely interwoven with the impact of the scientific and technological revolution. This is only natural, for the scientific and technological revolution is inseparably linked with the social revolution which has become the banner of the 20th century; it is developing in conditions of the struggle between the two world systems, in close association with the great social changes of our day, and, above all, with communist construction in the Soviet Union, with the development of the world socialist system. The scientific and technological revolution engenders social consequences which undermine the very foundations of capitalism.

In the decades that separate us from the time when Lenin elaborated the fundamental tenets of the theory of socialist revolution these tenets have stood the most exacting of tests—the test of practice.

Graphic evidence of this are:

– The formation and development of the world socialist system, the successes of communist and socialist construction in the Soviet Union and in the fraternal countries; the transformation of socialism into a major factor in world economy and politics.

– The sharp increase in the numerical strength, the greater organisation and enhanced consciousness of the international working class; the tremendous upsurge of the world working-class movement; its substantial gains in the economic, political and social spheres, and an improvement in the living standards of the working people in many countries; the fact that the vanguard of the working class—the international communist movement—has become the most influential political force of our time.

– The unprecedented scope of the national-liberation movement; the collapse of imperialism's colonial system and the emergence of scores of new politically independent states; the active participation of the peoples of former colonies and semicolonies in public and world affairs; the socialist orientation of groups of developing countries; the intensified process of

class differentiation in some of the young national states, the big changes in the balance of social and political forces, the mounting struggle for economic independence and social emancipation.

– The deep-going changes in the economy of contemporary state-monopoly capitalism, which are leading to the further massive socialisation of labour, the expansion of the material basis for socialism; the sharp socio-political crises that have become chronic for many of the leading capitalist countries; the aggravation of the crisis of bourgeois ideology; the growing determination of the broad masses to put an end to the economic and political oppression of the monopolies, and the creation of favourable conditions for the establishment of broad antimonopoly coalitions; the unprecedented scope of the democratic movements and anti-imperialist struggle of the youth.

– The cardinal changes–under the influence of world socialism and the unceasing anti-imperialist struggle–in the whole system of international economic and political relations; the creation of the prerequisites for successfully resolving the key problem of averting a new world war, a problem that concerns the vital interests of all peoples; the implementation in international life, on an ever wider scale, of the principles of peaceful coexistence of states with differing social systems, noninterference in the internal affairs of peoples and recognition of their right to choose the social system that suits them, equality of all peoples and states; the development of international economic, and scientific and technological relations on mutually advantageous terms, the creation of more favourable conditions for utilising the advantages of the international division of labour.

In the past fifty years the process of the revolutionary reconstruction of society has advanced at seven-league strides. As a result, both the political map of the world and the face of most countries have changed completely. In other words, social development has greatly quickened its pace.

Imperialism is powerless to reverse the course of history, to recover its lost world positions and historical initiative. However, the fact that imperialism is historically doomed does not necessarily spell its automatic collapse. Imperialism was and continues to be a dangerous enemy. It possesses a tremendous economic and also scientific and technical potential which is rapidly increasing. It widely resorts to a policy of social manoeuvring and continues to hold under its ideological influence considerable sections of the population. It relies on a powerful military machine. "However, we Communists," stated L. I. Brezhnev at the 24th Congress of the CPSU, "are well aware that there is no room for passivity or self-complacency. The fighters against capitalist oppression are confronted by the last but the most powerful of the exploiting systems that have ever existed. That is why a long and hard struggle still lies ahead." [2]

Marxist-Leninists, the world communist movement equip the masses with a truly revolutionary programme of action and head their struggle, resolutely rebuff all kinds of adventurist theories, combat both Right and

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[2] *Report of the Central Committee of the Communist Party of the Soviet Union Delivered by Leonid Brezhnev*, Moscow, 1971, pp. 28-29.

"Left" deviations (in practice they often closely interlace), revisionism and dogmatism, all actions that weaken the anti-imperialist front.

Q: As we know, capitalism is trying in every possible way to adapt itself to the demands of the scientific and technological revolution, to use it to its own ends. How do you assess this process? How is the scientific and technological revolution affecting imperialism's main internal contradictions?

A: Yes, both the monopolies and bourgeois states are making the most of scientific and technological progress; without this it would be impossible, in general, to conceive of modern capitalism, that is, its most developed countries. They are paying paramount attention to science and the implementation, as quickly as possible, of its achievements in the economy, are liberally financing scientific research and the establishment of large scientific research centres (private and state), intensifying the automation of production, speeding up the development of its more progressive branches, are introducing fundamental structural changes in the economy. Parallel with this, processes are under way intensifying the concentration of production and the centralisation of capital, which create the necessary basis for reinforcing the regulation of the economy; major changes are taking place in management where the latest computer techniques are being introduced on an ever wider scale; the economic role of education is growing as also is the general educational and professional training of sizeable groups of the working people.

All this, naturally, is affecting economic growth rates–in the capitalist economy as a whole they have been much higher in the past 15-20 years than in the preceding decades–and the effectiveness of social production.

Imperialism is achieving certain successes–and not minor ones–in an effort to adapt itself to the demands of the scientific and technological revolution. This is a fact, and a very important one, predetermining the growing significance of such an area of the class struggle on a world scale as the competition between the two systems–the socialist and the capitalist–in the economic sphere and in the sphere of scientific and technological progress. This fact was brought out clearly and forcibly by the 24th Congress of the CPSU.

However, one cannot fail to see that under capitalism scientific and technological progress is used to intensify the exploitation of the working people, to strengthen the power of the monopolies; this in itself makes for the inevitable sharpening of class antagonisms in the capitalist world. At the same time, the facts show that capitalism's adaptation to the demands dictated by the objective laws of the development of the productive forces and the scientific and technological revolution, which is proceeding at a rapid pace, is possible only up to a certain limit determined by the very nature of capitalism, which engenders a number of profound contradictions. These are:

First, the contradiction between the vast possibilities opened up by the scientific and technological revolution for developing the productive forces, satisfying the material and spiritual requirements of society, and the mercenary, deformed use to which these possibilities have been put by the monopolies, and imperialism's utilisation of the achievements of science and technology for militaristic, aggressive purposes.

The result has been an ominously rapid leap in military research which has become an integral element of scientific and technological progress, lea-

ding to the creation of the thermonuclear weapon–a weapon of unprecedented destructive power–and the means of its delivery, in the first place missiles of all kinds. This means that as a result of imperialism's aggressive policy mankind is compelled to live under the threat of a thermo-nuclear holocaust. It also means that vast sums are diverted from vital economic and social projects.

Second, the growing contradiction between the imperative need, dictated by the scientific and technological revolution, to internationalise economic life, expand international economic, scientific-technical and cultural ties in the interests of all peoples, and imperialism's policy of hampering this. Graphic evidence of this is the widening economic gap between the highly developed capitalist states and the developing countries, which account for more than 70 per cent of the population of the non-socialist world.

One of the main reasons why the developing countries find themselves "by-passed" by the scientific and technological revolution, why they are encountering difficulties in obtaining scientific and technical know-how, up-to-date technology, is because imperialism wants to perpetuate the economic dependence of the said countries. The latter are finding themselves at an increasingly greater disadvantage, as compared with the developed states, in such an important indicator as per capita gross output. The role of the developing countries in capitalist world trade is decreasing. The outflow of money from these countries, extracted by the imperialist monopolies in the form of profits, is swelling–between 1965 and 1969 alone, it exceeded $30,000 million. The debt of the developing countries is growing; state debts alone totalled $50,000 million at the beginning of the 1970s.

Third, the ever sharpening contradiction between the new possibilities opened up by the scientific and technological revolution of using the riches and forces of nature, of remaking it in the interests of man, in the interests of society, and the threat of pollution to man's environment, connected with the domination of private property which is bent on gain, on profit-making to the exclusion of all else. The result of this domination is that there are ever more strongly being felt such negative consequences of scientific and technological progress as the thoughtless, irrational exploitation of natural resources, destruction of the external environment–pollution of water, land and air.

Fourth, the major contradiction between the requirements of scientific and technological progress and the whole way of life of modern capitalism. This is rooted in the domination of the military-industrial complex which distorts the very concept of progress, in the scientist's profound dissatisfaction with his place in a society where capital seeks to establish its control over science, to suppress freedom of research. It is dictated by the class, the social restrictions existing in education in the capitalist countries and which inevitably narrow the sphere from which science draws its personnel.

Lastly–and this should particularly be stressed–the fifth contradiction, which is growing more and more acute, the contradiction between the need to make the most effective, planned use of the vast and rapidly growing industrial, scientific and technical potential created by mankind–and this is possible only given public property of the main means of production and the planned development of the economy–and the anarchy, uneven development

of production, the economic instability immanent in capitalism.

Imperialism is trying to weaken this contradiction by stepping up state-monopoly tendencies, by turning a number of sectors of the economy into state sectors, by expanding state regulation and programming. As a result, the socialisation of labour, characteristic of monopoly capitalism even at its early stages, is proceeding on an unprecedented scale. But this means that the objective requirements, engendered by the scientific and technological revolution, by their very nature, clash with the private property principle, with the private capitalist nature of the bourgeois system.

Q.: Many bourgeois economists, sociologists and philosophers try to represent the current scientific and technological revolution as a factor that eliminates the inevitability of the revolutionary overthrow of capitalism. What is your view on this score?

A.: First of all, it should be noted that in their efforts to "outwit" history, which has passed inexorable sentence on capitalism as a system, bourgeois philosophers, sociologists and economists allege that modern capitalism is not at all capitalism in the Marxist sense, that it is a system which knows of no class antagonisms, that, in general, in highly developed capitalist countries there are no factors engendering social revolution.

However, the development of state-monopoly capitalism, although it has considerably modified capitalist society, has left its foundations intact. Developed state-monopoly capitalism continues to be capitalism with its inherent contradictions, especially the contradiction between labour and capital, and does not represent a social order that is fundamentally different from the old capitalism.

That is due to the fact that the monopolies–despite all the changes that have taken place in the process of the concentration of production and the centralisation of capital–continue to be private capitalist formations. The process of the accumulation of wealth at one end of the pole and of destitution at the other has not stopped; on the contrary, it has intensified as never before.

It is also due to the fact that there is no such thing as "pure" monopoly and state-monopoly capitalism. Even in the most developed capitalist countries there continue to exist, side by side with the powerful monopolies, tens and hundreds of thousands of middle, small and very small enterprises; alongside with the process of the concentration of capital, a process is under way of its dispersion among small owners; the merger of monopolies and the establishment of super-monopolies is accompanied by the break-up of many monopoly formations, the growth of state property–by the denationalisation of different enterprises.

Lastly, it is due to the fact that modern capitalism is not only a small group of highly industrialised powers. It is also tens of countries of average industrial development and many tens of economically underdeveloped countries; and sharp social contradictions exist in those countries where processes of impoverishment are under way, where mass hatred of exploitation and oppression is mounting daily, hourly.

Of course, it would be unrealistic to underestimate the effectiveness of some of the state-monopoly measures introduced by modern imperialism in

the economic sphere and in the sphere of internal policy and social relations. However, the facts show that the development of state-monopoly capitalism leads, in the final analysis, to the exacerbation of the main antagonisms of the capitalist system.

An analysis of the processes under way in the capitalist world shows that the scientific and technological revolution, causing deep-going changes in the development of the productive forces, is thereby engendering changes in the relations of production, in the alignment of class and political forces which, far from leading to the perpetuation of capitalism, as its apologists would have us believe, are leading, on the contrary, to the aggravation of its social and political antagonisms, are stimulating the class struggle, the growth of the anti-monopoly forces.

In the past few decades the polarisation of society in the capitalist countries has intensified: the expansion of the economic positions of the monopoly bourgeoisie and the strengthening of its political domination is accompanied by the growth of the working class and its allies, by the increasing activity of all anti-monopoly forces.

Scientific and technological progress stimulates the growth of the proletariat—the most numerous and organised detachment of all wage workers—the expansion of its composition, the inclusion in it of more and more sections of the working people. The 1960s were unmatched for the scope of the strike struggle, the content of the economic and political demands advanced by the working people.

A direct consequence of the scientific and technological revolution is the sharp increase in the number of mental workers, the growth of the intelligentsia, the rapid increase in the student body. In their material condition and position in society many groups of the intelligentsia are drawing closer to the working class, thereby creating increasing prerequisites for joint actions.

Under the impact of scientific and technological progress, which has greatly increased the intensity of agriculture, the proportion of the peasantry in the highly developed capitalist states is decreasing. At the same time, its class differentiation is growing and the anti-monopoly struggle in the countryside is intensifying as a consequence. The peasantry continues to be an important ally of the working class.

Scientific and technological progress is accompanied by a marked expansion of the service sphere, resulting in big changes in the position of the urban middle strata. The life itself brings the majority of small commodity producers into conflict with monopoly rule.

All this goes to show that the changes taking place in the social structure of the developed capitalist countries objectively promote the establishment of broad anti-monopoly coalitions.

The working people bear the brunt of the consequences of such chronic features of capitalism as the cyclical nature of economic development. Neither the growth of the monopolies, nor increased state interference in the economy, or programming and forecasting, have saved or can save capitalist production from slumps, crises, inflation. For nearly two years now the United States, the leading capitalist country, is experiencing a recurrent cyclical

crisis; there have been five economic slumps in the country in the period since the end of the war. At present, matters are made still worse by a sharp dollar crisis and inflation.

The scientific and technological revolution which in the beginning made for a certain decrease in unemployment (thanks to the appearance and rapid development of many new industries), has, since the second half of the 1960s, aggravated the employment problem. Particularly affected are the youth who lack the necessary training and skills, and elderly workers who cannot keep up with the increasingly strenuous pace of work, or whose skills are now outdated. Thus, a sharp contradiction arises between the rapidly growing demands for skilled and educated workers made by scientific and technological progress, and the capitalist system of general education and professional training, and the social and class barriers characteristic of this system.

Such are some of the consequences of the scientific and technological revolution from the viewpoint of the social structure and position of the working people in the developed capitalist countries.

Q.: I take it that there are other consequences, since the economy and social processes in real life are inseparably linked with politics. Would you please describe in what way the scientific and technological revolution exerts its influence on the politics of modern capitalism?

A.: It influences the politics of modern capitalism in different ways: through changes in the basis, which, in turn, bring with them changes in the entire superstructure, and also directly.

The scale of the economy today, the degree of its socialisation, the objective need for a more effective way of running the economy and, above all, for long-term planning—all these factors, which are closely linked with scientific and technological progress, intensify the tendency towards management centralisation, towards increasing the role of the state.

Of course, in conditions of imperialism it is not a question of some kind of abstract state power, and certainly not of some kind of "supra-class" body, as bourgeois ideologists maintain, but of a bourgeois state with a pronounced class character and embodying the political rule of monopoly capital. As for the latter, its characteristic inclination is towards reaction, the establishment of all kinds of reactionary regimes and dictatorships, towards devising more and more subtle ways of deceiving the masses. This inclination is buttressed by the calculations of many representatives of the ruling class that scientific and technological progress will give the powers that be additional possibilities to influence the masses not only with the aid of direct punitive measures, but also with the aid of biochemical, genetic and other means of manipulating the consciousness, of repressing the psychology.

It would be rash to underestimate the growth of Right tendencies in the political life of the imperialist states, which is connected with the intensified centralisation of the economy and management. However, this centralisation, effected in the interests of the monopolies and setting at nought the aspirations of the masses and the freedom of the individual, inevitably leads to the intensification of class conflicts,—of the spiritual crisis in the capitalist countries.

The antagonism between imperialism, which negates democracy, and the

masses, who aspire to democracy, is particularly intensely felt today. The mounting struggle for democracy, the sharp protest against all forms of social and national oppression, the unprecedented scope of the anti-imperialist actions of the youth–all this are as much integral features of the present stage of capitalist development as are the concentration of production and the growth of the monopolies, or the fusion of the monopolies with the state.

All this goes to show that the aggravation of the contradictions between labour and capital, which springs from the relations of property and material inequality prevailing under capitalism, is further exacerbated by the growing dissatisfaction of the masses with the whole way of life–dictated by monopoly rule and bourgeois morals–is accompanied by the protest against militarism and the policy of aggression. And such is the law of development that, as the scientific and technological revolution develops, these contradictions, this dissatisfaction, this protest, become more and more intense, draw more and more people into the struggle against imperialism.

We see this in the sharp socio-political crises that have shaken the developed capitalist countries in the past few years. A characteristic feature of these crises is that they occur even in conditions of relatively favourable business activity. This fact underscores the gravity of the situation that has arisen in the leading capitalist countries, the existence in them of a tremendous revolutionary potential.

The growth of the anti-monopoly forces is inseparably linked with the consolidation of their united actions, with the enhanced vanguard role of the communist and workers' parties.

Thus, despite the assertions of the bourgeois reformists and the revisionists, the scientific and technological revolution, far from leading to the perpetuation of capitalism, is leading to the reproduction–on an increasingly bigger scale and in more acute form–of the social antagonisms inherent in it. New contradictions are being added to the "old" ones. The anti-imperialist front of struggle is expanding. In the depths of modern capitalism, where the economic prerequisites for the transition to socialism have already accumulated, social forces are maturing capable of overthrowing the obsolescent social order and replacing it with a new one.

In conclusion I should like to note that the basic laws of historical development in the more than fifty years since the October Revolution, the dynamics of the struggle between the two world systems, which is proceeding in conditions of the rapidly advancing scientific and technological revolution, the picture of the capitalist world economy and capitalist politics today–all this confirms, again and again, the great vitality of the Marxist-Leninist analysis of imperialism and the theory of socialist revolution, the invincibility of the progressive social system–socialism, and the inevitability of the doom of capitalism.

Marxist Philosophy and Modern Natural Science (Materials of the Second All-Union Conference on Philosophy and Modern Natural Science)

December 1-4, 1970, Moscow was the venue of the Second All-Union Conference on Philosophical Problems of Modern Natural Science, held in the House of Scientists. The Conference, which was dedicated to the centenary of the birth of V. I. Lenin, was attended by more than 700 Soviet philosophers and naturalists, and by scientists from Austria, France, the People's Republic of Bulgaria, the Hungarian People's Republic, the German Democratic Republic, the Czechoslovak Socialist Republic and the Socialist Federative Republic of Yugoslavia. The Conference was sponsored by the Scientific Council on Philosophical Problems of Modern Natural Science under the Presidium of the USSR Academy of Sciences and the Institute of Philosophy of the USSR Academy of Sciences.

Until recently, philosophical studies in the natural sciences in the USSR centred on interpreting scientific theories already tested in practice, ascertaining their place in the system of knowledge, and their philosophical significance. Such studies were given a powerful impetus after the First All-Union Conference held in 1958. The philosophers and naturalists attending it (physicists, astronomers, chemists, biologists and scientists engaged in cybernetics) noted the importance of promoting the alliance of naturalists and Marxist philosophers studying the philosophical problems of modern natural science. Lenin, it will be recalled, stressed the need for such an alliance.

To coordinate philosophical studies in the natural sciences a special Scientific Council was formed under the Presidium of the USSR Academy of Sciences. The Council's members include leading Soviet naturalists and philosophers engaged in the elaboration of methodological and logical problems of the modern natural sciences in the realm of philosophy.

In recent years increasing attention is being paid to the new problems connected with the elaboration of the gnosiological, methodological and logical aspects of scientific research, with the emergence of new ideas, theories and methods in the natural sciences. These problems, the solution of which should contribute to the further development of the theory of materialist dialectics, were discussed at the Second All-Union Conference.

Its main objectives were: to sum up the results of philosophical studies carried out in the USSR in recent years in modern natural science; chart the course of further research; strengthen the links between Marxist philosophy and the natural sciences; critically to analyse the idealistic interpretations of

modern natural science. In their reports the participants of the Conference dwelt on the impact of Lenin's ideas on modern natural science, on how these ideas were enriched with the further development of science.

The Conference was opened by Academician M. Millionshchikov, Vice-President of the USSR Academy of Sciences. He was followed by Professor L. Gabriel (Austria), President of the International Federation of Philosophical Societies, who addressed the Conference with a message of greetings. Academician P. Fedoseyev, Chairman of the Scientific Council on Philosophical Problems of Modern Natural Science, made the concluding remarks.

Below we publish the opening speech by Academician M. Millionshchikov, the abridged text of the report by Academician V. Ambartsumyan and V. Kazutinsky, Cand. Sc. (Philos.), an article by M. Omelyanovsky, Corresponding Member of the USSR Academy of Sciences, giving the gist of his report, the report by Academician V. Fok, and articles by Academician V. Engelgardt and by Academician P. Anokhin, outlining the main ideas of their reports.

The reports by the late Corresponding Member of the USSR Academy of Sciences P. Kopnin, Academician B. Kedrov, Academician A. Alexandrov, and by V. Barashenkov, D.Sc. (Phys. & Math.), and D. Blokhintsev, Corresponding Member, USSR Academy of Sciences, are summarised, since articles by these authors on similar subjects were published in previous issues of our journal and in our other publications. We have not included here Academician N. Dubinin's report, since the main ideas of this report were expressed by him in his speech at the discussion on "Philosophical and Socio-Ethical Problems in Human Genetics", published in No. 3(5) of our journal.

We also publish here a detailed review of the discussion on the reports.

Academician M. MILLIONSHCHIKOV

Opening Speech

The need to evolve a world outlook, an integral idea of the world, has always been characteristic of man. The progress of science, which deepens our knowledge of the world in all its manifestations, constantly changes our ideas about it, establishes at times unexpected connections, engenders situations that at first seem paradoxical.

Today, when in various spheres of knowledge the principles of scientific analysis are constantly being perfected and its methodology further developed, a particularly important role is played by dialectical materialism—the philosophical methodological conception designed to show us the world as an integral whole, with the help of the harmonious system of the developing categories of the Marxist-Leninist philosophy.

Particularly relevant in our times is the thought expressed by Frederick Engels in his work *Ludwig Feuerbach and the End of Classical German Philosophy:* "With each epoch-making discovery even in the sphere of natural science it [materialism] has to change its form." [1]

[1] K. Marx and F. Engels, *Selected Works*, Moscow, Vol. III, 1970, p. 349.

Philosophical concepts are much broader and more general than the concepts of other concrete sciences. Only materialist dialectics, the concept of which, according to Lenin, must be "flexible, mobile, relative, mutually connected, united in opposites, in order to embrace the world", [2] can give a truly scientific philosophical generalisation of the achievements of modern science.

Philosophical generalisation, if it is truly creative, can, as we see from the brilliant examples of Lenin's analysis of the revolution in physics at the beginning of the century, have a tremendously invigorating effect on the intellectual climate of the epoch, can open up new possibilities for creative activity in scientific theory and practice.

The task facing our philosophers and representatives of the natural sciences–that of further developing the categories of materialistic dialectics, which are the methodological basis for a vast number of concrete scientific laws and conceptions–can be accomplished only given an alliance of philosophy and the natural sciences. The complex and acute philosophical problems the natural science today pose can successfully be solved by the joint efforts of philosophers and naturalists.

The many-years' creative collaboration of philosophers and representatives of the natural sciences in the Soviet Union has its sources in the profound interest of naturalists in philosophical questions, on the one hand, and the constant striving of Marxist philosophers to generalise the latest achievements of the natural sciences, on the other.

Despite the distorted interpretations in the past of this alliance, which caused a certain amount of harm to the development of new scientific trends and to the elaboration of the philosophical problems of the natural sciences, this alliance has stood the test of time. Striking evidence of this is the composition of the present meeting, among whose participants are many eminent scientists who have made a significant contribution not only to the further development of the concrete sciences, but also to evolving a number of important philosophical questions of the natural sciences.

When speaking of the importance of the alliance of philosophy and the natural sciences it should be remembered, it seems to me, that its purpose is to further the successful solution of general methodological questions, so that philosophy would not replace the natural sciences, and the latter philosophy.

Mutual understanding between philosophers and naturalists, the ability to distinguish between the truly philosophical problems of natural science and those which come within the competence of the natural sciences, are one of the main conditions making for fruitful work in the philosophical sphere of the natural sciences.

Lenin gave us brilliant examples of such an approach. He showed that confusion of philosophical and physical questions underlay the criticism of materialism on the part of representatives of various idealistic philosophical trends, who in their arguments proceeded from the state of physics at the time. The elevation of some propositions of natural science to the rank of

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[2] V. I. Lenin, *Collected Works*, Moscow, Vol. 38, p. 146.

philosophical truths or, the other way round, opposing them to the basic propositions of Marxist philosophy, runs counter to the fundamentals and spirit of Marxist philosophy.

Being a genuinely scientific philosophy, dialectical materialism does not come into conflict with concrete scientific discoveries; on the contrary, they further enrich it.

Such an alliance of philosophers and naturalists is an essential condition to the success of the struggle against antiscientific views, against manifestations of idealism and metaphysics. It will enable our philosophy more effectively to influence the way of thinking of naturalists in the West. Leading scientists of the West are, for the most part, either conscious, or spontaneous materialists. However, when interpreting the known laws of nature they often make concessions to idealism. In our age when science is playing an increasingly bigger social role, when scientists directly participate in the solution of issues of concern to all mankind, the participation of representatives of the natural sciences in evolving the philosophical principles of the Marxist outlook is particularly important.

V. AMBARTSUMYAN,
Academician,
V. KAZYUTINSKY,
Cand. Sc. (Philos.)

The Problem of Methodology and Logic in the Development of Natural Science Today

Developing at an ever increasing rate, modern natural science expands and deepens our knowledge of nature, and inhances man's power over it. However, nature is invariably much deeper and much more multiform than the natural scientific views on it at every given moment, and this insistently compels us to improve our knowledge about it.

The progress of natural science has posed a number of fundamental theoretico-cognitive, methodological and philosophical questions around which sharp controversy rages between various philosophical trends. Lenin analysed these questions in his *Materialism and Empirio-Criticism, Philosophical Notebooks, On the Significance of Militant Materialism* and other works. He proved that the idealistic and metaphysical interpretations of the natural science of the early 20th century were untenable, and showed that materialist dialectics was the only philosophy adequate to the requirements of the contemporary development of natural science. The further development of this science has brilliantly confirmed Lenin's conclusion.

I

The constantly growing role and importance of the natural sciences in social life is a major feature of our time.

The fundamental and applied sciences are drawing closer together. The scientific experiment is being industrialised. The natural sciences and technology are forming closer ties. Science has become a direct productive force, influencing all aspects of social development. The forms of organisation of research in the natural sciences have also changed. Research has become the business of big groups of people which could be described as "factories" for the extraction of knowledge about nature. The development of the natural sciences is leading to a rapid increase in our knowledge about nature and making that knowledge even more complicated.

The sweeping revolution that began in physics at the turn of the century and later extended to the other natural sciences, notably to astronomy and biology, is still proceeding. It is in these fields that we are constantly faced with the most acute "problematic situations", evoked by temporary crises in our views on nature. Such situations, making it necessary to advance fundamentally new conceptions and theories, to amend and deepen the picture of

the world presented by natural science, have given powerful impetus to the progress of the natural sciences.

The revolution in physics, that took place in the first half of the 20th century, was crowned by a special and general theory of relativity and quantum mechanics. These new theories seemed at first so unusual that their establishment in science was figuratively called "the strange world's inevitability".

Later on, the fundamental theories of modern physics and the methods of study based on them were concretely applied to many branches of science. Their application in various branches of the natural sciences (chemistry, biology, etc.) and technology was extremely fruitful and led to rapid scientific progress, to the emergence of fundamentally new conceptions, which is rightly considered as a continuation of the revolution in modern natural science.

The fact that the outstanding achievements of the natural sciences in the past three decades were scored through the application of the already existing, fundamental theories, and not through the creation of new ones, has developed in some researchers a certain feeling of complacency. They believe that all (or almost all) fundamental natural laws have already been discovered and that all that is left for us to do is to apply them to the study of various phenomena.

Research, however, leads to quite unexpected results, reveals an endless multitude of new "bizarre" phenomena. The fields in which the most surprising discoveries are being made now, discoveries which require (or may require) a deep and far-reaching reappraisal of our views on nature, are the physics of elementary particles and, to an even higher degree, astronomy.

Heretofore unknown objects–galactic nuclei, quasars, etc.–have been recently discovered in the universe. Attempts to characterise them within the frameworks of the fundamental physical theories at our disposal encounter enormous difficulties.

Deep changes are being wrought also in the ways and means by which we advance towards new frontiers of knowledge.

Firstly, the relation between experience (experiments, observations) and theory has become more complicated. The way from experience to the construing of a theory now sometimes requires a great many intermediate and mediating stages and links. It has become possible to give different interpretations to identical empirical data, which can often be understood on the basis of very different (including mutually exclusive) notions. At the same time, the construction of new scientific theories requires that, in addition to empirical data, various (and often very complicated) theoretical notions should be drawn from the existing system of knowledge.

Secondly, and this is no less important, the paradoxical, critical "problematic situations" that emerged in the different natural sciences excluded the possibility of a stereotyped approach to their solution by a simple application of existing methods and principles; and the "bizarre" conclusions arrived at as a result of the solutions to such situations often cast doubt on their veracity and well-foundedness.

The above tendencies in the development of modern natural science have

posed many questions requiring a philosophical analysis, questions which are on the fringes of natural science and philosophy. Every fundamental step in the development of such sciences as physics, astrophysics and biology was linked with the solution of such questions. The sharper the relevant "problematic situation" was and the more resolutely the new theories, being forced upon us by nature, broke with generally accepted views concretising and generalising them, the more urgently the problems arising in this context called for a philosophical analysis.

The methodology and logic of scientific research (especially in untraditional situations, when fundamentally new problems have to be solved) and also the logic of the development of natural science in general, hold pride of place among the philosophical problems confronting natural science today.

II

The ascertainment of the relation between empirical and theoretical factors in the construction of theories describing the regularities in the different fields of nature is a matter of no little importance.

Various idealistic trends in modern philosophy approach this problem one-sidedly: they exaggerate some factors and ignore or underestimate others.

The positivists have sharply accentuated the increased role played by empirical data in the study of nature. Experience has led to the rejection of a number of seemingly "unshakable" views held by classical science, such as the indivisibility of the atom, absolute space and absolute time, the universal applicability of Laplace's determinism, etc. This has proved that basic scientific concepts are far from being something *a priori*. But the positivists have not confined themselves to establishing the collapse of apriorism. They have gone much further and done everything to minimise the role of the existing system of knowledge (notably of philosophical ideas and principles) in the synthesis of new knowledge about nature. [1]

On the other hand, there have also been jealous defenders of the *a priori* origin of fundamental concepts and of the theories of modern natural science. A. S. Eddington, for example, writes that while the idea about the possibility of an *a priori* knowledge in natural science has always been anathematised, genuine science begins when the mind prescribes laws to nature and does not borrow them from it. Eddington says that "all the laws of nature that are usually classed as fundamental can be foreseen wholly from epistemological considerations". [2] Experience, from Eddington's point of view, is always a hopeless "debtor" of theory. Eddington likens the physicist to Procrustes with his notorious bed. [3]

The dilemma of "apriorism or empirism?", around which a controversy rages to this day, is fallacious from the viewpoint of materialist dialectics. The

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[1] See, for example, the articles by Philipp G. Frank, Hans Reichenbach and others in the collection: *Albert Einstein: Philosopher-Scientist*, ed. by P. Schilpp, Evanston, 1949.

[2] A. S. Eddington, *The Philosophy of Physical Science*, Cambridge, 1939, p. 57.

[3] See A. S. Eddington, *Relativity Theory of Protons and Electrons*, Cambridge, 1936, p. 329.

study of nature is impossible without the use of experimental data just as it is impossible outside the available system of knowledge which is to the researcher relatively *"a priori"*; by accumulating preceding experience it participates in the research to some extent independently of the researcher.

Empirical data, certainly, play an exceptional role in the creation of scientific theories, including the fundamental theories of modern physics. Quantum mechanics is a vivid example. Perennial and exceedingly difficult research of atom spectra and of phenomena on an atomic scale were needed; and before the new mathematical formalism and the basic physical principles of the quantum theory could finally be formulated, all attempts to understand these phenomena on the basis of semi-classical views (including also of Bohr's atomic model) had to fail.

That the theories of modern natural sciences are not evolved wholly on the basis of some *a priori* principles is clearly proved by the following generally known fact: most of the important discoveries were made by natural scientists quite unexpectedly. These discoveries were not predicted on the basis of the existing system of knowledge, and in a number of cases could not be adequately explained a long time after they had been made.

However, recognition of the enormous role of empirical data in the construction of theories of modern natural science, naturally, gives no grounds to belittle or underestimate, as the positivists do, the role played in the synthesis of new scientific conceptions by the existing system of knowledge. The theory of relativity and quantum mechanics, which the positivists regard as having been built by the method of "pure empirism", could not have actually been construed without a thorough analysis of a number of fundamental physical concepts. It was in the course of such an analysis that the non-classical conceptions of space, time, causality, etc., were worked out in line with modern physics.

In a certain sense Eddington's comparison of the natural scientist with Procrustes is justified. All natural sciences study their objects subjectively—they proceed from the viewpoint of human practice, of its needs, interests, etc. The natural scientist has to do directly with the fragments, sides and aspects of nature that have intruded into the practical sphere. Their regularities do not lie on the surface of observed phenomena. Trying to grasp these phenomena, the researcher throws over them the theoretical "net" he has at his disposal. Thus, an attempt is made, as it were, to fit the aspects of nature being studied into the "Procrustean bed" of the researcher's theoretical possibilities.

However, this is only one side of the matter. We must not forget that nature, on its part, not only "prompts" us, but most insistently imposes on us the methods of describing reality, and also the regularities of the empirical and the theoretical levels of knowledge, including fundamental physical theories. And if it turns out that a description of at least a few recently discovered phenomena in the universe requires a generalisation of the known fundamental physical theories, we shall obtain one more argument against Eddington's views about the "apriority" of these theories.

Thus, although he perceived the real feature of the modern study of nature—the intensification of the researcher's activity—Eddington failed to under-

stand its true meaning and drew as a result a number of extremly subjectivist conclusions.

Albert Einstein gave much attention to the problem we are discussing. While attaching great importance to facts in construing physical theory, he believed that facts by themselves, irrespective of their number, cannot account for the elaboration of such theories as, for example, the general theory of relativity. "A theory can be tested by experience, but there is no way from experience to the setting up of a theory," [4] Einstein said. He often repeated that view.

Einstein was quite right when he emphasised that the fundamental theories of modern physics were not deduced from empirical data in a purely inductive manner; naturally, they were elaborated in a much more complicated way. Intuition plays a most important role in such cases. But if there is no formally strict one-way road from experience to theory, this does not mean that the road from experience to theory is absolutely indeterminate. In addition to intuition, the setting up of a natural scientific theory greatly depends also on the factors whose role can be easily analysed methodologically. These are: 1) empirical data; 2) theories, general theoretical ideas and principles of the relevant science; 3) the picture of the world presented by natural science; 4) mathematical considerations; 5) philosophical categories, principles and ideas. There is no algorithm that makes it possible to build up some theory proceeding from the enumerated factors, yet they limit the "arbitrariness" of researchers so much that a theory literally cannot be considered "a free creation of the human mind", as Einstein said.

Thus, despite the rational points, contained in Einstein's view on the ways leading to the setting up of a physical theory, it suffers from a definite one-sidedness, not to mention the fact that its main ideas have been formulated not quite well.

Materialist dialectics constitutes the basis for a profound, comprehensive analysis of the general methods for construing theories in natural science.

From the viewpoint of materialist dialectics, the cognition of nature (as all cognition in general) is the creative activity of the subject directed at reflecting reality according to its own laws.

Materialist dialectics proceeds from the assumption that empirical data, and also various layers of the theoretical level of knowledge, participate in the synthesis of new knowledge. The role of these factors, naturally, differs in the various natural sciences, at different stages of their development and at different stages of research; in taking account of them the researcher proceeds in every concrete case from the essence of the task he has to work out. In some cases empirical data are advanced to the foreground, in others the main role is assigned to philosophical considerations (in close relation with other factors, of course). However, only an understanding of the importance of all these factors keeps the researcher from a one-sided approach.

Within the framework of materialist dialectics there are different approaches to an analysis of some concrete aspects of the problem under examination. They concern mainly the question about the relative role being

[4] *Albert Einstein: Philosopher-Scientist*, p. 89.

played in the synthesis of new knowledge by empirical data and different layers of the theoretical level of knowledge, and also the question of the logic of building theories in natural science.

The view is sometimes expressed that the relative role of empirical data in the synthesis of new knowledge has decreased, while the role of the existing system of knowledge has grown. To substantiate that view it is said that in the past experience generally preceded new theories, whereas now the position is said to have changed. In modern natural science (we have in mind mainly physics) theory has attained such a state of maturity that experience is often but a stage in the test of theoretical constructions, advanced by the logical development of theory itself. On the other hand, one often hears the directly opposite view—that the role of experience in the building up of theory, far from decreasing has in fact considerably increased.

The assertion that ever fewer hypotheses are advanced which can be regarded as a direct generalisation of experimental data cannot be proved conclusively. Firstly, nobody has ever made any computations of that sort. Secondly, the theoretical views and models evolved by classical natural science have often been based on the principles of mechanics and only afterwards compared with experimental data.

We have already mentioned that facts played an enormous role in constructing quantum mechanics. Let us now turn to astrophysics, another field of modern natural science.

Astrophysics possesses a number of specific features distinguishing it not only from the other natural sciences, but also from other branches of physics. The empiric basis of astrophysics are facts observed, not experimental facts. When the physicist encounters a new and as yet unexplained phenomenon, he generally repeats his experiment to establish the connection between the phenomenon and the conditions in which the experiment is conducted. He is able not only to study these conditions comprehensively but also to change them. This does not apply to astrophysics. When we run up against an unusual phenomenon, we are neither able to control the external conditions in which it took place, nor to repeat it at will. Sometimes we do not even know these conditions. For this reason astrophysical research in most cases goes through three stages: 1) observation; 2) interpretation of a phenomenon—the elucidation of what is taking place in the object under observation, and 3) the setting up of a complete theory of the phenomenon, including an explanation of its cause. Let us give a few examples to make this clearer.

Astronomers were interested in the flare-ups of novae, or "new stars", as early as in the last century. It was found that a flare-up is linked with an increase in the light output of some formerly obscure weak star. The hypothesis, naive from the viewpoint of our present knowledge, was advanced according to which a flare-up is produced by the collision of two stars. Further data, accumulated as more flare-ups of new stars were observed during the first half of the 20th century, led to the decisive rejection of that hypothesis. It turned out that we have to do with a rapid, almost instantaneous emission of energy by the star, with an outburst. As a result the substance of the external layers of the star is ejected into ambient space. A gas shell forms around

the star; by extending it forms a nebula, which continues to expand and disperse.

Thus, perennial research made it possible to understand what is happening during a flare-up. But we still have no theory to explain the cause of the flare-up. Attempts to evolve such a theory by "jumping over" the second stage of research have failed.

Curiously enough the methodological mistake made in its time in the study of new stars was repeated in the second half of the 20th century, when galaxies emitting radio waves were discovered.

In 1952, the US astrophysicists W. Baade and H. Minkowski demonstrated that some point sources of cosmic radio waves were galaxies. They tried to explain the phenomenon they had discovered by the hypothesis that a radio galaxy is the result of a collision of two galaxies which contained a big mass of gas prior to the collision. Almost immediately after its publication that hypothesis was thoroughly analysed by the Byurakan observatory. It was demonstrated that the probability of almost head-on collisions, which the hypothesis postulated, was much too small to explain the great number of radio galaxies observed. Besides, radio galaxies are nearly always supergiants and the cause of the emergence of intensive radio emission should, therefore, be sought within the galaxy and not in external factors such as collisions.

At present it can be considered proved that the transformation of an ordinary galaxy into a radio galaxy–its radioactive flare-up–proceeds as a result of an *ejection from the galaxy's nucleus* of enormous clouds of relativistic electrons. Moving in a magnetic field they intensively emit radio waves. The ejection of a cloud proceeds in a relatively short time and the entire phenomenon is, therefore, a colossal outburst during which an energy of the order of $10^{60} - 10^{62}$ ergs is emitted. These are the biggest explosions observed in nature. This is how the modern view about the *activity of the nuclei* of galaxies has emerged–a view which has very serious implications already now.

Let us give one more example. Until very recently there existed different, contradictory and often mutually exclusive hypotheses about the structure of the lunar surface and the origin of the specific features of the lunar topography. They relied on indirect data, and for a long time could not be substantiated sufficiently. It was only when automatic stations and spacemen landed on the Moon that direct tests could be made to check the correctness of our views on the nature of the Moon. Undoubtedly, the factual data obtained from the direct study of our satellite will lead to the advancement of new and more realistic theories about the Moon, which will throw light also on many other puzzles of the solar system.

The above examples, naturally, do not exclude the growing role of the physico-theoretical and mathematical premises in astrophysical research. If there is a sufficiently well worked out theory (for example, the theory of stellar atmospheres), it becomes a reliable instrument for an analysis and generalisation of facts. Yet, these examples do show that the diminishing of the role of empirical data in modern natural science is out of the question.

A lively debate centres around the question of the role played by materialist dialectics in the scientific search, in the synthesis of new knowledge.

Does philosophy still provide natural science with new ideas as it did before, or did it lose that role when Naturphilosophie collapsed? Does philosophy affect the study of nature only through the picture of the world given by it, and the mode of reasoning based on it, a mode that is peculiar to the given stage of scientific development, or does it give more direct assistance by helping the scientist find his bearings even in situations emerging at the empirical level of research?

It is often believed that theoretical natural science has reached a degree of maturity when it can, in the main, formulate its basic ideas without the help of philosophy. Any other view on that question is regarded as a return to Naturphilosophie.

Naturally, attempts at a speculative construction of scientific theories by their deduction from "pure philosophical" ideas has long since been rejected by modern science. But the philosophical ideas of atomism, causality, development and many others have lost none of their methodological meaning even now. They participate actively in the synthesis of new scientific ideas, in close relation with empirical and theoretical data formed in the relevant field of natural science. The heuristic role of philosophical categories, principles and ideas is manifested at all levels of natural scientific research.

In recent years we have clearly seen the heuristic role played by materialist dialectics in the synthesis of the modern scientific picture of the world.

Philosophy also played an important role in the setting up and development of the fundamental theories of modern physics. Just as physico-theoretical considerations help us to choose a definite type of equations for the mathematical apparatus of a theory, philosophical considerations help us formulate the principles which are subsequently used in the theory's physical interpretation.

Philosophy often also "cooperates" in the working out of theories describing the regularities of complex phenomena on the basis of our knowledge of the fundamental laws of nature, and in many cases even at the empirical level of research.

It is the dialectical conception of development in combination with a thorough analysis of factual data that enabled us to formulate the idea that non-stationary objects in the universe are legitimate phases of cosmic evolution. It will be remembered that in characterising the dialectico-materialist conception of development, Lenin drew particular attention to the source of development. He emphasised that all phenomena in the world act as a unity (identity) of opposites. This means a "recognition (discovery) of the contradictory, *mutually exclusive*, opposite tendencies in *all* phenomena and processes of nature". [5] Each side of a single whole is able to transform into its opposite; opposites turn into one another; the interaction, "struggle" of opposites is the source of development.

When analysing the problem of non-stationary objects in the universe from the positions of the dialectical conception of development, we unwillingly arrive at the conclusion that the traditional interpretation of these objects

[5] V. I. Lenin, *Collected Works*, Moscow, Vol. 38, pp. 359-360.

as some sort of degenerates, as deviations from the normal ways of cosmic evolution, is erroneous. In opposition to this long-standing and generally accepted view, a new conception was advanced according to which non-stationary objects are turning points in the development of cosmic bodies and systems. Here quantitative changes lead to qualitative ones—to the transition of a cosmic object from one state to another, or to the emergence of new objects.

The example given above should not be regarded as something exclusive. Even in astronomy, not to mention the vast number of other natural sciences, we could point out many cases when materialist dialectics has determined the methodology and logic of the scientific search for a solution of concrete problems of fundamental importance.

Does the synthesis of new knowledge in natural science involve the use of the whole system of philosophical categories or do only some of them have special importance?

A look into the synthesis of any fundamental scientific theory shows that the group of categories corresponding to the natural scientific conceptions that are the basic ones in the given theory has always been advanced to the foreground. For example, in elaborating the special theory of relativity Albert Einstein used chiefly such categories as matter, space, time and motion. In creating quantum mechanics the decisive place belonged to different philosophical categories: causality, necessity, chance, possibility and reality. Particularly important to cosmogony is the category of development and other categories directly linked with it.

It should be noted that in the synthesis of new knowledge philosophical views are used in many cases not in their general philosophical form, in which they are abstracted from their concrete content, but are modified in accordance with the specific features of the objects being studied. For example, in astrophysics the principle of the unity of the world and the principle of development, which, in the final analysis, form the basis for different approaches to the study of the Universe, are used in two different forms. One of the concrete forms assumed by these principles is the view that all objects and processes studied by astronomy can be described on the basis of a limited number of fundamental physical theories. The adherents of such views assume that phenomena, say in the world of galaxies, represent nothing qualitatively new as compared with phenomena in the systems of a smaller scale: they are described by the same physical laws.

According to another view on the unity and development of matter, every level of the material world has its own structural and evolutionary regularities. Fundamental physical theories, those known and those yet to be created, can essentially be applied only on a limited scale. The unity of the world is linked with an endless multiformity both as regards the level of phenomena and the level of laws.

The above differences in the concretisation of the dialectico-materialist principles of the unity and development of matter have led to differences in the logic of research—the selection of different facts, considered essential to the building of a theory, to different ways of their analysis and generalisation.

All this has resulted in the emergence of different views on many problems connected with the structure and evolution of the Universe.

Thus, in natural science as a whole we have a sharp intensification of the role of experimental data and also of theoretical considerations, including special theories relating to the subject of the given science; this is only logical if we consider the considerable growth of the complexity of the objects and processes modern natural science has to deal with.

In recent years there has been a tendency to revise the view that in the final analysis theory is a generalisation of empirical data.

In emphasising that the elaboration of theory is not purely inductive, but is much more complex, some authors consider as obsolescent the view that theory emerges as a result of the generalisation of empirical data. Others say that while the building of theory is extremely complicated, it should nevertheless be regarded as a generalisation of empirical data. Only the concept of generalisation should not be understood too literally, by reducing it to induction alone. The latter point of view seems to be correct.

Naturally, in most cases the logic of the building of a theory cannot be reduced to a movement following the pattern: experience–theory. Of necessity it includes a comparison and comprehensive analysis of empirical data, the elaboration and analysis of different hypothetical variants explaining empirical data, and comparison of these variants with experimental data, and also between themselves. This can only be achieved by using, in addition to inductive, also deductive methods of reasoning, which may intertwine in a peculiar fashion. Experience gives an impetus to the building up of a theory, but it emerges within the framework of the theoretical level of knowledge. In cases when there is a special theory able to explain empirical data, this explanation is built up of the elements of already existing theoretical notions. If the analysis shows that the existing notions are insufficient and clash with the facts, new (if necessary, fundamentally new) notions are elaborated within the framework of the theoretical level of knowledge. The emergence of both, the former and the latter, is stimulated by empirical data, and they are elaborated so as to interpret and explain these data, and to include them in the system of knowledge. That is why the view that theories and theoretical notions are in the final analysis a generalisation of factual data fully reflects the essence of the matter. It should be remembered, however, that the forms of such a generalisation may differ greatly.

A new theoretical view can emerge as a more or less direct explanation of empirical data. For example, the modern views on the origin of stars and stellar systems were created in that way. Research led to the conclusion that stars emerge jointly, in groups. These groups are at first comparatively compact, but many of them are unstable and gradually disperse. Naturally, it was essential to check first how these facts were explained by classical conceptions about the condensation of stars from rarified diffused matter. It turned out that even if we stretch these classical views to the utmost, they encounter unsurmountable difficulties. The system of stars that have emerged as a result of the condensation of rarified gas should have been relatively stable, but this is not borne out by observation. This made it essential to seek fundamen-

tally new explanations. [6] An alternative hypothesis assumed that stellar groupings emerge as a result of an explosive fragmentation of dense and superdense protostars. A comparison of those hypotheses with the facts and between themselves showed that there were empirical data unexplainable from the viewpoint of the first hypothesis but natural from the viewpoint of the second. This provided further arguments which led to the rejection of the classical views, even though there is as yet no fully elaborated and comprehensively founded theory based on "unorthodox" ideas.

However, if a theory embracing all the regularities in some field of natural phenomena has already been set up, new theoretical views can be worked out on the basis of the inner logic of the development of that theory. Many such views were, for example, formulated as the corollaries of quantum mechanics. All of them were eventually substantiated by experiments. Should that be taken to mean that now, in addition to the building of a theory on the basis of a generalisation of empirical data, there has emerged also a different, opposite, way, no less legitimate than the former? To answer that question we should remember that quantum mechanics emerged as a generalisation of experimental data. Since theory as an integral system is something more than simply an abbreviated registration of facts, it is not surprising that theory is able to transcend the limits set by the phenomena, through the generalisation of which it was evolved. However, the possibility of a relatively independent development of theory is only one of the stages in the development of the theoretical level of knowledge, which, despite all its zigzags, now, as before, is a process of the *generalisation* of empirical data.

III

The logic of the development of modern natural science is an extremely many-faceted problem. We shall touch upon only two questions here:

1) does the development of natural scientific knowledge lead to a more adequate reflection of objective reality?

2) does an analysis of the logic of the development of modern natural science warrant the conclusion that we are advancing towards the creation of an all-embracing and more or less complete picture of the world?

The positivists deny the tendency towards the ever greater objectivity of natural scientific knowledge. They consider that any theory is but a short stenographic report of empirical data. Today we know of one aggregate of empirical data and build a theory on their basis, tomorrow new data appear and our theories have to be amended accordingly. It would be senseless to ask whether the new theories are closer to objective reality than the preceding ones were. Modern natural scientific theories, the positivists aver, are as well-founded as Aristotle's teaching seemed in his time. Some foreign naturalists and philosophers who hold even more extreme views say that as natural scientific knowledge develops the element of subjectivity grows ever stronger

[6] See V. Ambartsumyan, *Scientific Works in Two Volumes*, Vol. 2, Yerevan, 1960 (in Russian).

in it. It would thus appear that the advance of natural science drives an ever deeper wedge between nature and the researcher.

The true course of scientific development fully refutes these views; it gives more and more proof of the correctness of Lenin's propositions about the relationship between objective, relative and absolute truth. That our knowledge of nature is not locked in a shell of its own, that it reflects with increasing accuracy the true features of nature, can be seen from the unexpectedness, the extraordinary nature of the discoveries in modern natural science and the fact that many of the scientific conclusions of today cannot be visualised. Man's ability to visualise the essence of phenomena is determined by the specifics and conditions of his cognition of the environment. The phenomena he studies, however, exist independently of his consciousness, and therefore must not necessarily be perceivable from the human viewpoint. The above considerations apply fully not only to some natural phenomena but also to the ever more profound regularities characterising nature, regularities formulated by the various natural sciences at the empirical and theoretical levels of knowledge. That these regularities, in their turn, often are unusual only goes to show how insistently nature makes us reject our conventional notions, which have turned out to be much too rough approximations of objective reality, and introduce new and more adequate ones.

What are the prospects of construing a single natural scientific picture of the world? There are two viewpoints on that question. One proceeds from the existing tendency towards the ever greater unity of natural scientific knowledge. On this basis it is believed that we can, proceeding from the fundamental laws of modern physics, build a complete (naturally, only in general outline) natural scientific picture of the world, i.e., that the entire aggregate of natural phenomena–physical, astrophysical, chemical, biological, and other phenomena, which have already been discovered as well as those which have as yet not been discovered–can be reduced to these laws. A modification of this viewpoint says that the unity of the natural scientific picture of the world is unattainable within the framework of already known theories but that after the construction in the near future of a "single physical theory", including gravitational, relativistic and quantal phenomena, this will become feasible.

Even though the idea that an endless number of natural *phenomena* can be understood on the basis of a limited number of fundamental laws and theories should not be fully discounted in principle, the development of modern natural science indicates that it is inadequate. The laws of nature are also infinitely multiform. Whatever general and "final" laws describing the properties of matter we establish, it seems likely that they will always be applicable only within certain limits. Hence, any single natural scientific picture of the world will be no more than a relatively complete theoretical synthesis of knowledge, and as further research of nature is made, it will be replaced by a new, more general and more precise but always only relatively complete "single pictures of the world". In our view, a consistent understanding of the principle of the inexhaustibility of matter leads to such a conclusion.

We have examined a few questions linked with the application of materialist dialectics to the natural sciences. But even the above shows that it

plays a major role as the methodology and logic of the development of modern natural science. This fully disproves the assertion that materialist dialectics is "outdated". Not being a dogma or universal recipe, it is a method of reasoning that gives interesting and fruitful results, notably in the study of nature. This is because materialist dialectics develops and grows richer on the basis of a generalisation of human practice and knowledge. The further development of materialist dialectics through the achievements of modern natural science is a topical and important task.

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Lenin and Problems of Dialectics in Modern Physics

DIALECTICS IN MODERN NATURAL SCIENCE

Modern, or non-classical, physics sharply differs from classical physics in its fundamental content, structure and spirit of thought. Among these differences are the idea of the law-governed changeability and transmutability of physical bodies and fields, including elementary particles which, according to modern conceptions, form the foundation of known matter; the principle of the internal unity of space and time concepts in the theory of relativity; denial of rigid mechanical determinism and recognition of the unity of the opposite corpuscular and wave concepts of matter in quantum theory; the so-called principle of correspondence which links theories differing in their fundamental content; the combining of different and opposite notions, propositions and theories into deeper syntheses of theoretical structures; a negative attitude to dogmas in science and recognition of "bizarre" ideas and theories in it. These and similar features of modern physics underline the disparity between its nature and methodology, and the spirit of classical physics; they in fact signify that physics advances and arrives at dialectical materialism and that a conscious application of materialist dialectics in physics is now a vital necessity.

"Modern physics is in travail, it is giving birth to dialectical materialism." [1] With this statement in *Materialism and Empirio-Criticism* Lenin completed his philosophical analysis of the revolution in natural science which began with the discovery of electrons and radio-activity.

Modern natural science looks for and finds in materialist dialectics a basis for solving the philosophical and methodological problems raised by its development.

Nature has proved to be infinitely richer than the world pictured by classical physics, which was rooted in ordinary "macroscopic" experience. The finest electromagnetic phenomena, the atomic and sub-atomic worlds, immense phenomena of a galactic scale—such is the sphere of activity of modern physics with its finest and most sophisticated instruments, industrialised experiments and colossal technical facilities. It is because all these worlds profoundly differ from the macroscopic world and simultaneously are connected with it by diverse links that the "bizarre" (to use Lenin's term) notions and theo-

[1] V. I. Lenin, *Collected Works*, Moscow, Vol. 14, p. 313

ries of non-classical physics arose and developed in the course of cognising them, reflecting nature more correctly and fully than classical physics.

It has become a vital necessity in modern natural science to cognise the comprehensive universal law governing the development of nature in concepts which, according to Lenin, must be "flexible, mobile, relative, mutually connected, united in opposites, in order to embrace the world". [2] It is such concepts that are characteristic of the dialectical way of thinking.

It is significant that scientists themselves who created non-classical theories speak of dialectics (and its principles) in physics without using the respective terms (there are, of course, exceptions).

Only a conscious application of materialist dialectics makes a scientist really free from one-sidedness and preconceived viewpoints in studying philosophical problems of natural science and opens up a broad prospect, corresponding to experimental data, for exploring their solutions. The dialectical materialist ideas and concepts of matter and of such objectively real forms of being as space and time, of causality and necessity in nature, the absolute and the relative, and the dialectics of the cognitive process, have played a determining part in shaping and establishing the materialist and dialectical understanding of the theory of relativity and quantum mechanics as new (compared with classical physics) landmarks in the cognition of nature by progressing science.

The dialectical idea of the inexhaustibility of the electron, voiced for the first time by Lenin, is increasingly entering the theory of modern physics, as noted by eminent scientists, including the American physicist Dyson, the British physicist Powell, the Japanese physicist Sakata and other scientists. The dialectical idea of the unity of possibility and reality underlies the views of quantum mechanics expounded by V. Fok. [3] A rich Marxist literature on the philosophical problems of natural science has of late appeared in the USSR and other socialist countries. Many works by contemporary scientists show that the conscious application by them of dialectical materialism promotes the more rapid development of natural science, and that they analyse the latest discoveries in natural science from this angle. [4]

In the past, classical physics was satisfied with some immutable schemes and unchanging fundamental concepts, whereas modern physics denies such schemes and eternal basic principles from the outset. Dialectical contradictions pervade modern physics, including its holy of holies–its theoretical foundations. The law of the unity and the struggle of opposites makes it possible to express, in the logic of concepts, change and development of objectively real nature. Development as the unity of opposites is the bifurcation of the

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[2] V. I. Lenin, *Collected Works*, Vol. 38, p. 146.

[3] See V. Fok, "Quantum Physics and the Structure of Matter" in the book *Structure and Forms of Matter*, Moscow, 1967 (in Russian).

[4] See, for example, N. Semyonov "Marxist-Leninist Philosophy and Problems of Natural Science", *Kommunist*, No. 10, 1968; V. Ambartsumyan, "Modern Natural Science and Philosophy", *Uspekhi fizicheskikh nauk*, Vol. 96, September 1968 (in Russian).

whole into mutually exclusive opposites (sides, aspects, tendencies) and the relationship between them. This applies to all phenomena and processes of the real world and to their reflection, in the form of concepts, in the human mind, i.e., to their cognition.

Here it is important to note that dialectical logic does not simply discard the absolute significance of the antithesis between the assertion and its negation. It preserves its real content as *an absolute value within definite bounds*, determined by the conditions in which a definite theory is applicable, while beyond these bounds the abovementioned antithesis becomes relative. Such, and no other "preservation" of the value of concepts, ensures on the one hand precision of the employed language of concepts, on the other, these concepts acquire the requisite flexibility when science encompasses a wider sphere of phenomena which the available theory is unable to explain.

These brief remarks about dialectical contradictions will help us to understand the logical essence, the language of the concepts of the theory of relativity and quantum mechanics which developed from the theories of classical physics.

It is legitimate to ask why we should examine here the theory of relativity and quantum mechanics. After all, the theory of relativity and quantum mechanics represent logically complete theories and, therefore, from this point of view the philosophical future belongs rather to the theory of elementary particles and modern astrophysics.

Without denying the need for elaborating philosophical problems of the last two theories, it should be, however, forcefully emphasised that the theory of relativity and quantum mechanics are now least of all the philosophical hinterland of science. These theories belong to the leading theories of modern physics; without a deep philosophical analysis of their basic principles it is difficult, to say the least, to advance in laying the foundations of the theory of elementary particles and modern astrophysics. It is not by chance that lately sharp discussions have again flared up over the theory of relativity and quantum mechanics.

But philosophical problems of quantum mechanics are now by no means discussed at the level of 20 years ago. N. Bohr and W. Heisenberg wrote in their latest works that they gradually rendered their arguments and terminology related to the quantum theory more precise. Philosophical problems of quantum mechanics were the subject of papers by the noted philosopher K. Popper and the physicist A. Landé at the International Philosophical Congress held in Vienna in 1968. The discussion on these problems between A. Landé, on the one hand, and M. Born and W. Heisenberg, on the other, was published in the March issue of *Physikalische Blätter* (1969). In recent years there have been press statements by many foreign non-Marxist philosophers against the ideas of Bohr and, in essence, against the ideas of dialectics in quantum physics. It is generally known that in the last 15 years a definite viewpoint concerning the philosophical problems of quantum mechanics has been elaborated by the joint efforts of physicists and Marxist philosophers. These and other data speak of the importance of philosophical, methodological and logical problems of quantum mechanics and the necessity for analysing them.

THE IDEA OF DIALECTICAL CONTRADICTION IN THE THEORY OF RELATIVITY

In terms of quantum concepts the theory of relativity has introduced no considerable changes in the scheme of classical mechanics, inasmuch as it preserves the classical concept of the trajectory of a moving particle–in this sense it may be regarded as a classical theory–whereas at this point quantum mechanics has radically transformed Newton's laws of motion. But the theory of relativity *initiated* in physics what was continued by quantum mechanics. By its radical revision of the concepts of space and time in the physics of Newton and Maxwell, it, speaking figuratively, has aroused physicists from their metaphysical (dogmatic) slumber. The idea of the changeability of fundamental principles of physics–now customary among scientists–was for the first time embodied in the theory of relativity. [5]

The theory of relativity–if we consider its philosophical and methodological aspects–is playing in modern physics an important role because it demonstrated for the first time the intrinsic need for the idea of dialectical contradiction in the theoretical content of physics. The application of this idea to the fundamental principles of physics in non-classical theories draws a clear line of distinction between the latter and classical physics.

It is impossible to understand the very origin of the theory of relativity outside and independent of the idea of dialectical contradiction. This has been discussed in a general form in Marxist philosophical literature. Here we shall underline only some aspects of this question. According to classical mechanics, there is no absolute rest and absolutely uniform and rectilineal movement. Being relative, they represent correlative concepts. This is expressed in the principle of relativity of Galileo who asserted that it was impossible, on the basis of the laws of classical mechanics, to single out a preferential frame within a class of inertial frames of reference.

Galileo's principle of relativity, however, proved incompatible with the laws of classical electrodynamics, specifically with the proposition about light velocity being independent of the motion of a light-emitting body. This was revealed when questions arose pertaining to the application of Maxwell's electrodynamics to phenomena in moving bodies. Classical electrodynamics allowed "light-carrying ether" and this was in accord with the independence of light velocity. But such an assumption introduced into physics the concept of absolute rest and absolute motion, which ran counter to Galileo's principle of relativity.

The logical conflict which arose at the junction of classical mechanics and classical electrodynamics could not be resolved directly by experiments. The unsuccessful attempts to discover the movement of the Earth relative to ether, i.e., its absolute velocity (the experiment of Michelson and its analogies), *based on assuming some legitimate premises,* led to diametrically opposite conclusions: 1) if classical mechanics is applied to the propagation of light on moving bodies, light velocity proves to be relative; 2) if the hypothesis of

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[5] This was noted, in particular, by W. Heisenberg. See his *Physik und Philosophie*, Stuttgart, 1959.

Lorentz (which takes its origin from the theory of electromagnetism) is applied to this phenomenon, the negative result of Michelson's experiment must be interpreted as an indication that light velocity is absolute (because the absolute velocity of the Earth, according to Lorentz's hypothesis, cannot be experimentally discovered).

The conflict between classical mechanics and classical electrodynamics turned into a contradiction between the principle of relativity and the proposition that in a vacuum light travels at a definite velocity that does not depend on the motion of the light-emitting body. Both of them were convincingly demonstrated by experiments, but logically were regarded as incompatible.

The contradiction was resolved by Einstein, which served as a logical basis for constructing the theory of relativity. The principle of relativity in which the idea of the equivalence of all inertial frames of reference was extended to electromagnetic phenomena (Einstein's principle of relativity), was taken as the first premise of the theory. Einstein put forward as the second and last premise of the theory the proposition that light velocity is independent of the motion of its source, expressed in the principle of the constancy of light velocity. Einstein combined both principles and he succeeded in doing it at the price of changing the physical concepts of space and time. The simultaneous occurrence of two events in different places ceased to be absolute, spatial distances between bodies, and temporal spans between events also proved to be relative, i.e., dependent on their motion in relation to the frame of reference. The resultant relativist kinematics led to the transformation of classical physics. A new law of motion for particles travelling at tremendous velocities was formulated in the theory of relativity; the law of the interconnection of the mass and energy of a material system was discovered and the law of the conservation of mass merged with the law of the conservation of energy, and so on.

What is essential for the present subject is the logic of Einstein's resolving the contradiction between classical mechanics and classical electrodynamics, mentioned earlier.

To begin with—and this is the main thing—Einstein eliminated the contradiction between the principle of relativity and the principle of the constancy of light velocity not by introducing some additional hypothesis which would preserve both these principles and the foundations of classical physics. Such a "resolution" of this contradiction actually would not remove but only put it off because the principle of relativity and the principle of the constancy of light velocity would remain separate, existing parallelly within the framework of some classical scheme. Einstein resolved the paradox at the junction of classical mechanics and classical electrodynamics in a truly dialectical way. He combined the mutually contradictory principle of relativity and the principle of constancy of the velocity of light and this implied *renunciation* of some of the fundamental concepts of physics, which seemed immutable, and the *formation* of new fundamental physical concepts; consequently it signified *the construction of a new fundamental physical theory* in which the principle of relativity and the principle of the constancy of light velocity appear as necessarily interconnected.

It is in the theory of relativity that physics parted with absolute space and time and introduced relative space and time. This is adequately expressed in the Lorentz transformations, with the help of which a transition is made in the theory of relativity from one inertial frame of reference to another. At the same time this theory does not completely discard the concepts of absolute space and time and preserves them in cases when the terms of a problem make it possible not to pay attention to certain circumstances. If, for example, it is possible to ignore the duration of time for the passage of light between points where events take place, then the concept of absolute simultaneity is applied. In other words, the theory of relativity concretely discloses the approximate nature of the concepts of space and time in classical physics and finds the boundaries for their applicability.

And so, the theory of relativity reflects objective reality more precisely and profoundly than the classical theory. But the need to connect phenomena occurring in different inertial frames of reference and to find concepts and laws, common for all inertial frames of reference, raises the level of abstractness of physical concepts. Classical concepts are generalised and converted into new, relativist concepts; moreover, classical concepts appear as aspects of the more meaningful and general relativist concepts. We shall demonstrate that the idea of the dialectical contradiction is of utmost significance in such metamorphoses.

In classical mechanics space and time are united by Newton's laws of motion and, in accordance with the selfsame laws, within the sphere of such unity they do not depend on each other and exist separately, parallelly. Galileo's transformations, through which transitions from one inertial frame of reference to another are made in classical mechanics, make invariant the expression of spatial distances and of temporal spans (these expressions convey the main properties of space and time in accordance with the classical theory) for all inertial frames of reference.

The situation is entirely different in the theory of relativity. In it space and time are united by laws of motion which differ from the Newtonian ones and, in accordance with these new laws, are interconnected by their nature. In this theory space and time are regarded as elements forming an integral system, each component of which is objectively impossible and inconceivable without the other. The Lorentz transformations make invariant the expression of the square of the interval, which conveys the main properties of space and time according to the theory of relativity, and the interval of the four-dimensional distance represents the specific unity of the space distance and the temporal span between events. Thus, the question of uniting space and time, of the specific feature of this unity is the pivot of the theory of relativity. If it is a question of an event having four dimensions in the sense that the event is characterised by three spatial magnitudes and one temporal magnitude, then there is no difference between classical physics and the theory of relativity in this respect. In his book *Space and Time* Minkowski rightly wrote: "The objects of our perception are always only places and times taken together. No one has ever yet observed a certain place otherwise than in a certain moment of time, or a certain time otherwise than in a certain place." Although the concepts of space and time in classical physics are more abstract than the material on space and time given by perception, classical

physics also relies on the recognition of the idea of an event having four dimensions, i.e., the totality of spatio-temporal characteristics of physical objects. "Classical mechanics, too, is based on the four-dimensional continuum of space and time," Einstein wrote. [6]

The difference between classical mechanics and the theory of relativity on the question of four-dimensionality begins with solving the problem of transition from one inertial frame of reference to another. In classical mechanics, during such a transition the spatial magnitudes change separately from the termporal magnitude which remains unchanged. In the theory of relativity, during the transition from one inertial frame of reference to another, time does not remain invariant but changes together with the spatial magnitudes. In other words, a simple division into space and time is impossible in the theory of relativity because such a division depends on the frame of reference in which the transition takes place, i.e., in this theory three-dimensional space and one-dimensional time form a truly single spatio-temporal four-dimensional entity.

And so, according to the theory of relativity, space and time do not exist independently; they are a single entity, something more than space and time, and, so to say, simply added to each other. Such an understanding of space and time is already clearly discernible in the Lorentz transformation formulae. But the fullest understanding of space and time by the theory of relativity is embodied in its concept of the interval. The elaboration of this concept by Minkowski, like his ideas of the four-dimensional world, together with the appropriate mathematical constructions, has imparted the necessary theoretical consummation to the concepts of relative time and space, expounded in Einstein's work *On the Electrodynamics of Moving Bodies.*

The most essential thing in the theory of relativity is not so much the discovery (or the introduction of the idea into physics) of relativity of spatial distances and relativity of time, as the point that it reflects, in corresponding concepts, the united, necessarily connected space and time. The interval which connects into a single whole the spatial distance and the temporal span is invariant in relation to the Lorentz transformation, i.e., it is the same whatever the inertial frame of reference. Because of this the spatial distance and the temporal span will be different in different frames of reference.

DIALECTICAL CONTRADICTION AND THE QUANTUM THEORY

Experimental data on the corpuscular and the wave properties of microobjects are incontrovertible and are not denied by any physicist. But how are these data—the corpuscular-wave dualism—to be interpreted in theory? This task is all the more significant since that in classical physics corpuscular and wave theoretical constructions are regarded as mutually exclusive. On the philosophical plane, the question first of all arises about the ontological status of "waves" and "particles": does the objective reality correspond to the experimental data on microobjects, which we designate by words pertaining to

[6] *Albert Einstein: Philosopher-Scientist.* Ed. by P. Schilpp, Evanston, 1949, p. 57.

"waves" and "particles"? Is Ph. Frank, for example, right in stating that the electron is only a totality of physical magnitudes introduced by us for establishing principles from which we can logically draw conclusions concerning the readings of the pointer of a measuring instrument? [7]

It is possible to speak of a definite analogy between Zeno's aporias pertaining to motion and corpuscular wave dualism. In the first case it is a question not so much of the sensory authenticity of motion as of motion expressed in the logic of concepts. In the second instance we also have the need to express, in the logic of concepts, the empirical authenticity of the corpuscular and wave properties of microobjects because we cannot be satisfied with the authenticity of these properties alone. The corresponding problems in both cases are solved by dialectics. But these cases differ as regards the nature of the arising dialectical unities. In the case of motion (mechanical shifting) the latter does not directly cause the idea of contradictoriness, and to this day we admire the virtuosity of Zeno's dialectical mind (this virtuosity is not always grasped by many contemporary scientists) with which he, so to say, "bifurcates" the whole. In the case of corpuscular-wave dualism, on the contrary, the "bifurcation" is ordinary, while amazement is caused by the empirical fact of diffraction of electrons or visual experiments with light of low intensities, which signifies that the corpuscular and wave aspects merge together.

How are we to unite the mutually contradictory corpuscular and wave aspects? Different approaches to the solution of this problem are possible.

At one time attempts were made to regard the wave phenomenon as a phenomenon in a medium formed by particles. A case in point is Thomson's theory, according to which an electron behaves as though it was passing through an atmosphere saturated with electrical charges. [8] Such a theory in which fundamental significance is ascribed only to the particle, while the waves are regarded as something derivative, is resurrected in modern physics in one or another form.

When quantum mechanics was created, Schrödinger tried to interpret the corpuscles as "wave packets". This interpretation did not tally with the facts (the "wave packets", as can be demonstrated, have to "spread out" in the course of time, which is not the case with microparticles), and, moreover, met with an insurmountable difficulty in explaining the interaction between two "wave packets" in physical three-dimensional space. In recent theories (D. Bohm and other authors) corpuscles and waves are regarded as equally fundamental aspects of matter. They emphasise first of all the idea of the joint existence of the corpuscular and wave properties of moving objects in a certain model of the classical type. The classical notion of the trajectory of motion is preserved in this model and the symmetry between particles and waves inherent in the quantum theory is in effect eliminated.

The application of some or other classical concepts and schemes to phenomena on an atomic scale is characteristic of these and similar interpretations. Thereby classical notions and schemes are interpreted as immutable and

[7] See Ph. Frank, "Foundation of Physics", *International Encyclopaedia of Unified Science*, 1946, Vol. I, No. 7, p. 54.

[8] See J. Thomson, *Beyond the Electron*, Cambridge, 1929.

absolute in the respective conceptions. Methodologically, this feature of the indicated conceptions is the main source of their weakness: at best they "explain" post factum the results already obtained on the basis of Bohr's conception which rests on non-classical principles. Let us now turn to the viewpoint of the problem of uniting the corpuscular and wave aspects, the viewpoint which differs in principle from those mentioned earlier.

Bohr described as "irrational" the method of uniting the corpuscular and wave aspects, which is based on the idea of carrying over the concept of the wave from classical optics to corpuscular mechanics. Despite the fact that attacks on Bohr's concept of uniting the corpuscular and wave viewpoints and his use of the term "irrationality" in the given case continue to this day and assume an unjustifiably sharp form, [9] one cannot but agree with Bohr in substance. The unification of the corpuscular and wave aspects in quantum mechanics greatly resembles the introduction of irrational and imaginary numbers in mathematics or the notion of the interval in the theory of relativity. From the positions of any formal logical system one cannot get far in analysing questions related to such a unification. Here we have dialectical logic which may seem, and does seem, to rational thinking to be irrational, although logically it is faultless.

Each of the earlier mentioned ("rational") approaches to the problem of uniting the corpuscular and wave aspects highlights one-sidedly that element of the line of cognition which reflects the state of things as it is. Materialist dialectics, on the contrary, precludes one-sided knowledge. It provides everything necessary and adequate for ascertaining the question: do the mutually exclusive–corpuscular and wave–pictures of the behaviour of microobjects have objective significance?

Matter, i.e., substance and field, is on the whole neither particles nor waves from the standpoint of classical theories, nor a unity of the latter in some macroscopic (classical) model. The corpuscular and wave properties are united in their antithesis. In other words, matter possesses both the properties of particles and waves. The movement of microobjects can only approximately be regarded as the shifting of particles and the propagation of waves. If we consider marginal cases, in some experimental conditions microobjects behave like waves and in others like particles. So-called relativity with regard to the instruments of observation (the latter realise the conditions in which the mutually exclusive properties of microobjects are displayed) comprises a characteristic feature of description in the quantum theory, which follows from recognition of the dual corpuscular-wave nature of microobjects.

These ideas have been elaborated in a most distinct and systematic form by scientists who are conscious proponents of dialectical materialism. [10] The

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[9] See, for example, *Studies in the Foundations of Methodology and Philosophy of Science*, Vol. II, *Quantum Theory and Reality*, Berlin-Heidelberg-New York, 1967.

[10] See A. Alexandrov, "The Meaning of the Wave Function", *Doklady AN SSSR*, 1952, Vol. LXXXV, Issue 2; D. Blokhintsev, *Fundamentals of Quantum Mechanics*, Moscow-Leningrad, 1949, and "Critique of the Idealist Understanding of Quantum Mechanics", *Uspekhi fizicheskikh nauk*, 1951, Vol. XLV, Issue 2; S. Vavilov, "The Development of the Idea of Substance", *Collected Works*, Vol. III (see also his other works on philosophical problems of natural science); V. Fok, "Quantum Physics and the Structure of Matter" in the book *Structure and Forms of Matter*, Moscow, 1967.

influence of idealist and metaphysical views is felt in the first place in a definite interpretation of the problem of uniting the corpuscular and wave pictures of the behaviour of microobjects: in the denial of the objectively real nature of the unity of corpuscular and wave properties of matter at its atomic level and in the subjectivist interpretation of relativity with regard to the instruments of observation. This interpretation is expressed most distinctly in the idea of fundamentally uncontrollable interaction of the microobject and the instruments of observation.

"Fundamental uncontrollability" in the strict sense of the word does not express any truth whatsoever, because processes and phenomena in nature are knowable in principle and hence are controllable in principle. But in the case of physicists who used this term it often had no definite significance and was a specific designation of the fact that quantum laws qualitatively differ from the laws of classical mechanics. But the opponents of materialism utilised this philosophically erroneous term in a subjectivist spirit.

Of late, the notion of "fundamental uncontrollability" has been disappearing from scientific works, especially of those physicists who object to the principles of positivism in natural science (we refer here not only to scientists who are conscious proponents of dialectical materialism). Thus, Bohr in his later works on philosophical problems of atomic physics did not use the concept "fundamental uncontrollability", stressing that the description of atomic phenomena reflects their objective nature. The term "complementariness" preserved by Bohr signifies a specific relationship between experimental data on microobjects obtained with the help of mutually exclusive means of observation. These data, as Bohr points out, although they seem to contradict each other, actually furnish exhaustive information about the object. [11]

Of interest in this context are the views of Heisenberg. Taking issue with Landé, who tried to bring back quantum mechanics to the positions of the classical theory, Heisenberg points out that the language evolved in quantum mechanics during the 40 years of its existence struck root among physicists and is by no means the product of dogmatic assertions or some kind of convention. The concepts "particles" and "waves" have been borrowed, according to Heisenberg, from classical physics and the natural language. A physicist does not look upon a quantum mechanical description as dualistic. He is accustomed to the idea that in translating this monistic description into the natural language various complementary pictures might appear. The question as to which picture–corpuscular or wave–is correct no longer has any meaning. [12]

We now have to examine more closely some aspects of the conception which proceeds from the recognition of the dual corpuscular-wave character of microobjects.

The particle–a basic concept of classical mechanics (just like its other basic concepts)–can be defined indirectly through Newtonian axioms. Such a definition means that the particle is characterised jointly by an impulse and

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[11] See N. Bohr, *Atomic Physics and Human Knowledge*, New York-London, 1958.
[12] See W. Heisenberg. "Zur Sprache der Quantentheorie", *Physikalische Blätter*, 1969, Hf. 3, pp. 112-113.

a coordinate.[13] But the classical concept of the particle cannot be applied on an atomic scale, since it does not correspond to the experimentally established quantum regularities expressed by quantum formalism. A major part in the given case is played by the relationship of uncertainties. It not only establishes the bounds of the applicability of the *classical* concept of the particle, but also makes it possible to generalise and deepen it, infusing it with new content unknown to the classical theories. This new stems from the need to consider in theory the wave properties of microobjects.

In classical mechanics the definition of a particle implies that its coordinate and impulse are not interconnected by their nature and must be considered separately. In quantum mechanics it is impossible to consider separately the coordinate and the impulse of the particle. The need for comprehending its coordinate and impulse in their deep interconnection is determined by the fact that microobjects have wave properties which are inseparable from corpuscular properties. This is ascertained, specifically, in mental experiments which accompany the exposition of the relationship of uncertainties. They graphically show that in quantum mechanics it is impossible to separate the particle's coordinate from its impulse precisely because of the dual corpuscular-wave nature of microobjects.

Quantum formalism, which qualitatively differs from the formalism of classical theories, describes mathematically the state of affairs in physics, intrinsically linked with recognition of the dual corpuscular-wave character of microobjects. It has symbols which denote not numbers (as in classical formalism) but more abstract mathematical concepts (operators), which, generally speaking, are not subject to the commutative law of multiplication. In quantum mechanics, every physical quantity is comparable to its operator so that the values of the latter give the possible values of this quantity while its own functions describe the corresponding conditions of the object (system). The very definitions of the operators of the impulse and the coordinate already contain, in potential form, the relationship of the uncertainties (for the impulse and the coordinate), which show that in a quantum state (it is mathematically expressed by a wave function) the operators of the coordinate and the impulse have no common values of their own, i.e., it is asserted in essence that quantum mechanics does not deal with the "classical" particle.

Thus, in quantum mechanics—and this is demonstrated above all by quantum formalism—the corpuscular and wave ideas cannot converge in the classical manner. In terms of classical physics the expression "corpuscular-wave dualism" can have, as is evident from the abovesaid, the following meanings: 1) *either* a particle *or* a wave; 2) *both* a particle and a wave. But in terms of quantum formalism both these meanings fall away. We have to find, to use Bohr's expression, an "irrational" form of uniting the corpuscular and wave concepts. If such a form exists, what then is its logical meaning?

The specificity of uniting the corpuscular and wave concepts in quantum mechanics lies in the specificity of *quantum* probability—one of the fundamental concepts of the quantum theory. Introduced by Born and further deve-

[13] Here we have in mind the concept of the particle only from the viewpoint of classical mechanics.

loped by Bohr, it signifies that processes in material systems are subject to probability laws. In accordance with this interpretation, the process of transferring a particle is linked with the wave process which represents the process of propagation of a probable wave. The Schrödinger equation controls the probable wave, i.e., it makes it possible to determine the probability of any variation of the temporal course of the phenomenon in the corpuscular process.

Probabilities in quantum mechanics differ radically from probabilities in classical theories. In the latter they express the existence of circumstances accidental for the studied phenomena and, therefore, they do not enter directly into the laws of these phenomena. The hypertrophy of such a state of affairs, characteristic of the metaphysical viewpoint, leads to a subjectivist interpretation of chance and probability (Laplacian determinism). In quantum mechanics the situation is entirely different: in it probabilities are regarded as components of the basic laws of nature (the abovementioned Schrödinger equation) and their introduction reflects the objectivity of the potential which exists under definite conditions. The probability laws of quantum mechanics are laws of the behaviour not of "classical" particles and not of "classical" fields, but of material systems which unite the properties of particles and fields in a specific way.

It is very important to establish what the indivisibility of the corpuscular-wave properties of the electron implies, or, to put the question on a broader plane, what is meant by the dialectical unity of the corpuscular and wave properties of matter. This can be demonstrated by the following example.

Examining Young's interference experiment (it is assumed that the installation screen is made of a substance which produces a noticeable photoelectric effect), which demonstrates the corpuscular nature of light even on interference bands, Born denied that light in this experiment appears simultaneously in both its aspects–as a corpuscule and as a wave.[14] But if we ponder over Born's line of argument (he asserted in particular that it is absolutely meaningless to speak of a particle unless at least two points of its trajectory are determined experimentally and also that it is absolutely senseless to speak of "a wave unless at least two interference maxima are observed" [15]) then it becomes clear that Born's statements in fact refer to the *"classical"* particle and wave. Indeed, to understand the respective phenomena in Young's experiment one must not apply the concepts of particle and wave in the interpretation of classical physics. This, as a matter of fact, is what Born proved in his arguments, although he thought of demonstrating something else. Here we must already apply the concepts of the *quantum* theory which qualitatively differ from the classical concepts. The concept of particle in the quantum theory, undoubtedly, differs from its classical analogue, and Young's experiment demonstrates this point in its own way.

The distinction between the quantum concepts of particle and wave, and the analogous classical concepts consists in that the quantum concepts are relative within the bounds of the quantum theory, while classical concepts

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[14] See M. Born, *Atomic Physics*, London, 1963, p. 103.
[15] Ibidem.

are absolute within the bounds of their theory. This means that to describe the behaviour of a microobject it is necessary to consider the instruments of observation (relativity to the instruments of observation), whereas in classical physics it is possible to abstract oneself from such consideration. [16] This difference rests on the recognition of the fact that in quantum theory moving objects are examined in terms of the unity of their opposite corpuscular and wave properties, while classical theory allows of the unity of waves and particles but only in terms of their coexistence, or parallel existence in some model subject to the laws of the classical theory.

We are entitled to draw the conclusion: dialectical unity, in which relative opposites must unite and do unite, differs radically from the unity of opposites, in which the latter are preserved absolute and immobile. The combining of opposites in dialectical unity does not lead to any formal logical contradictions (this follows from the definition of dialectical unity). Such combining presupposes that a deeper theory than the one in which absolute opposites figure is emerging or has already emerged, a theory with correspondingly new basic concepts and principles. In this theory the combining opposites become aspects of a new concept. Thus, the concept of particle in quantum mechanics "preserves" from the classical concept of particle the element of discreteness, but "loses" the property of moving along a trajectory and the property of individuality. These "losses", strictly speaking, signify that wave properties are combined with corpuscular ones, when we speak of objects of quantum mechanics (which in quantum mechanics concretely expresses the relationship of uncertainties for the impulse and the coordinate).

Summing up in the logical plane what has been said about dialectical unity, we may note that this unity is governed, generally speaking, by the formula "both yes and no", and as applied to the problem of corpuscular-wave dualism, by the formula "both a particle and a wave". This formula cannot and does not lead to formal logical misunderstandings, since in quantum mechanics the concepts "particle" and "wave" imply reciprocally relative concepts, while in classical physics these are absolute concepts. In terms of modern logic it is especially clear that the formula "both a particle and a wave" leads to no logical absurdity. This expression is related to metalanguage, while the expression "either a particle or a wave" is related to the language of classical theories. From this viewpoint, quantum mechanics is in a sense a metatheory of classical mechanics. It is quantum mechanics that makes it possible to establish the boundaries for the applicability of classical mechanics, its principles and basic concepts and also to consider other questions pertaining to classical mechanics as a theory in its entirety (for example, the question of the adequacy of the concepts of objective reality admissible in classical mechanics).

Thus the restrictions to which the classical concept of particle is subjected in quantum mechanics are neither a restriction of cognition nor confirmation of the positivist thesis that the question of the objective significance

[16] For the concept of relativity to the instruments of observation, see V. Fok, "Interpretation of Quantum Mechanics", *Philosophical Problems of Modern Natural Science, Proceedings of the All-Union Conference on Philosophical Problems of Natural Science*, Moscow, 1959; see also V. Fok's article in this issue of our journal.

of the empirically observable is senseless. Such "restriction" actually represents deeper cognition of the corpuscular properties of matter, which takes into account its intrinsic wave properties from which classical theories of substance are abstracted in studying particles. In accordance with this "restriction", the concept of particle is generalised and deepened, discarding its classical form in this generalisation.

METHODOLOGICAL QUESTIONS

Efficient search for new fundamental concepts and principles in physics presupposes new methods of cognising things and processes unknown to existing theories, which these concepts and principles should reflect in one or another way.

In applying some established (known) knowledge to something that is being cognised (as long as it is not cognised, the established knowledge is a hypothesis in relation to it) such application may contain the possibility of qualitatively changing the established basic concepts, principles and theories, i.e., the possibility of the emergence (construction) of *new* concepts, principles and theories. It is this that is characteristic of the rise of the non-classical theory (its intrinsic basic concepts and principles). It is at this point that the dialectics of concepts and the dialectics of cognition in physics manifest themselves with utmost clarity. "...Human concepts are not fixed," Lenin wrote, "but are eternally in movement, they pass into one another, they flow into one another, otherwise they do not reflect living life. The analysis of concepts, the study of them, the 'art of operating with them' (Engels) always demands study of the *movement* of concepts, of their interconnection, of their mutual transitions." [17]

This thought of Lenin's is exceedingly important as applied to the development of physics if we want to understand the cognitive powers of non-classical physics, to characterise its style and the spirit of its thinking.

In modern physics the problem of methods of thinking, or the problem of theoretical methods, has acquired, together with a new content, particularly great importance for its progress. This problem, in the form in which it exists now, did not arise in the natural sciences of the classical period for the reason that in those days the observed phenomena were ultimately explained on the basis of a mechanical macroscopic model, and such an explanation was considered the only one possible which did not cause in principle any logical vagueness, although in intricate cases it gave rise to practical difficulties. Today the situation is different. During the development of modern physics–and this was discussed earlier–paradoxical theoretical situations began to arise and demand their solution.

The theoretical methods of modern physics are methods of resolving paradoxes which arise or exist in it, methods whose resultant application more than corroborates the existing fundamental propositions (and theories) and leads to new fundamental propositions (theories). These include the

[17] V. I. Lenin, *Collected Works*, Vol. 38, p. 253.

method of mathematical hypothesis, structural approach, probability approach, the method based on the principle of observability, and other methods. All of them are interconnected. These methods were not examined in traditional philosophy. Of them we shall briefly examine only the method of fundamental observability.

The proposition of "fundamental observability" plays an heuristic role in physics only when it is "inspired by an experiment". The exclusion of "absolute" and the introduction of "relative" simultaneity, for example, which led to the theory of relativity, represents an idealised expression of the adverse result of Michelson's experiment which had to establish the so-called absolute motion of the Earth.

The method of fundamental observability (this also applies to other theoretical methods of modern physics) essentially rests on the idea that the basic concepts and principles of a certain fundamental theory are not absolute but relative, are approximate and can be changed when knowledge encompasses another sphere of phenomena which the given theory cannot cognise (paradoxes are a symptom of this).

Such an idea expresses the dialectics of cognition. Lenin pointed out that "the 'treatment' and 'twisting' of words and concepts to which Hegel devotes himself here" (in the part of his *Science of Logic* dealing with law–*M.O.*) "is a struggle against making the concept of *law* absolute, against simplifying it, against making a fetish of it. NB for modern physics!!!" [18]

It is on this road of dialectical cognition that the theory of relativity and quantum mechanics arose. These theories do not merely generalise classical theories; simultaneously with generalisation they specify their basic concepts and principles, subordinating the latter to deeper concepts and propositions which reflect new spheres of phenomena. The theoretical methods of modern physics indicate the direction of search and the construction of its theories.

We have discussed only some questions of the subject, but it is evident from the material examined that modern physics and dialectical materialism are indivisible. In our epoch of the revolutionary remaking of the world the philosophical problems raised by the development of physics and natural science can be solved only on the basis of dialectical materialism which Lenin enriched with new theoretical concepts and conclusions. The principle of development in its broadest form, and which materialist dialectics demands, is part of the philosophical basis of modern natural science.

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[18] V. I. Lenin, *Collected Works*, Vol. 38, p. 151.

Academician V. FOK

Quantum Physics and Problems of Philosophy

Materialism is bound to modify its form with every epoch-making discovery, runs the famous dictum enunciated by Engels and quoted by Lenin. Quantum physics is no doubt an epoch-making discovery of this kind and confronts science with new problems of the theory of knowledge. Moreover, quantum mechanics cannot be grasped in terms of physical theory without an adequate solution of the epistemological problems involved.

The problems under consideration here belong to the fundamental philosophical question of object-subject relations. Analysis of these problems must rely not only on the general proposition of materialist philosophy that consciousness does not exist outside matter and regardless of it, but also on the principle of the conventionality and relativity of all facets in nature. Lenin said that "the difference between matter and mind is also *relative and not excessive*". [1]

EPISTEMOLOGICAL IMPORTANCE OF DISTINCTION IN THE METHODS OF DESCRIBING PHYSICAL OBJECTS

The concepts of the theory of knowledge are usually divided into two categories: the subject with his consciousness, thinking, feelings and perceptions, on the one hand, and the objects of the external world which the subject studies, on the other. Classical physics saw no cardinal differences in the methods of describing different external objects; accordingly, all material objects were classed epistemologically under the same category. In quantum physics (we are referring to the physics of the microworld) there emerged the cardinal role of measuring instruments as intermediaries between external objects and man's mind. At the same time it transpired that the construction and operation of measuring instruments must be described quite differently than the properties and behaviour of those microobjects for the investigation of which they are used. This difference is so big that, according to the theory of knowledge, microobjects and measuring instruments must be classified under different categories.

[1] V. I. Lenin, *Collected Works*, Moscow, Vol. 14, p. 244.

On the other hand, measuring instruments have much in common with man's sense organs. For example, for many purposes the eye is a sufficiently accurate measuring device, and the use of spectacles, a microscope or a telescope does not alter the process in principle but simply magnifies many times the possibilities of observation as well as its accuracy. A visual estimate does not differ in any aspect (except precision) from instrumental measurements. Academician S. Vavilov's disciples even managed to register visual quantum fluctuations of light. The case is similar when the weight of a body is determined by muscle effort and with a balance. These considerations lead us to the following conclusion: if it is necessary to isolate instruments of observation into a special category when investigating an act of cognition (as is recognised in quantum physics), both measuring instruments proper and man's sense organs fall within this category. Accordingly, instrument readings and human sensations also fall within the same category.

Thus, we may conclude that while preserving the basic line of demarcation drawn in materialist philosophy between mind and consciousness (in other words, spirit), on the one hand, and matter (in the broadest sense), on the other, we should differentiate epistemologically different categories of material objects as well.

All these differences are connected with those in the methods of describing the corresponding concepts. Thus, man's mind and consciousness are described subjectively. There is no doubt that thought is a product of the brain; however, thought differs from the brain as radically as an idea presented on paper differs from the paper and ink whereby it is recorded. The fact that man thinks with the aid of his brain which can be (and is) a study object in biology and physiology does not cancel the existence of man's mind and consciousness as a special subjective category described "from within". This has always been recognised by materialist philosophy and holds good after epistemological differences have been drawn between types or categories of material objects. The only new contribution that the establishment of this kind of differences makes is the isolation of man's sensual perceptions from the concept of the "subjective" and the coalescence of perceptions and sensations with the readings of instruments.

On the other hand, the changes introduced by quantum physics into the methods of describing some categories of external objects (those which are labelled microobjects) are quite significant. In pre-quantum physics a general feature of the methods of description applied to widely different objects of the external world was the tacit assumption that the means of observation are inessential. It was assumed that for any object there must always exist a certain "cautious" method of observing it which does not affect its behaviour in any way; under this assumption it was possible to refer to the behaviour of an object *per se* and neglect the problem of means of observation as conditions of cognition. Accordingly, in pre-quantum physics both categories-means of observation and objects of observation–were united as one category, and it is this category that approximately corresponded to the concept of the external world. Any object of the external world was described on the basis of abstractions borrowed from classical physics (and actually applicable to

macroscopic objects alone). Later we shall consider these abstractions in more detail.

Analysis of the basis of quantum physics indicates that the description methods of means of observation essentially differ from those of microobjects. Means of observation can (and must) be described on the basis of classical abstractions with due account for only quantitative restrictions following from quantum mechanics. On the other hand, the description of microobjects (such as molecules, atoms, electrons, photons, all kinds of elementary particles and quasiparticles) require new principles and new concepts differing from their predecessors to such an extent that they cannot be expressed in terms of classical physics at all. A special language (both mathematical and verbal) had to be developed for them: the language of quantum physics.

As quantum processes penetrate new fields and the corresponding physical theories develop, this language keeps improving. An especially large contribution comes from high-energy physics concerned with the interaction and transformation of elementary particles. However, the physical concepts in this field have not yet been formulated with sufficient mathematical accuracy and lend themselves to philosophical analysis with greater difficulty. Therefore, we shall only touch upon them cursorily at the end of the article.

This paper will mainly be concerned with the analysis of concepts arising in low-energy physics with its theoretical basis: non-relativistic quantum mechanics. Even this limited field contains, as compared with classical physics, so much that is new in the very formulation of the problem of description of physical processes that the solution of certain epistemological problems becomes imperative.

BASIC FEATURES OF THE CLASSICAL METHOD OF DESCRIPTION OF PROCESSES

We have referred elsewhere to idealisations and abstractions connected with the classical method of description of physical processes.[2] Here we shall repeat what is especially important.

The basic feature of the classical method of description of processes is the assumption of physical processes being completely independent of the conditions of observation. It was assumed that the scientist can always "watch" a process without interfering into it or influencing it (we have mentioned above the "cautious" method of observing an object). True, if a physical process is "watched" from different viewpoints (and described accordingly in different frames of reference), its form will be different. Thus, the free fall of a body may prove rectilinear in one reference frame and parabolic in another. However, due account was always taken of the dependence of the form of a process on the movement of the reference frame; this was done by a simple way of recalculation of the coordinates of one reference frame in terms of another. Variation of the form of a process making possible this recalculation does

[2] See, for example, the author's paper "La physique quantique et les idéalisations classiques", *Dialectica*, 1965, Vol. 19, No. 314, p. 223.

not, obviously, introduce anything new into the process itself; therefore, it would be possible to postulate, as before, that the process itself does not depend on the method of observation.

Quantum mechanics indicates, however, that in the case of microprocesses this is not so; the very possibility of observation there assumes certain physical conditions which may prove to be connected with the essence of the process under study. The registration of these conditions is not just a matter of indicating the reference frame used, but requires a more detailed description.

The neglect of this circumstance is an abstraction which can be called the *absolutisation* of a physical process. If it is accepted, it becomes possible to consider physical processes as occurring on their own, regardless of whether there is a possibility of observing them in principle, i. e., whether the physical conditions necessary for their registration are fulfilled.

This abstraction is quite permissible when a study is made of large (macroscopic) processes with respect to which the influence resulting from the measurement is practically nil. The absolutisation of such processes seemed to be so natural that it was never stipulated explicitly before the advent of quantum mechanics. It was taken for granted that any physical process occurs "by itself". This simplified the description of physical processes to an extraordinary degree, since any special description of the conditions of observation could be dispensed with.

All classical physics is based on the absolutisation of the concepts of the physical process. This abstraction is one of its characteristic features.

A further abstraction is the possibility assumed in classical physics for making observations more and more accurate. By this we imply not only an ever more accurate measurement of a quantity under study but a simultaneous measurement of any other quantity relating to the object or process under observation; this kind of ever greater accuracy can be called the *detailing* of measurement. Even in those cases when the measurement of different quantities requires different conditions of observation, classical physics assumes the possibility of combining the data obtained under different conditions into a single picture describing the physical process under study. This assumption of the possibility of simultaneous registration of different aspects of the behaviour of an object, of different aspects of a physical process under study, is connected logically with the assumption that a physical process is independent of the conditions of observing it, i.e., with its absolutisation.

The concepts of classical physics lead to the interpretation of a state of motion of a physical system (with certain degrees of freedom) as something which is not only absolute but also exhaustive: once the observations have been completely detailed (which is assumed to be possible), no further observations can add anything to the result.

The physical process was regarded in classical physics as a sequence in time of states of a certain system. Since the concept of a state of a system with certain degrees of freedom was interpreted as absolute (in terms of its being independent of the conditions of observation) and exhaustive (in terms of completeness of description) it was only natural to assume that the sequence of states in time obeys an unambiguously determinate law. The result was the concept of Laplacian mechanical determinism. Not only clas-

sical mechanics but also electrodynamics agreed with this concept, since these theories make it possible to determine the state of a requisite (mechanical or electrodynamic) system at any time, provided its initial state is known. Nor did the theory of relativity contradict this concept (we are referring to Einstein's theory of 1905), though it introduced many new concepts. The positions of unambiguous determinism were undermined to some extent by classical thermodynamics, the theoretical justification of which on the basis of statistical physics was impossible without the concept of probability being introduced. However, it is quantum mechanics, the basic ideas of which will be discussed below, that revealed especially saliently the inapplicability of the concepts of unambiguous determinism as well as the concepts of the absolute nature of physical processes and the possibility of detailing them *ad infinitum*.

LIMITATIONS OF THE CLASSICAL METHOD OF DESCRIPTION OF PROCESSES AND THE SPHERE OF ITS APPLICABILITY

Fundamental facts like the dual, corpuscular-wave, nature of light and particles of matter conclusively indicate that the classical method of description of processes does not apply to microobjects. At the same time we cannot simply discard it, since the objective description of processes requires a direct or indirect reliance on something which would call for no reservations as to the method of observation, and this is just what the "absolute" method accepted in classical physics is.

To be able to apply effectively the classical absolute method of description we must first of all establish its limits. Let us repeat those well-known considerations which lead to Heisenberg's inequalities describing these limits.

Consider a very simple process: the movement of a material point of a certain mass m. According to classical mechanics, the state of movement of a material point is determined for each moment of time by its coordinates x, y and z and the components of its momentum P_x, P_y and P_z.

It would, however, be wrong to consider the joint values of all these quantities without taking into account the actual possibilities for their measurement; the latter are limited by quantum effects. These effects appear, for example, as a particle interacts with photons of light irradiating this particle. It is essential that a photon characterised by wave parameters is at the same time the carrier of a certain energy and momentum, i.e., the carrier of the properties of a "particle of light". The wave parameters are: the frequency ν (or the angular frequency $\omega = 2\pi\nu$), the wavelength $\lambda = \frac{c}{\nu}$ and the wave vector $\mathbf{k}$ giving the direction of propagation, its absolute quantity being equal to $k = \frac{2\pi}{\lambda} = \frac{2\pi\nu}{c} = \frac{\omega}{c}$ where ω is the angular frequency. If Planck's constant h divided by 2π is denoted by h' (so that $h = 2\pi h'$), the energy of the photon E and its momentum P will be connected with the wave parameters by the relation

$$E = h' \cdot \omega; \quad \mathbf{p} = h' \mathbf{k} \qquad (1)$$

where the constant

$$h' = 1.05 \cdot 10^{-27} \text{ erg/sec.} \qquad (2)$$

Eq. (1) connects the wave and corpuscular properties of the photon: its right-hand parts contain the quantities ω and $\mathbf{k}$ determined from interference phenomena, and its left-hand parts E and $\mathbf{p}$ describe the photon as a particle.

Eq. (1) thus reflects the corpuscular-wave dualism of the photon as a particle of light. This dualism proves to be a general property of all particles in general, not only photons. As Heisenberg demonstrated, the localisation of a particle in any small area of space requires physical conditions unfavourable for measuring its momentum (i.e., for localising the particle in the space of momenta) and vice versa. This result is perfectly natural, since a small wavelength of light favourable for localising the particle in the space of coordinates means the application of photons carrying high energies and capable of pushing the particle very strongly and thus violating its localisation in the space of momenta; now, the application of low-energy photons implies the use of a large wavelength of light, which leads to a widening of all diffraction bands and to a lower accuracy of the particle localisation in the conventional (coordinate) space.

Quantitatively, Heisenberg's result can be expressed in the form of inequalities

$$\Delta x \Delta p_x \geqslant h' ; \quad \Delta y \Delta p_y \geqslant h' ; \quad \Delta z \Delta p_z \geqslant h' \tag{3}$$

where the quantities Δx, Δy and Δz characterise the size of localisation in the space of coordinates x, y, z and the quantities Δp_x, Δp_y and Δp_z the size of localisation in the space of momenta p_x, p_y, p_z. These expressions are known as Heisenberg's inequalities. They indicate that, intrinsically, the particle does not permit a simultaneous localisation in the coordinate and momentum space.

Added to Heisenberg's inequalities (3) can be the following relation

$$\Delta t \Delta (E' - E) \geqslant h' \tag{4}$$

connecting uncertainty in a particle-energy change with uncertainty at the moment of time when this change occurred. According to the relation (4), the energy transfer cannot be localised precisely in time. The relation (4) can be called the Heisenberg-Bohr relation. The relations of Heisenberg and Bohr (3) and (4) describe the applicability region of the classical ("absolute") method of description of processes. Since Planck's constant is small, this method is certainly applicable to macroscopic bodies. However, its importance is not confined to this field of application. The method plays an important role in the description of quantum processes as well because it is applied to those instruments the readings of which make it possible to study atomic objects. The conditions of experiments (including those involving atomic objects) are always described by the classical, "asbolute", method.

Now we can return to what was discussed in the second section and specify the concept of means of observation as intermediaries between human consciousness and atomic objects under study, as well as indicate the method of describing them. *Means of observation must be described on the basis of classical abstractions, taking into account, however, Heisenberg's and Bohr's relations.*

RELATIVITY WITH RESPECT TO MEANS OF OBSERVATION AS BASIS OF THE QUANTUM METHOD OF DESCRIPTION OF PROCESSES

The new method of describing processes must take into account the actual possibilities of measurements of microobjects. We should not ascribe to objects such properties (and such states of movement) as could not in principle be registered. Therefore, special attention should be paid to the conditions necessary for this kind of registration. We must take into account the design and operation of the instruments which create those physical conditions in which the object is studied. As has been said above, the instruments and external conditions must be described classically, by giving the parameters characterising them. Naturally, these parameters can only be assigned with an accuracy permitted by Heisenberg's inequalities; otherwise, we shall go beyond the real possibilities of the instruments used.

The microobject manifests itself in its interaction with an instrument. For example, the pass of a particle becomes visible only as a result of an irreversible shower process in the Wilson cloud chamber or in a photo-plate layer (the particle spending its energy on the ionization of the air or photolayer so that its momentum becomes uncertain). The result of interaction of an atomic object with a classically described instrument is just one of those principal experimental elements the systematisation of which, based on certain conjectures about the properties of the object, constitutes the aim of the theory: it is on the basis of an investigation of such interactions that the properties of the atomic object are deduced, while the predictions of the theory are formulated as expected results of interactions. This formulation of the problem fully permits the introduction of quantities which would characterise the object independently of the instrument (charge, mass, spin of the particle as well as other properties of the object described by quantum operators) and yet permits a versatile approach to the object: the object can be characterised from that aspect of it (the corpuscular or wave, for example) the manifestation of which is conditioned by the design of the instrument and the external conditions it creates.

The new formulation of the problem makes it possible to consider the case when different aspects and different properties of the object are not manifested simultaneously, i.e., when the behaviour of the object cannot be detailed. This will be the case if incompatible external conditions are required for different properties of the object to manifest themselves (for example, the capacity of an electron for localisation in space and its capacity for interference).

On Bohr's suggestion we can call *complementary* those properties which appear in their pure form only under incompatible conditions and which manifest themselves under compatible conditions only in their incomplete, "softened" form (for example, incomplete localisation in the coordinate and momentum space as permitted by Heisenberg's inequalities). It is meaningless to consider the simultaneous appearance of complementary properties (in their pure form); this is what accounts for the absence of a contradiction in the concept "corpuscular-wave dualism".

Having based the new method of description on the results of microobject-instrument interaction, we introduce thereby an important concept: *relativity as to the means of observation* generalising the well-known concept of relativity as to the frame of reference. This method of description by no means implies that we ascribe a lesser degree of reality to the object than to the instrument or that we reduce the properties of the object to those of the instrument. On the contrary, a description based on the concept of relativity as to the means of observation presents a much more profound and subtle objective picture of the microobject than it was possible on the basis of idealisations of classical physics. This picture requires a more developed mathematical apparatus as well: the theory of linear operators, their eigenvalues and eigenfunctions, the theory of groups and other mathematical forms. The application of this formalism to the problems of quantum physics has yielded a theoretical explanation of several fundamental properties of matter which could not be explained with the aid of classical concepts. Besides, and this is no less important for us, the physical interpretation of mathematical concepts used in this formalism leads to several profound cardinal conclusions, and, in particular, to the generalisation of the concept of a system's state on the basis of probability and potentiality.

THE CONCEPTS OF PROBABILITY AND POTENTIALITY IN QUANTUM PHYSICS

Having accepted the object-instrument interaction as a source of our knowledge of the properties of a microobject and having based our description of processes on the relativity as to the means of observation, we thereby introduce a new element in the description of the atomic object, its state and behaviour: the concept of probability and thereby the concept of potentiality. The need for considering the concept of probability as an essential element of description and not as a sign of incompleteness of our knowledge follows from the fact that under given external conditions the object-instrument interaction is not, in the general case, determined unambiguously but merely possesses a certain probability. A series of such interactions leads to statistics corresponding to a certain distribution of probabilities. The latter reflects the potentialities objectively existing under given conditions.

Consider an experiment with a given physical system making it possible to forecast the results of future interactions with all kinds of instruments. This initial experiment should include certain preparations of the system (for example, the preparation of a beam of electrons with a certain energy) and the establishment of certain external conditions in which the system will be after its preparation (for example, the passage of the electron beam through a crystal). Sometimes it is expedient to consider the preparation and establishment of external conditions as two different stages of the experiment; however, they can also be considered as a single initial experiment the purpose of which is to obtain a forecast. The initial experiment always refers to the *future*.

The method of preparation and the external conditions of the initial experiment are described classically but its result which is to yield a complete description of the potentialities existing under given conditions, requires for its formulation new, quantum mechanical means. To form an idea as to the problems which must be solved by these means, let us consider how the potentialities existing under given conditions are realised.

First of all it should be borne in mind that the concluding experiment in which these potentialities are realised can be staged in different ways: there can be different designs of a registering device in this experiment (and, besides, they will, as a rule, be reciprocally exclusive). Just as in the initial experiment, the design and operation of the instrument are described classically. Variants of the concluding experiment and the corresponding design of the instrument depend on the type of quantities (coordinates, momentum, etc.) for the measurement of which they are intended.

Thus, in an initial experiment there is above all the possibility of choosing a certain type of instrument for the concluding experiment. In any case the concluding experiment refers to the *past* (and not to the future, as the initial experiment) and it can be called a *verifying* experiment, since it enables us to verify the forecasts obtained in the initial experiment.

Let us assume that the type of verifying experiment has been chosen. How should we formulate its result? Here we should always remember that the reference is to the *potentialities* created in the initial experiment and realised in the verifying experiment. Given a chosen type of verifying experiment, these potentialities are formulated as the distribution of probabilities for a given quantity (more accurately, for the values of a given quantity which can be obtained in the verifying experiment). Thus, the distribution of probabilities is subject to an experimental verification. Obviously, this verification can be obtained not by a single experiment but by repeating many times the entire experiment (with the same method of preparing the object and the same external conditions). The statistics obtained as a result of numerous repetitions enable us to estimate the distribution of probabilities under study.

A complete experiment (i.e., an experiment carried out to the end and making it possible to compare it with theory) consists of a set of initial and verifying experiments repeated many times. Here it is appropriate to recall once again that given a certain initial experiment (under given initial conditions) the concluding experiment can be made in different ways (different quantities can be measured in the experiment) and each type of concluding experiment corresponds to its own distribution of probabilities.

Thus, theory is confronted with the problem of characterising the initial state of the system in such a way as to be able to obtain from it a distribution of probabilities for any type of concluding experiment. Thereby a total description of the potentialities following from the initial experiment will be obtained. Since the concluding experiment may refer not to the initial moment but to a later time, theory must also yield the time dependence of these probabilities and potentialities. The establishment of this dependence will play the same role as the establishment of laws of motion in classical physics.

MATHEMATICAL FORMALISM OF QUANTUM MECHANICS AND THE DEGREES OF FREEDOM OF PHYSICAL SYSTEMS

A well-developed mathematical formalism is used to describe physical processes taking into account the relativity as to the means of observation and based on the concept of potentiality.

The initial problem of possible values of the quantities measured is solved on the basis of the theory of linear operators: corresponding to each value is a linear self-conjugate operator, the eigenvalues of which yield possible values of this quantity. This correspondence comprises the case of discrete eigenvalues (point spectrum) as well as a continuous series of values (continuous spectrum). It is noteworthy that the term "spectrum" had been used in the theory of linear operators as well as in physics (optical spectra) long before a relation was established between the two meanings of the world.

The concept of the eigenfunction of the operator leads to a more general concept of a *time-dependant wave function* describing the potentialities inherent in a given physical system under given conditions. The wave function satisfies a differential equation the form of which is directly connected with the form of the operator of the total energy of the system; this connection results from the fact that the energy-conservation law holds good in quantum mechanics as well. The differential equation for the wave function is of the first order with respect to time; therefore, the wave function is determined unambiguously by its initial value. All probabilities relating to a given system are expressed through this wave function (and through the eigenfunctions of the operators corresponding to the quantities measured). It can be demonstrated that these distributions of probabilities are such that Heisenberg's relations are obtained from them automatically.

The construction of the energy operator constitutes an essential part of the theory of given physical system. In this case it is necessary above all to take into account the degrees of freedom inherent in the system. It would be most natural to take those degrees of freedom which correspond to the classical concepts of the system. For example, we could ascribe to an electron those degrees of freedom which a material point has in classical mechanics and, accordingly, consider the wave function of an electron depending on the three coordinates for a given time. However, our analogy with the classical theory may prove insufficient. The very term "degrees of freedom" should be interpreted in a more general sense than in the classical theory, without reducing it to variables relating to motion in space but permitting the introduction into the wave function of all sorts of other (quantum) variables corresponding to the nature of the object. Thus, for the electron it is necessary even in the non-relativistic approximation to introduce its intrinsic angular momentum determined by special operators, known as spin; [3] this degree of freedom is especially essential for the formulation of the properties of a system of electrons such as an atomic electron shell. In the relativistic

[3] The terms "spin" and "intrinsic angular momentum" resemble classical analogies, but they should not be interpreted literally, in the sense of a kind of rotation of the electron.

approximation we have to go a much longer way towards the introduction of new degrees of freedom and consider the electron as part of an incomparably more complex system including positrons as well. Here we cannot help recalling a prediction of Lenin who referred to the inexhaustibility of the electron even when there was no quantum mechanics yet. [4]

The possibilities of introducing the new degrees of freedom of physical systems revealed by quantum physics with its new principles of describing processes are quite important even for understanding the simplest and basic physical laws. Thus, the properties of atoms as expressed by Mendeleyev in the Periodic System had not been explained theoretically until the electron spin was discovered and Pauli's principle formulated (the principle of antisymmetry of the wave function with respect to the transmutations of the coordinates and spin variables of any pair of electrons). It is the properties of the systems of electrons that are basic to the explanation of many macroscopic properties of solids (crystals, semiconductors), the properties defying any explanation in terms of classical physics.

The laws of quantum physics apply not only to particles proper (having a non-zero mass at rest) but also to particles with zero mass at rest, such as photons. As compared with electrons, photons have two peculiarities: first, they can readily be absorbed and emitted so that a collection of photons represents a system of an indefinite number of particles; second, a system of an assigned number of photons is described (in contrast to a system of electrons) by a symmetric wave function. The quantum theory of the electromagnetic field, including the theory of photons, is known as quantum electrodynamics.

Theories of other quasiparticles such as elementary sound oscillations, photons, have been constructed upon the pattern of the theory of photons connecting the concept of a field and that of a particle (or quasiparticle). Along with the theory of the electron system, these theories have been used in solid- and fluid-state physics. The properties of semiconductors as well as the superfluidity and superconductivity of some fluids observed at low temperatures cannot be interpreted otherwise than in terms of quantum laws.

Already in the theory of the electron, the introduction of new degrees of freedom (and above all its spin) played a decisive role. In recent years the identification of new degrees of freedom has been of major importance in connection with the development of high-energy physics and the investigation of interactions and transformations of elementary particles. These degrees of freedom are formulated as properties of symmetry and properties of transformation of wave and field functions. The establishment of their connection with space and time conversions as well as with the transition of particles to antiparticles opens up new prospects in quantum field theory. This region of quantum physics is still far from its completion; however, even now we can see how essential are in this region the new principles of description of processes introduced by quantum mechanics.

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[4] See V. I. Lenin, *Collected Works*, Vol. 14, p. 262.

CONCLUSION

Relying on quantum physics, we have been trying to demonstrate the need for methods of description of processes based on the concepts of relativity as to the means of observation and potentiality. The application of new (quantum) methods does not rule out but, on the contrary, complements and restricts the application of the old (classical) methods based on the concepts of absolutisation and detailing. The old methods receive their own field of application.

As has been said above, quantum physics possesses a well-developed mathematical apparatus. This apparatus allows of a non-contradictory interpretation only on the basis of concepts of relativity as to the means of observation and potentiality; therefore, epistemological differences between those objects which are described by methods of quantum physics and conventional (macroscopic) objects seem to us definitely justified.

The question arises: can there occur in nature other objects requiring specific methods of description? Living organisms could be such objects, for example. The problem of the organism-environment relationship resembles somewhat the problem of the object-instrument relationship: the organism is characterised by its own properties which by no means amount to the properties of its environment; however, the organism cannot be conceived as existing independently of its environment.[5] When the problem of life has been finally solved and adequate methods of describing living organisms found, a set of concepts, which are also new epistemologically, will no doubt be identified. However, this new set of concepts will not abolish but will merely complement the concepts of quantum and classical physics and will restrict the sphere where they are sufficient to inanimate nature. Here the philosophical proposition of the conventionality and relativity of all facets in nature will have to be recalled again.

Problems adjacent to the theory of knowledge also originate when a study is made of entirely different processes on an entirely different scale, viz., those relating to cosmology. Here Einstein's theory of gravitation is the guide. Therefore, the problem of the limited applicability of this theory arises. Is it permissible to apply it where it leads to qualitatively different properties of space and time than those which were originally basic to it (for example, where it yields a zero value for the velocity of light)? Is it permissible to extend our conventional concepts of space and time to infinitely large space-time regions and ascribe to them the properties formally following from the theory, without analysing the possibilities of observation?

We think it would be incorrect to extrapolate the physical concepts which have proved their worth in a field where certain means of observation are applied, onto a field where these means are insufficient. An example from the microworld might be in place. There, a simple space-time concept like the orbit of an electron has proved to be unacceptable. It is quite possible that

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[5] See V. Fok, "Close Contacts Between Physicists and Philosophers Contribute to the Development of Science", *Methodological Problems of Science*, Moscow, 1964, p. 234 (in Russian).

there are some restrictions for the cosmologically vast regions of space and time as well.

In general, any physical theory, including Einstein's theory of gravitation, has its limits of applicability, and it should not be, therefore, extrapolated infinitely. Sooner or later it becomes necessary to introduce new physical concepts corresponding to the properties of the objects under study and the means of cognition applied, and this is where the limits of applicability of the theory manifest themselves and new epistemological problems arise as a result. The guiding ideas in the solution of these problems must continue to be the ideas of dialectical materialism, formulated by Lenin with utmost clarity and universality.

Academician V. ENGELGARDT

Integratism: the Way from the Elementary to the Complex in the Cognition of Living Phenomena

The revolution in biology, of which we are witnesses and participants, has not only raised the study of fundamental biological problems to a qualitatively new level, but simultaneously, precisely because of its rapid development, has been increasingly confronting the researcher with philosophical, epistemological questions.

The growing flow of experimental research today is characterised by a snow-balling–and frequently explosive–process in the accumulation of factual material and a stupendous break-throughs by the mind into areas but recently regarded as inaccessible or infinitely remote. At the same time, there is a growing need to find the integrative principles making it possible to lay the basis of fundamental conceptions. An urgent problem facing science as a whole is to find the optimal synthesis of two dominant tendencies–differentiation and integration. The same need is also being acutely felt in our branch of science that studies the living world.

There is a considerable number of purely biological problems requiring theoretical comprehension and philosophical elucidation. There is no doubt that among these the greatest importance attaches to the problem of the extent to which it is justifiable to reduce complex phenomena, with which we have to deal in biology, to the elementary levels of physics and chemistry. That is one of the fundamental epistemological problems, first roughly outlined by Engels. The difficulties in this case are compounded by the fact that what is to be "reduced" is the most complex, the most delicate and the most perfect of anything we know on this planet of ours, namely, the phenomena of life. And it is this we want to reduce to the very rudiments–to the behaviour and properties of molecules. This was the subject of sharp and bitter controversy in the very recent past.

In Soviet scientific circles, this question of reducibility, that is, of whether it is justifiable to explain the properties of the complex by a study of its simplest components, was at one time declared to be very nearly a heresy. Thus, for instance, the efforts to reduce hereditary phenomena to the operation of genes were considered to be futile. This tendency permeated every sphere in the study of living objects. Today, the controversy over whether it is justifiable to study complex phenomena, above all those in the living world, through reduction as the main way has been totally removed from the order of the day by actual progress in scientific knowledge. What is now be-

ing discussed in biological circles is the question of the correct relationship between the two trends in scientific thinking in the study of the living world, which have been designated as "reductionism" and "organicism". Reductionism is a term used to designate a principle of research arising from the conviction that the way to cognition of the complex lies through its division into more and more simple component parts and the study of their nature and properties. The implication is that by reducing the complex to an aggregation or a sum-total of its parts, and by studying the latter we shall also obtain a knowledge of the properties of the original whole.

To avoid any confusion in interpretation, it should be noted that the term "reductionism" is used here to designate a strictly limited, specific range of phenomena. In accordance with the established tradition in scientific writings, this term is used in the study of living objects, in an interpretation of their vital functions. It covers simultaneously both the method of research, in substance, an analytical approach which is being systematically elaborated and deepened, and the aim whereby it hopes to obtain exhaustive knowledge about the properties of the original integrity. While the former aspect is accepted entirely and unconditionally, the second requires some reservations stemming from the conditional and inadequate nature of the knowledge obtained. I shall here deal, therefore, with the ways of overcoming these defects of reductionism.

In contrast to reductionism, organicism postulates the impossibility of reducing the complex to the simple, and is prepared to adopt as the object of its research only this or that degree of integrity, the level of organisation which is adequate to the character of the functions and properties being studied. Organicism bases its stand on a postulate which some believe to have been formulated by Plato. According to this postulate the whole is something more than the mere sum-total of its parts.

Today, reductionism does not require any kind of defence or evidence that it is justifiable. The evidence comes from the whole body of modern biological research, which is essentially nothing more than the triumphal advance of the reductionist principle. To molecular biology–a direct product of the reductionist principle–have fallen all the epoch-making successes and achievements which constitute the substance of the current revolution in biology. The key question today should be this: how does the complex arise from the simple, what are the forces here set in motion, what are the regularities of this process, how are the new properties created as a result of progressive complexness, with the transition to new and higher levels of organisation? Many of these questions have been dealt with in various books published over the last few years. [1]

It would, of course, be wrong to assume that reductionism, as a methodological basis for biological research, could claim a monopoly in the study of

[1] See V. Kremyansky, *Structural Levels of Living Matter*, Moscow, 1969 (in Russian); Henry Quastler, *The Emergence of Biological Organisation*, New Haven and London, 1964; H. von Foerster, "On Self-Organising Systems and Their Environments", *Self-Organising Systems*, Oxford, 1960: Collections: *The Problem of Integratism in Modern Biology*. Moscow, 1968, and *The Concept of Information and Biological Systems*, Moscow, 1966 (both in Russian).

the living world. To organicism is left its own, sufficiently extensive sphere of research, and the task today should largely consist not in contrasting these two methodological approaches, but in seeking ways to synthesise them—or at any rate to complement them mutually in one way or another—to establish the relationship of the parts of complex integrities, an idea on which Niels Bohr specifically insisted as one of the leading principles in producing a modern picture of the universal structure of the world.

Evidence that the advocates of organicism are themselves aware of the need to find the right forms of inter-relationship between the two approaches to the study of living phenomena and that they have been seeking ways to achieve this, comes from the 1968 Symposium at Alpbach which was organised by Alfred Koestler, who has written on various problems of modern natural science. The proceedings of the Symposium were published under the highly significant title *Beyond Reductionism,* [2] implying, one may assume, that the sponsors of the Symposium were far from rejecting reductionism and were anxious to find ways of how to advance.

A fairly extensive magazine article dealing with the results of the Symposium has also appeared. [3] The author, even though clearly inclining to organicism, has to admit the brilliant successes scored along the way of reductionism. While going to the extent of labelling reductionism the "nihilism of the present day" (which paradoxical assertion, incidentally, he does not back up in any way), he nevertheless draws the remarkable conclusion that all hope of successfully probing the secrets of living nature, manifested at higher levels of organisation, must be pinned on an attack from below, that is, beginning precisely from the lower levels at which so-called "reductionist" molecular biology normally operates.

In order not to return again to this contrasting of reductionism and organicism, I think it would be useful to quote a highly profound and penetrating statement by Ivan Pavlov, one of the greatest representatives of organicism of our age. In a speech about Heidenhain, a leading physiologist at the turn of the century, Pavlov characterised him as a "representative of the physiology which is bound to succeed our present-day organ-physiology and which can be regarded as the harbinger of the last stage in the science of life—the physiology of the living molecule". [4]

The successes scored by molecular biology along the way of reductionism are much too numerous and sufficiently well-known to need listing here. But if we are to formulate the most characteristic feature of molecular biology we might say that its task is to study living phenomena by operating with non-living objects, that is, those deprived of life.

Genes are known to be the real vehicles of hereditary properties. Their own properties have been studied in every detail, and there is no reason to doubt these to be real, but researchers had to infer their existence to some

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[2] A. Koestler and J. Smythies (Ed.), *Beyond Reductionism*, The Alpbach Symposium, London, Hutchinson, 1969.

[3] W. Thorpe, "Reductionism v. Organicism", *New Scientist*, 1969, Vol. 43, No. 668, pp. 635-638.

[4] I. Pavlov, *Complete Works*, Moscow-Leningrad, 1949, Vol. 5, p. 162 (in Russian).

extent indirectly, judging by the effect of their action. The urge to see them at first hand was therefore quite natural. It is this that has been effected in the very recent period, and in a two-fold manner: on the one hand, in its static form, that is, through a demonstration of the gene as a static object, and, on the other, in a dynamic state, in the process of the gene's fulfilling its specific biological function.

A team of researchers [5] have succeeded, using remarkably refined and subtle methods, to isolate from the hereditary apparatus (genome) of the intestinal bacillus a group of three functionally connected genes which effect the reduction of lactose in the cell of this microbe. It is a segment of the DNA containing the said genes. The electron microphotograph shows it as a distinct linear structure with proportions that are up to theoretical expectations, and sharply demarcated from the rest of the gigantic DNA molecule, which appears in the form of a haphazardly tangled knot.

Another work [6] gave a visual demonstration of the first stage of the gene's function. It is a process of transcription, when on the DNA molecule carrying the genetic information there occurs the synthesis of another nucleic acid, the so-called matrix or messenger RNA. This is effected by the operation of a special enzyme, the polymerase RNA. In this case, the electron microscope gives a view of what was earlier inferred only from the results of chemical analysis. The photographs show the growing threads of the RNA as it is being synthesised. On a section of the thread-like DNA molecule, corresponding to one gene, up to 100 molecules of the polymerase RNA are in operation, joining in one after another to ensure the consistent growth of the RNA molecules. This is something like a time-coordinate cross-section of the dynamic picture of the biosynthesis of nucleic acid, a picture of "a gene in action".

I think it is in place at this point to deal also with an area of research which in substance constitutes the boundary between reductionism and the new line of research which I want to examine and substantiate in this article. Attention here will be focussed on the processes of integration, of an organic inclusion of primary component parts, with which reductionism operates, into integrities of a higher level of complexness. In concrete terms this involves a study of the two most important classes of biopolymers–proteins and nucleic acids–undertaken from the standpoint of synthesis through the means of organic chemistry. The fundamental groundwork in both these cases was laid along reductionist lines, following an analytical establishment of the chemical structure of the molecules involved.

Discovery of the primary structure of such proteins as the insulin hormone or the ribonuclease enzyme, created the prerequisite for their chemical synthesis, and this has been done in several laboratories. The recent total synthesis of the gene, carried out by H. Khorana and his associates, must be re-

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[5] J. Shapiro, L. Machattie, L. Eron, G. Ihler, K. Ippen and J. Beckwith "Isolation of Pure lac-Operon DNA", *Nature*, 1969, Vol. 224, No. 5221, pp. 768-774.

[6] O. Miller and B. Beatty, "Portrait of a Gene", *Journal of Cellular Physiology*, 1969, Vol. 74, Supplement I, pp. 225-232.

cognised as an event of outstanding importance.[7] In formal terms, this epoch-making achievement could be viewed as the initial step along the way of integratism, inasmuch as there has been integration of low-molecular monomers–amino acids and nucleotides–to constitute a new integrity, biopolymer macromolecule. But in both cases, the integration was carried out by totally different ways than this occurs in biological systems, so that no regularities of biological integration are revealed here.

It would be wrong to think that the current achievements of reductionism could be regarded as an aim in itself, as the final stage beyond which there is no further quest. The sphere to which the principles of reductionism are applied is bound steadily to expand. In practical terms, we must consider it as inexhaustible as the study of the atom or the electron, as Lenin had predicted in his lifetime. As I shall try to show later, it is possible to think of a transition from the present, molecular level to a level lying even lower, in the sphere of atoms, and even of electronic structures.

A totally different, and fundamentally distinct methodological importance should be attached to the orientation of scientific research which moves from the most primitive, elementary and basically molecular levels, where modern reductionism reigns, in the opposite direction, towards levels with ever increasing complexity of organisation, towards systems acquiring new properties and functions. The task of this direction should be seen in overcoming the one-sidedness of reductionism, in learning how the more primitive elements are included, integrated into new integrities at higher stages of the organisational hierarchy, with different degrees of systematisation. The basic feature in this transition from the simple to the complex is precisely its integrative character, the emergence of a definite system of bonds, the loss by the components constituting the integrity of some of their individual properties, an assimilation of their properties by the integrated whole. Accordingly, the term "integratism" could be applied to this line of scientific knowledge.

What meaning then is given to the concept "integratism"?

The relationship between the part and the whole is characterised above all by the existence of definite, firmly established and multilateral interactions between the parts constituting the whole, which have the form of *bonds*. It is quite clear that without the existence of bonds between the parts no integrity could exist; it would inevitably disintegrate. From this the following conclusion could be drawn: the *distinction* between the whole and the sum of its parts consists in the *existence* of a system of *bonds* between the latter. It is the bonds that constitute the new latent item which distinguishes the whole from the sum of its parts. Anything that could be found within the whole, without establishing bonds with the other parts, would not be a part of the whole, but a foreign body.

The emergence of a system of bonds in the formation of the whole out of its free, separate parts should be regarded as the most fundamental, primary condition of integration, that is, the emergence of a new entity. It is a

[7] K. Agarwal, H. Büchi, M. Caruthers, N. Cupta, H. Khorana, K. Kleppe, A. Kumar, E. Ohtsuka, U. Rajbhandary, J. Van de Sande, V. Sgaramella, H. Weber, T. Yamada, "Total Synthesis of the Gene for an Alanine Transfer Ribonucleic Acid from Yeast", *Nature*, 1970, Vol. 227, pp. 27-34.

necessary condition. It is quite another matter whether it is *adequate* to the constituted aggregation acquiring the properties of an integrity–that is something we shall not deal with here.

Observance of the fundamental condition just formulated implies that the parts which are to constitute the whole are invested with a definite number of properties ensuring the possibility of bonds arising between them. These properties could be designated as desmogenic, from the Greek "desmos"–bond. The formation of a network of mutual bonds between the parts constituting the emergent integrity is the *condition* for the formation of this integrity.

What then are the *effects* of the formation of these bonds bringing a set into a unity? These effects have a bearing both on the part and on the whole, because the formation of the new bonds entails definite changes in the properties. The part entering the composition of a new and more complex unity loses some of its properties, seemingly sacrificing them for the sake of the advantages acquired, for instance, a reduction of the free energy of the system. The properties of the part are variously eliminated, assimilated by the properties of the whole, and are transformed into the properties of the latter. On the other hand, the emergence of the new integrity is accompanied by the appearance in it of the new properties which are not at all identical with those the component part has "lost", but which are in the main determined precisely by the bonds which arose as the part entered the emergent whole.

Consequently, we may speak of three elements which in the aggregate characterise the relationship between the whole and its parts. First, there is the emergence of an interacting system of bonds between the parts of the whole. Second, there is the loss of some properties of the parts as they enter the composition of the whole. Third, there is the emergence of new properties in the emergent new integrity being determined by the properties of the component parts and by the emergence of a new system of inter-partial bonds. To this should be added a *greater order* in the arrangement of the parts, and the determinantness of their spatial and functional relationship.

To illustrate what has been said with a simple example, let us take the formation of glycogen from glucose. As a part of glycogen, glucose loses its restorative properties and its mobility, and capability for diffusion. The integrity of a higher level which has arisen–glycogen–has a high molecular weight, does not diffuse, and acquires properties which enable it to play the part of a reserve carbohydrate.

A result of this aggregation of events, which go to produce a whole from the parts is that the part, which had earlier been independent, ceases to exist as such and becomes a component of an intrinsically coherent integral whole. There emerges something new which had not existed earlier, with its specific new properties. It is this result that we shall designate by the term "integration".

Cognition of the essence of integration, of its regularities, of its motive forces and sources is the highroad for penetrating into the nature of biological organisation at every level, from the lowest, molecular ones towards a growing degree of complexity. There is scarcely any doubt that movement along this way must run from the simple to the complex, and it is this way which

was designated above as integratism. The task of work along this line is to move from reductionism, which is based on a division of the complex and a study of the simplest components, to cognition of the regularities of biological organisation.

Integratism should develop from reductionism, and proceed from its results. There should, of course, simultaneously be an awareness of the fact that the way from the simple to the complex is much more difficult than that running from the complex to the simple, which is the basis of reductionism. However, this difficulty should not be regarded as insuperable. On the contrary, that this way is a realistic one is being amply proved by the steadily accumulating material from an extensive range of experimental research in the recent period.

Alongside the term "integratism" it is advisable to use the concept of *integrative information* as the guideline factor at every level of integration. The concept of information has introduced a basically new, fundamentally specific category into the sphere of the cognitive complex with which we operate in studying living objects and systems. Some authors even believe that "science has added information to such 'atoms' of the universe as matter and energy". [8]

The concept of integrative information will imply here the sum total of the properties required to ensure the possibility of integration in each separate case. What are these properties? These are above all the properties which enable the part entering the composition of the new integrity to interact with the other components of the latter. Interaction implies here the emergence of bonds, and bonds imply the existence of various forces. We arrive at the conclusion that integrative information consists of a sum total of properties ensuring the existence of forces of inter-component bonds. In that case, the process of integration itself consists in a manifestation of the effect of these forces. Consequently, the central task of integratism becomes the clarification of the nature of the forces participating in integrative information, the regularities governing their operation, the sources from which they arise, spatial localisation, etc.

The concept of integration is firmly bound up with the concept of the existence of a systemic principle, because any integrity rests on a system of bonds. A study of the regularities governing the properties and behaviour of the systems is now the sphere which attracts most attention. No wonder the "systemic theory" idea itself was formulated by Bertalanfy, a theoretical biologist. The principles of the systemic approach acquire exceptional importance in the cognition of the living world. It will not be surprising at all if the systemic theory will soon come to play as important a role as we have seen fall to the lot of the theory of information.

In integration we invariably find a growing regulation of order. Integration can quite well proceed within a closed system. It would appear that the increasing regulation of order which occurs in the process clashes with the second principle of thermodynamics, because the entropy of the system seems

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[8] See I. Blauberg, V. Sadovsky, E. Yudin, *The Systemic Approach: Prerequisites, Problems, Difficulties*, Moscow, 1969, p. 6 (in Russian).

to be reduced. Actually this is only an apparent contradiction: integration runs strictly towards a reduction of the systems' free energy, and this reduction is always very much more considerable than the negentropy of the growing order.

Let us take a simple example, Plateau's well-known experiment: of two liquids of equal specific weight, which do not mix, the liquid of which there is the lesser quantity seeks to assume the form of a sphere. But the sphere is a much more ordered system than the same mass of liquid freely changing its form under the impact of the disordered forces of the heat movement of its molecules. The answer is a simple one: with a given volume the sphere has the minimum surface. Consequently, the forces of surface tension will be at a minimum, and the gain of its free energy will exceed many times over the negentropy of the limited free movement of the molecules.

Because this question is of fundamental importance let us cite another experiment to illustrate the actual state of affairs. The description of this experiment is borrowed from Foerster.[9] This experiment may appear to be naive, because it looks so simple, but it is a clear demonstration of what I mean. Let us take two sets of cubes in two transparent boxes. At first the cubes lie in both in total disorder. When one of the boxes is moved and shaken the disorderly arrangement remains. But when the same thing is done with the second box we find that the cubes have fallen in a highly ordered arrangement, that they have been arranged in rows. The answer is simple: little magnets have been attached to the sides of the cubes, and the reciprocal pull of the opposite magnets, while reducing the free energy of the system, exceeds the negentropy of their ordering many times over. Here again we find that the second principle of thermodynamics has not been broken.

Mention of the "regulated order" had a bearing on one of the most fundamental conceptions in the modern picture of the living world. The concept of "order" in application to living objects is most closely and indissolubly connected with the phenomena of integration we have been considering. Without the conception of integrity that of integration loses all meaning as well, because the latter would be identical with mere summation, that is, a quantitative increase of a given set, without any qualitative changes arising. Integrity, for its part, necessarily implies the existence of an element of order, of fixed inter-relationships of parts, in contrast to a disordered mixture.

Experimentators and thinkers have always been keenly aware of the problem of order as an inalienable attribute of living systems. It acquired a new aspect in the light of the conceptions of thermodynamics, with the strict requirements of its second principle. This problem is dealt with in the works of outstanding modern researchers. Mention should be given to J. Needham's book, *Order and Life*, which stresses the importance of making a deep study of integrative hierarchies which never occur in the world of inanimate nature. Needham develops the idea that biological order and organisation are not axiomatic categories, but, on the contrary, present the researcher with a demand of fundamental importance, namely, that these concepts should be

[9] H. Von Foerster, "On Self-Organizing Systems and Their Environments", *Self-Organizing Systems*, Oxford, 1960, p. 31.

given a scientific interpretation. Needham believes that a real comprehension of the intrinsic regularities constituting the basis of the living world can be obtained only after it has been discovered how the successive "integrative levels" are connected with each other, without reducing the gross to the fine, or the higher to the lower, but likewise refraining from unscientific quasi-philosophic conceptions. [10]

It was Schrödinger's classic work that started the interpretation of the principle of order in biological systems in the light of thermodynamics. [11] This approach was recently elaborated in a brilliant and entertaining form by A. Lwoff, winner of the Nobel Prize in molecular biology. [12] He summed up his standpoint in brief formulations by characterising entropy (in this case the reference to entropy is with a negative sign, that is, negentropy) and "order" as the real fuel which helps to maintain life. He saw as a typical feature of living matter the fact that in virtue of the order inherent in it, it is itself capable of creating order: the only source of biological order is biological order itself. Even if we find this assertion to be somewhat too categorical, it is impossible to deny that there is much truth in it. But it is impossible here to examine in detail the question of order as one of the most important factors in living phenomena–this would take us too far afield from the main point of this article.

We find the simplest instance of integration when polymer molecules are biosynthesised from monomers (to designate the components entering as a result of integration into a new integrity we shall subsequently use the term "protomer", as has been suggested by Monod). The situation here is the simplest possible. Integration occurs through the formation of chief valence bonds; consequently, the integrative information in this case is above all concentrated in the groupings of the protomer which participate in forming these bonds. To these may be added certain other factors, like steric configuration, but their role remains secondary. An example of this kind of integration is provided by the above-mentioned formation of glycogen from the remains of glucose. The instances of the synthetic production of biopolymers–proteins and nucleic acids–may also be referred to this case, with necessary reservations.

Participation by the chief valence forces of chemical affinity in the phenomena of biological integration is limited mainly to the processes of the formation of biopolymers. In practical terms, in all other instances the chief role in integration falls to the so-called weak forces of inter-molecular interaction. It is these forces that we must regard as a factor of decisive importance in integration phenomena.

In principle, the forces of chief valence bonds are of a coherent nature, which is determined by the electronic structure of the atoms taking part in forming these bonds. The latter are of considerable durability. In contrast to this, the forces of inter-molecular interaction are highly diverse in form and are considerably weaker than chief valence forces. For the same reason, they

[10] See J. Needham, *Order and Life*, Cambridge, Mass., 1968.

[11] E. Schrödinger, *What is Life? The Physical Aspect of the Living Cell*, Cambridge, 1944.

[12] A. Lwoff, *L'ordre biologique*, Paris, Lafont, 1969.

are much more mobile, largely subject to the influence of the environment, and frequently reveal phenomena of cooperation. These are hydrogen bonds, electrostatic forces, the Van der Waals-London forces, dipole-dipole interactions, dispersion forces, forces connected with charge transfer, hydrophobic interaction, etc. We must add that in many respects they have been less fully characterised than the chief valence bonds are, and their study is now attracting increasing attention. But we are not here interested in the question of their nature and detailed data about their properties, which is why it will suffice merely to list them. We find inter-molecular forces important because it is they that are, to an overwhelming degree, the vehicles of the integrative information here being dealt with.

It should be emphasised that in integration on the basis of chief valence bonds, which underlies the synthesis of biopolymers, we find simple conditions only in the formation of high-molecular polysaccharides. There the information governing the process of integration is contained in the protomers themselves, that is, the monosaccharide molecules. No external factors introducing information take part. Enzymes do not introduce information but merely enhance the reactive capacity of the molecules.

Totally different conditions obtain in the biosynthesis of proteins and nucleic acids. Here we are dealing with the matrix mechanism. There is no need to describe its essence, whose main features are generally known. In the formation of colloidal polysaccharides the integration of protomers could occur through the information contained in their molecules. This type of information could be designated as *endogenic* or *immanent,* that is, inherent in the integrated protomer. This type of information turns out to be inadequate to produce new integrities of such a degree of complexity, of a such strict ordering which we find in the macromolecules of proteins or nucleic acids. It is to fulfil this task that the mechanism of matrix synthesis comes into operation. It introduces information from outside which determines the order, the sequence of the protomer integration. The matrix itself, containing this information in the form of a chemical structural record of the arrangement of the nucleotides, does not constitute a part of the end product which has arisen under its governing influence. This is an *exogenic* type of integrative information (and could be called a *directive,* governing type).

The participation of the matrix mechanism ensures the solution of perhaps the most complex problem of biological integration. Out of total thermodynamic disorder, out of the chaos that is the odd mixture of heterogeneous protomers–four or five nucleotides, in one case, two dozens of amino acids, in another–there must be produced a strictly set and observed order in the sequence of the mutual combination of the integrated elements, their integration into a higher-level system–the chemical structure of a molecule of the corresponding polymer, consisting of hundreds of thousands of separate links.

We do not know to what extent mechanisms of this type which introduce integrative information from outside (that is, the exogenic type) take part at other stages of the hierarchic gradation of biological systems. Our thoughts naturally run to the highest tiers of this hierarchy, like the mechanisms of memory or other functions of the nervous system. But it would appear to

be extremely superficial to expect to penetrate the nature of integration phenomena by conducting research at the summits of biological organisation. It is a long way from the boundaries of modern reductionism to systems of increasing complexity. It may turn out to be immeasurably long, if the organism of a higher animal is regarded as the ultimate goal. But the way to the chemical synthesis of the protein molecule, to the synthesis of the enzyme or the gene, or to the visual observation of the vehicle of hereditary properties, the isolated gene, must have appeared to be just as long at the turn of the century.

But even being aware that integration has a long and hard way ahead of it, we can draw considerable optimism by surveying the path that has already been traversed. It is not all that short, and the accumulating knowledge is a source of confidence that the charted way is right and well-grounded. It may be said that there are already many examples to show what might be called "integratism in action". In order to avoid charges of being declarative, it is advisable to recall some of the successes of integratism. Many of them may be well-known individually, but I should like to bring them all together so as to introduce an element of integration into my exposition.

The effect of integration is manifested in the fact that the emergent new integrity has qualitative marks which the protomers included in its composition lacked, but which are to some extent predetermined by their properties. We find the simplest but very important examples at the very early stages of the complexification of biological formations, namely, in the structuring of biopolymer molecules. Needless to say it is here impossible, and hardly necessary to go into more specific detail.

An instance which stands somewhat apart and which may be ranked among examples of integratism only fairly relatively is the inter-relationship between the so-called primary chemical structure of biopolymers, proteins and nucleic acids, and their real three-dimensional configuration. In formal terms, the molecules of proteins and nucleic acids constitute a chain of monomers. This is a linear formation, an object with one dimension. Actually, in natural conditions the linear character of this formation disappears, and it acquires a strictly fixed spatial, three-dimensional configuration. The volumetric, three-dimensional, spatial structure is naturally a higher-level organisation than the original thread-like sequence of links. We are dealing here with a peculiar intramolecular spatial integration. The information governing the process of integration is strictly fixed in the properties of the integrated lower-level object, in the primary structure of the molecule, that is, in the arrangement of the separate links of the one-dimensional chain, of its amino acids or nucleotides. The motive force of the integration process itself, which results in the acquisition of a tertiary structure, is the above-mentioned forces of weak interaction, which in this case operate between the parts of the same macromolecule. This could perhaps be called "intramolecular integration".

An important aspect of this type of integration is that here the acquisition by the biological object of a new quality–a three-dimensional, spatial configuration–goes hand in hand with the emergence of new properties of primary importance. In some instances it is the appearance of a capacity to

bind oxygen reversibly, as is the case with the oxygen-bearing pigment of muscle fibre, myoglobin. In other instances it is the appearance of a catalytic fermentative activity.

Directly allied with this type of integration are phenomena of spontaneous association of molecule fragments discovered by the works of A. Bayev and A. Mirzabekov at the Institute of Molecular Biology of the USSR Academy of Sciences. They applied enzymes to a molecule of a nucleic acid to cause a rupture of various numbers of chief valence bonds so that the molecule split up into two or even more parts. It turned out that when the appropriate conditions were created, these fragments could re-associate with a complete restoration of the original spatial arrangement between themselves as was evidenced by the complete resumption of the biological activity characteristic of this type of molecules (the capacity to react with the corresponding amino acid). But there was no question at all of the chief valence bonds being restored. Consequently, these remarkable experiments showed that integrative forces are to some extent capable of compensating for the loss of a number of powerful chief valence bonds.

The next rung in the hierarchy of integration levels is the interaction of molecules, with the formation of multimolecular complexes, associates of varying degrees of complexity. This complexity may be of two types: quantitative and qualitative. In one category of cases it is a matter of association involving greater or lesser numbers of the same type of molecules (either protein or nucleic acids), and these may either be indentical with each other or of a different chemical structure. A well-known example of a biomolecular associate is the paired DNA helix, built of two complementary, polynucleotide molecules in an anti-parallel arrangement. Closely allied to this are complexes which may be formed from the molecules of various types of nucleic acids, from RNA and DNA, capable of producing, "molecular hybrids". The emergent new system acquires new properties which the separate components making up the integrity do not possess.

The integration phenomena occurring between protein macromolecules are almost boundlessly diverse. This type of integration is most vividly manifested in the existence of a numerous category of proteins, whose molecule is made up of a greater or lesser number of separate polypeptide chains, normally designated in this case by the term "sub-units". Hemoglobin, the oxygen-bearing pigment of the blood, is the most typical formation of this kind and has been studied best of all. Its molecule consists of four sub-units, two pairs of polypeptide chains: two alpha-chains and two beta-chains. In the hemoglobin molecule (which could be designated as a tetramer) these four sub-units are found in a strictly defined arrangement vis-à-vis each other, constituting an internal unity with its own properties, which the separate sub-units lacked, including those on which crucially depends the biological function of hemoglobin, and its capacity to bind oxygen and to release it.

The integrative structuring of macromolecules from sub-units is characteristic of the overwhelming majority of biological catalysts, enzymes. In quantitative terms, the integrative complexification here may reach an extremely high level. There is an enzyme with a molecule consisting of 96 sub-

units which belong to at least four different types and are arranged in strict accordance with the laws of symmetry. They may be separated, but once mixed together they are spontaneously impelled by the forces of integrative information to constitute the original strictly ordered unity, which acquires specific, catalytic properties the isolated sub-units do not have.

These examples involve the integration of components belonging in each instance to one and the same chemical class–either nucleic acids or proteins. On the most extensive scale, integration at the molecular level also takes place between representatives of both classes of biopolymers. The most important morphological structures of this level contained in the cells of the higher organisms are the products of this "mixed" integration. This includes the repositories of hereditary information–the chromosomes, and the molecular mechanisms of protein synthesis–ribosomes, and the intermediate carriers of information from the cell nucleus to the ribosomes, the so-called informofers in the cell nucleus and informosomes in the cytoplasm.

In all these instances we find complexes structured from combinations of nucleic acids and proteins in strict regularity, with precisely set quantitative relations, qualitatively specific individual components and a high degree of spatial order.

All these typical criteria are also to be found among another vast group of biological formations, viruses, beginning with bacterial viruses (bacteriophages), plant viruses, and including animal viruses.

From the angle we have taken here primary importance attaches to the fact that for all these categories of objects, with all their profound differences and dissimilarities, one common feature has been established for all of them. It is the capacity of all these integrities to be structured from the appropriate separate components as a result of strictly determined integration taking place spontaneously on the basis of the integrative information contained in the chemical structure and, correspondingly, in the physical properties of the component parts making up the integrity. This is most clearly brought out in experiments carried out to discover phenomena which are designated by the term "self-assembly".

Selecting the appropriate conditions, such as changing the ionic composition of the medium, altering pH, bringing oxidation and reduction to bear, changing the temperature, etc., it is possible to cause the disintegration of these biological objects into their component parts, down to complete fragmentation, that is, to the point where these parts are obained individually isolated. If these isolated individual components are then mixed once again, definite favourable conditions produce the reverse process of integration of the separated elements into the original integrity, which is sometimes exceptionally complex and has a strictly set spatial arrangement. That this "self-assembly" process runs fully to its completion is decisively evidenced by the complete restoration of the biological functions inherent in the original object, like the infection properties of viruses, the synthetic capacity of ribosomes, etc.

This process of "self-assembly" in its diverse forms is nothing but a directly perceived manifestation of integration. How perfect it is may be judged by the fact that in some instances this involves the integration into a

strictly predetermined integrity of a very great number of separate elements. Mention was already made of an enzyme whose active particle consists of 96 sub-units; in the case of ribosomes we also have to deal with a number of components of the order of 100, and the "self-assembly" of a particle of the virus of the mosaic of tobacco involves thousands of units (it is true that there is no difference in quality–one molecule of RNA and a great many identical protein sub-units).

It would be an illusion to assume that the "self-assembly" phenomena fully reveal the substance of integration phenomena. It is merely a first step of exceptional importance leading up to new problems, primarily to the search of ways of moving on from the discovery and description of integration phenomenon, to a discovery of its internal regularities, in the first place the molecular basis of the recognition phenomena, where the governing principe of integration must lie, because without selective recognition of specific molecular structures it is impossible to imagine the emergence of a determinated interaction and interarrangement of the integrated parts. Discovery of the general principles of recognition, and of its concrete molecular basis in each individual case, will undoubtedly constitute one of the leading elements in the development of integratism in the immediate period ahead.

Integratism is not an aim but a means. Ensuring a correct blend, the proper relationship between reductionism and integratism is the basic strategy for a scientific quest in cognising the phenomena of life in the near future, or rather for the entire future of biology's development as an exact science. The governing principle here should be the urge to produce schemes and concepts of integratism, proceeding from the data obtained with the aid of reductionism, that is, proceeding from the simplest and most elementary conditions, rising step by step to the higher rungs of the hierarchic gradation, and moving to greater degrees of complexity of the systems being studied. The intrinsic dialectical unification of these two apparently diametrically orientated lines of biological research and thinking should characterise the next stage in the approaches to the cognition of the living world.

We should not close our eyes to the fact that in the present period, at the present level of development of integratism, we have to operate mainly with phenomenological information. The deeper motive forces, a detailed picture of the mechanisms of their action, and the causal and functional aspects for the time being remain largely concealed. Their discovery should constitute one of the most important sectors of biological research aimed at solving the fundamental problems which arise from studying the nature of living phenomena.

Academician P. ANOKHIN

Philosophical Aspects of Functional System Theory

1. GENERAL EVALUATION OF ANTICIPATORY REFLECTION OF REALITY

Our article presenting an elaborate argument in favour of our conception of "anticipatory reflection of reality" (see *Voprosy filosofii*, 1962, No. 7) has been followed by a series of monographs, articles and notes analysing this conception from various angles. By and large, the authors are inclined to admit that the "anticipatory reflection of reality" is one of the ways of development of the fundamental problems raised by Lenin's theory of reflection (T. Pavlov, B. Ukraintsev, M. Vedenov, G. Yugai and several other authors).

Indeed, the concept that the reflection of reality may be active and "anticipate" on the basis of previous experience is in keeping with Lenin's theory of reflection and indicates how effective the application of the theory can be to explain the processes of reflection of the external world.

Anticipatory reflection is one of the possible forms of reflection, in the process of which the organism actively readjusts itself to forthcoming events on the basis of previous experience The conditioned reflex is the highest form of this primary law of all living things.

This law of formation of all organisms and their adjustment to the external world disproves once again those critics of Lenin's theory of reflection who contend that the very concept of "reflection" merely points to the organism's passive (?!) attitude towards its environment. As applied to the evolution of the organisms we can say that the reflection of reality has always been an active process on the part of the organism itself; and at higher levels of the evolution it developed into a direct action on the external world in order to transform it (the use of implements and environmental adjustment).

For example, we can point to the ability of the brain to anticipate quickly future events in reply to a stimulus operating only at present. This is manifest in different forms, and, essentially, determines the formation of a continuously anticipatory "searchlight", illuminating all possible prospects for our conscious behaviour.

This process of anticipation of events as an adjustive process has been clearly demonstrated of late for the pupas of some insects which have to winter in open air owing to their developmental conditions (for example, the parasitic wasp Barcon). This fact caused great surprise among scientists and defied explanation for a long time. Indeed, how can a wasp pupa whose pro-

toplasm contains a considerable amount of water resist winter frosts? Persistent research led to striking discoveries which unravelled the enigma. It was found that the very first autumn colds stimulate a special process in the protoplasm of the pupa's cells: rapid formation of glycerin. That solved the problem, since glycerin is known to be a substance decreasing considerably the cryoscopic temperature of cellular masses.

A concrete experiment indicated that in early autumn (or when pupas were kept artificially at 5° below zero) the pupas aquire the ability, owing to accumulated glycerin, to withstand a frost of 40° to 70° below zero Centigrade. As soon as the pupas are transferred into a normal temperature, the glycerin disappears from their cellular protoplasm very quickly (in three days). This appearance and disappearance of glycerin is especially striking in case of Pensylvanian wood borers. They can be used for such experiments several times, and each time glycerin appears (up to 100 per cent) or disappears depending on temperature changes. This ability of pupas to accumulate glycerin in response to the first colds, though they will not need this glycerin until December, graphically confirms the anticipatory reflection of reality which has been developing throughout millions of years.

Our further exposition, and especially analysis of specific brain mechanisms, will be concerned with the mechanisms of realisation of this anticipatory reflection of reality.

2. PROBLEM OF "INSCRIPTION" OF LIVING BEINGS INTO THE ABSOLUTE LAWS OF THE INORGANIC WORLD

Biologists and physiologists face a new and interesting problem which can be described as the problem of "inscription" of living beings into the fundamental laws of the inorganic world. Quite a few number of inorganic processes can be identified to which living organisms adjusted themselves *volens nolens* in the course of evolution.

Take gravity by way of illustration. Gravity had been in evidence long before the appearance of life, and on the scale of the Galaxy and the Universe as a whole gravity was certainly a primary property of matter.

Indeed, the presence of gravity stimulated in different animals the development of amazing adjustments. For example, gravity determines the peculiar character of locomotion of reptiles, the widely varied methods of flight of birds, and the organs and system of regulation of fishes which enable them to use the weight of their bodies in relation to the specific weight of water, etc.

We can safely assume that the development of all living beings, of their most essential structural-functional features, of their most lasting interneuron ties is determined by the laws of universal gravitation. As a matter of fact, the beginning of this process ascends to the period of origin of life, or, more accurately, to the period of formation of pre-biological systems.

Similarly, all the details of the organisation of widely varying structures of the organs of sense "fit" very neatly the energetic properties of the external world. On a wider plane, we have a genuinely active reflection of the

laws of the inorganic world with which all living organisms of our planet have met and interacted in every way possible. We can say that the active reflection of the initial properties of the external inorganic world in the basic structural forms of animals is an absolute law of life.

Against the background of this fundamental law of motion of matter, space and time have been especially fundamental constant factors which have been acting on all living beings ever since the origin of life. Living beings were bound to get "inscribed" into the universal law, and it is only owing to its adjustment to space-time interactions that life could survive on our planet. Let us try and visualise those fundamental adjustments of animals to which space-time factors led.

3. SPACE-TIME CONTINUUM AS A FACTOR OF BIOLOGICAL ADAPTATION

Our evaluation of the adaptive activity of animals is based on the need of recognising the artificial identification of individual important aspects in their life. Thus, referring to the action of a stimulus on the organism we believe that this artificial assumption is basic to our understanding of the activity of the organism. It is this assumption which made it possible to formulate the concept of discrete acts of animals and the discrete operation of external factors on the organism.

Recent advances in physics and other sciences warrant the conclusion that the development of events in the world is based on continuous-discrete motion of matter. This concept is an absolute law inevitable to the same extent in the inorganic as well as organic world.

However, the "biological screen" introduces an essential addition creating discreteness in this motion of matter in accordance with the biological significance of different continuum components.

Indeed, by no means all continuum components are necessary, for example, to the animal for survival. Some of them may be decisive, while others play no role whatsoever. For example, the appearance of a large beast of prey is a vital event, while the motion of leaves on a tree or of water in a river may pass unnoticed. It is these factors of biological importance of isolated events that created for the animal a certain *discreteness* of space-time relations. We shall return to this point later.

Several types of space-time continuum are known. In the simplest case known as one-dimensional continuum any position of a point moving in one direction from a certain departure can be determined by the coordinates of space and time needed for the movement of the point to a certain destination. The essence of this type of continuum can be defined as follows: to any arbitrarily small indicator of spatial movement of the point there may correspond an arbitrarily small interval of time. We can make these lengths of space and time as small as we like and thus obtain at this micro-level an actual space-time continuum functioning as an indicator of material processes.

However, we can also take this point away from the one-dimensional continuum and put it on some limited plane, having imparted to the point yet another degree of freedom (movement in different directions) within this

plane. Then the position of the point at each moment of time can be determined by two axes of coordinates. Consequently, no matter where and how this point may move, its position can always be registered and expressed by two quantities fixing its position by two coordinates.

In the latter type of space-time continuum it is important for us to note that the movement of the point in this case as well can be represented in micro-distances and micro-intervals of time, which makes it possible to express its different positions in the coordinates of two-dimensional continuum.

Making this example still more complex, as Einstein does, we can get our point moving in three dimensions. Then its position at each moment of time will be estimated with respect to three perpendicular planes. However, apart from this, such a point may move and change its positions and the rate of movement also depending on space and time intervals. Since these intervals can be taken in conceivable micro-sizes of space and time, we shall have continuum again, just as in the former case; however, it will be more complex than the continuum discussed hitherto. It will be a three-dimensional continuum.

Any body, animate or inanimate, exists within a continuously changing three-dimensional space-time continuum. This constitutes an essential aspect of all living beings on the globe. However, this is why we suppose that the organism-environment relationship should be interpreted as a continuous processing of information in the protoplasm or—at the highest levels of evolution of the living—in its nervous system, as treatment of a continuum of influences having no spasmodic discontinuity in space and time.

As neurophysiologist I can insist on this proposition because practically all time parameters in which the nervous system functions prove to be much more prolonged and much more compact than minimum levels in the flow of events of the space-time continuum of the external world. On the other hand, external processes developing in a space-time continuum may be far removed from each other and, nevertheless, they are constantly being focused in the same brain, in the same nerve cells.

Thus, a jet plane flying in the sky before our eyes may, while advancing in a space continuum, cover dozens of miles within several minutes, and, nevertheless, all its positions from the initial to the final point of vision are reflected as at focus in micro-intervals of space and time in the shape of a continuous flow of neuronal processes of the brain.

It is this miraculous mechanism of a living being which focuses within the microscopic space the vast intervals of the space-time continuum of external processes that has become central to the entire evolution of life on earth. It is only owing to such a biological screen focusing the vast scale of external events in the molecular reactions of the cerebral tissue that it became possible to "comprise the world" in its entire variety and vastness with the aid of a small bit of cerebral matter. Laymen are apt to forget that vast achievement of evolution owing to which we, people, at the highest stage of it are able to comprise, within short time intervals, processes and events occurring on the scale of the entire globe. This has become possible by the molecular processes in the nerve cells accepting and reflecting the gigantic scale of the Universe with the aid of continuous processes occurring

in different organs of sense. Below we shall see what specific peculiarities of the organism and in particular of the brain help us to comprise and adjust ourselves to this infinite space-time continuum of the world.

4. THE CONCEPT OF CHEMICAL CONTINUUM IN CEREBRAL PROCESSES

The advances of philosophy, physics and mathematics of recent years indicate that the conventional approach to the investigation of the nervous activity and the behaviour of animals can no longer satisfy the neurophysiologist. It has become obvious that the artificial fragmentation of nervous processes, and especially the behavioural acts of the animal cannot satisfy the investigator who wants to understand the meaning of these processes in terms of a perfectly reliable architecture of the world developing within the framework of the law of the space-time continuum.

Indeed, if we investigate an animal and register its ability for behavioural acts only since the beginning of the experiment, we obviously remove the animal from the complex continuum of its life and largely subordinate the investigation of the processes at work in its brain to our concepts and designs. This artificial discretisation of external processes is especially salient in neurophysiology during the isolation of a stimulus which holds, in the physiologist's view, an exceptional status in the formation of the animal's behavioural acts. Indeed, we have all been brought up in an atmosphere in which the role of the stimulus as an absolute decisive factor of behaviour was beyond doubt.

Owing to the latest advances of neurophysiology, it becomes ever clearer that the stimulus merely triggers the exposure and development of what has been created in the brain under the influence of many factors as something whole, integrated–it merely triggers the exposure of this integration prepared beforehand. As early as 1949 we labelled this hidden, disguised cerebral integration as "pre-starting integration".

Now, what is "pre-starting integration"? This is a state expressed in numerous ties of nerve elements developing in a continuous continuum during, for example, the day when the experiment is conducted. Indeed, the coming of a laboratory assistant to the vivarium to fetch experimental animals at a certain time is sufficient for a complex of nervous processes to form in the brain, reflecting all the details of the future experiment and the future reinforcement of the animal by vitally important stimuli (food, pain, etc.). Practically we shall not find between all details of this continuous cohesion any disruption which could violate the continuum. Obviously, all external processes can be subjected to some discretisation only artificially, while actually they develop in a true space-time continuum.

Thus, the life of the animal as a whole could be characterised as a "discrete" occurrence of vitally important nodal events rising above the genuine continuum of imperceptible events. We are so accustomed to our life being invaded by individual events which essentially affect our state and evoke an emotional response that the existence of a true space-time continuum seems to us something unreal, imperceptible. The trend of development of the biological object is such that the organism inevitably re-

gisters all the essential components of its life, of its successes and failures. Nevertheless, these islands of significant events are linked by a true continuum of processes which are not of decisive vital importance but still are connective links in a true continuum of the world. Thereby a universal enclosure is attained of all continuum components some of which are vitally important, while others usher in their appearance.

Modern neurophysiology demonstrates on the basis of neurochemical molecular processes that the vital importance of individual events is represented in the brain even in specific chemical processes which register the "steps" of these vitally important events. For example, we have the varying chemistry of suffering, anguish, fear, joy and other essentially emotional experiences and events in the life of animals and man. The essential importance of all these phenomena and their sporadic breakthrough into man's consciousness are responsible for the fact that man does not subjectively perceive as continuum the true space-time continuum of our behaviour.

A thorough analysis of very many examples of our behaviour will indicate that they irritate our nervous system in a perfectly continuous continuum.

Let us now enter with the aid of imagination into the brain–into an infinite number of its processes reflecting reality. It is not only the investigation of rough, summary electrical processes in the brain during its activity that the current cerebral research techniques have made it possible. Electronics in its subtlest devices enables us to penetrate into the activity of any nerve cell out of all fourteen thousand million cells of the brain. This approach has extended considerably our concepts of subtle processes developing in a nerve cell during its activity under a certain exetrnal influence. Every nerve cell has on the average about 5,000 contacts with other nerve cells and with organs of sense. Besides, each nerve cell may experience at least 6 different general states. It is very difficult to conceive of that number of possible specific states which the brain may experience given such a vast number of variables.

We can ask this question: how does this boundless combination of nervous processes occurring in the brain reflect a continuous flow of external events in various spatial and temporal combinations? This "wisdom of the brain" is determined not only by *how many* quantitative indicators the brain can process but also by *how the brain* reflects all the properties of the space-time continuum of the external world in its dynamic processes and in the qualitative peculiarity of its structural interrelations.

Let us suppose for a moment that a continuous series of external events: a, b, c, d, e, . . .acts consecutively on man's nervous system, and this stimulation is effected with intervals which can be expressed in milliseconds. There is nothing impossible about this assumption. In fact, our life is filled with this kind of stimulation. We can take any example of our everyday behaviour and demonstrate how it is composed of continuous actions passing into each other and similarly continuous afferent excitations of the nervous system.

Every barely perceptible advance of a behavioural act is accompanied by an integral continuum of various impressions following each other without any appreciable intervals.

Actually, we cannot find in any act of ours any discreteness sufficient for registering the presence of an interval in the form of a complete "silence" of the nervous system between some sufficiently remote stimulations of the space-time continuum of the external world.

Our concepts of discrete actions of various stimuli on the organism and discrete processes of the brain have been inspired to a considerable extent by the form of artificial experimentation: a sudden application of the stimulus we need. However, as we have mentioned before, even in this case, the processes occurring in the brain of an experimental animal, for example, proceed with the same continuity as those described above, in natural behaviour.

Obviously, we must accept the following as the principal law of the activity of the brain: an absolute and universal law of the inorganic world–development of phenomena in the space-time continuum–led in the process of evolution to the acquisition, by the brain of animals as a special organ of reflection and adjustment, of the property of the continuity of its processes in complete correspondence with the components of this continuum in space and in time.

All the forms of our behaviour, all variations of it, and as we shall see below, the active choice, evaluation and classification by living organisms of individual stages and components of this continuum are inscribed into this great law of nature. It can be said that everything *relative*, varying versus the totality of many conditions of life, has always been *inscribed* into this absolute law.

Consequently, we must seek only the conditions and mechanisms of the appearance and behaviour of the relative and varying within this absolute law. This is, in our opinion, where the "reference point" lies for investigating the activity of the brain in all its variety.

Analysing the merits of Einstein's theory of relativity, Max Planck expresses its attitude to the absolute laws of the world in this way: "The so-called theory of relativity is based on something absolute; such is the determination of the measure of space-time continuum, and *an especially attractive problem is precisely to find that absolute which attaches its genuine meaning to the relative.* We can always proceed from the relative alone. All our measurements are relative... What is meant here is the discovery in all these data of that absolute, universal, invariant which is latent in them. (My italics–*P.A.*)." [1]

These words of the founder of the guantum theory lay down a programme for investigating any, even quite insignificant process against the background and within the framework of the absolute laws of the world. Especially this proposition is applicable and even indeed indispensable for investigating the evolution of life on earth which Planck had certainly meant least of all.

In the evolution of living beings all relative and variant is sewn with quite obvious threads to the absolute laws of the world. This is illustrated especially saliently by the evolution of the brain.

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[1] Max Planck, *The Unity of the Physical Picture of the World*, Moscow, 1966, p. 20 (in Russian).

In the further exposition we shall see how subtly all the structures and mechanisms of the brain have adjusted themselves to a maximum enclosure of that multi-dimensional continuum of the world which contributed to the development of many special adjustments in cerebral activity, ensuring survival for the organism.

However, let us return to what makes up the very nature of these adjustments: to the activity of the solitary nerve cell, to the processes at work in its protoplasm. The adjustment as such has always an integral, systemic character; however, the elementary process in these systems is the discharge activity of the neuron.

We have established above that in practically any movement of the animal or in the performance of any behavioural action the space-time continuum of the external world acts in micro-intervals of time on its organs of sense and consequently on the neuronal elements of the brain. Now, how do the nerve elements themselves respond to these influences of the components and phases of the space-time continuum?

To answer this question we must turn to the physiological properties of cerebral neurons. One of the most remarkable peculiarities of the neuronal elements of the brain is the variety of their individual behaviour, the variety of reactions to incoming excitations.

Thus, some of them pass to higher activity conditions as an incoming excitation acts. Others stay, on the contrary, in constant background activity and get inhibited on stimulation. Some neurons cease their responsive higher-intensity discharge activity as the stimulation stops, while others continue to discharge for a long time yet in the form of "trace activity". In different neurons this so-called "trace activity" may continue for a different time. While in some neurons it lasts for only several milliseconds, in others it may last for seconds and even minutes. Obviously, all this variety of the individual behaviour of cerebral neurons in response to stimulations reflects their place, functional importance in extensive integral formations developing in the process of forming the changing functional systems of the organism.

However, we shall not consider these problems from the point of view of neurophysiology. They have been discussed in detail in several fundamental monographs published recently. [2]

At present I would like to draw the reader's attention to those neurons—and they constitute a majority in the brain—which display trace activity extending for seconds after the stimulation has stopped. How should these cells behave in case of continuous change of external stimulations in micro-intervals, i.e., at least in intervals expressed in milliseconds?

Direct experiments using pair stimulations or a series of stimulations indicate that there occurs an inevitable superimposition of excitations, their summation and considerable prolongation of the active state of the nerve cell. This "trace activity" may acquire a different character, and it is the configuration of the discharges that mainly varies.

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[2] See, for example, I. Beritashvili, *The Physiology of the Cerebral Cortex*, Moscow, 1969 (in Russian).

However, it is beyond doubt that what we observe is a perfectly obvious superimposition of subsequent discharges of the cell in response to each previous stimulation or to an aftermath of previous activity. Such a process occurs, no doubt, every minute under natural conditions as well: as various visual impressions succeed each other, some optical cells with a well-pronounced trace effect continuously overlap the discharges caused by different and consecutive visual stimulations. Suffice it to analyse from this point of view one's passing from one room to another or going out.

The fact of overlapping activity of certain nerve cells of the brain is beyond doubt. Some components of the external space-time continuum may act on the auditory or optic apparatus over even shorter intervals than those mentioned above. Consequently, the overlapping of activities of nerve cells remains a constant and essential factor in the functioning of the brain; it is important to note that this overlapping of continuum components may be uniform, i.e., two different, for example, visual stimulations may follow each other. On the other hand, two different stimulations–auditory and then visual stimulations–may hit the same nerve cell within a small interval.

This means that certain types of cells of the nervous system are, in effect, leading in the brain a continuous "tune" of the space-time continuum of the external world. Evidently, they have the privilege of establishing an absolute basis for vitally important episodes of nervous activity. It is evidently these cells that maintain the continuous inscription of everything relative and variant into the absolute law of the space-time continuum of the world.

Here we approach the last series of arguments in favour of neuronal activity ensuring a continuous contact of the brain and hence the organism with all the processes occurring at various stages of development of the space-time continuum.

However, sooner or later the following question is bound to arise: now, what is the nature, the essence of those cellular discharges which can now be detected with the aid of electronic devices as electrical explosive processes?

Today there is no doubt that the discharge of the nerve cell is its "voice", its "outcry", and it must incarnate the entire history of the living being in question, the possessor of the brain. The discharge reflects numerous influences reaching the nerve cell in question. However, the intrinsic nature of this discharge is the derivative effect of highly specialised chemical processes called forth by an excitation reaching the neuron.

Thus, all the pulses reaching the nerve cell transform in its protoplasm into a chemical process which leads in turn to an electrical discharge.

Any influences or excitations acting on the nerve cell inevitably pass through a stage of chemical transformation which determines the coding of the integral result in the nervous activity of the cell at each moment in the form of a certain pattern of nervous impulses. This proposition leads us to our final conclusion which is the basic purpose of this section of the paper.

The very fact of presence of trace discharges in some kinds of nerve cells inevitably brings about the overlapping of chemical processes of neurons caused by previous influences with new chemical processes caused by a subsequent component of the space-time continuum.

In other words, behind the overlapping of nervous impulses or cellular discharges we should always see the overlapping of chemical processes of the neuron as a whole. Howevcr, the continuum of events of the external world has no interval or end. Consequently, the overwhelming majority of cerebral cells keeps staying in the chemical continuum of those reactions which are caused by permanently recurrent stimulatory factors.

Consequently, in the protoplasm of the nerve cells of the brain there is a chemical continuum reflecting the continuity of events of the external world, i.e., its space-time continuum.

This is that absolute, that basis, on which the entire vast variety of structural and functional manifestations of the brain relies.

5. BEHAVIOUR AS A CONTINUUM OF RESULTS

From the above it is clear that cerebral processes are interconnected and constitute a continuous chain of chemical processes that keep fluctuating depending on the operation of certain stimulations. We have established that it is precisely the trace of these fluctuations of excitability as expressed in the discharging activity of the neuron that constitutes that link which cements the previous with the subsequent in cerebral activity. In our opinion, this is what constitutes the profound neurophysiological nature of the chemical continuum of the brain.

However, this kind of description of cerebral processes may entail the reader's natural question: how can this apparently monotonous process of chemical sequences construct all the variety of behavioural acts of the animal and man adjusting the organism so subtly and dynamically to external changes? How can a behavioural act including various anatomic structures at different stages realise this chemical continuum?

A thorough and close analysis of the essence of the matter may take us into a field of exceptionally interesting regularities where the structural evolution of the nervous system is adjusted remarkably to the absolute law of the space-time continuum of the world which has created the continuum of the chemical processes of the brain. This analysis also shows that the brain in the process of evolution has developed special structures and their relations which are established especially for reproducing the space-time continuum of the external world and incorporating vitally important factors.

Indeed, the development of cerebral structures possessing the ability for generalised activation, i.e., the propagation of activating influence throughout the brain, has ensured one of the most important functions of behavioural acts: their signal character. At present it is highly important to analyse the concrete mechanism of this action.

Let us assume that in the external world the action of several stimuli on the brain unfolds within short time intervals. As we know, a vast number of cerebral cells keeps connecting the chemical consequences of these stimuli. Let us also assume that none of these stimuli have any essential importance for the organism, i. e., they are neither menacing nor promising.

Let us now make another assumption: in this series of the space-time continuum of external stimuli one stimulus has proved to be extremely dangerous for the life or integrity of the organism, i. e., has caused a strong sensation of pain. Thus, the concrete stimulus has evoked a whole complex of innate biologically significant processes in the medulla and hypothalamus. These excitations reach the cortex, and in the present case they excite positively all the cells of the cortical level. At any rate, it is difficult to find such a cell of the cortex which would not respond by the acceleration or deceleration of its charges to the excitation of the reticular formation and hypothalamus.

Let us try to imagine what occurs at this time in all those traces which remain from previous stimuli which had acted consecutively on the organism before the latter was stimulated by pain? Some of the cortical cells have preserved, no doubt, the traces of the excitations which have acted on them, i. e., were in the state of attenuating discharges. Therefore, it is obvious that the more closely the stimulation approached the moment of a strong pain excitation the more distinct the trace from this excitation which coincided with the moment of the state of pain. For the theory of conditioned reflexes that would be a "shortly detained signal".

Owing to this coincidence of traces from previous indifferent stimuli with generalised excitation from the reticular formation and hypothalamus, we observe the following interesting picture: no matter where the preceding stimulus is, it is bound to be "overtaken" by a generalised pain excitation, and there will occur a similarly inevitable rendezvous of two chemical processes in the protoplasm of the same nerve cell. This is the moment of the chemical connection of all previous "chemistries" with the "chemistry" of the pain excitation.

What will be the outcome and, which is especially important, the chemical result of this rendezvous? In each case, when there recurs a sequence of the same external stimulations, the process will run along nervous ties which have been fixed chemically prior to the formation of responses to the pain stimulation, though the entire subsequent chain of excitations preceding the pain irritation has not been reinforced by the concrete stimulations corresponding to them. In other words, we observe an actual anticipation of the components of the space-time continuum of the external world by the specific chemical cerebral process. Behaviourily this will just be what Ivan Pavlov called the signal, or anticipatory response.

The presence of the chemical continuum in the brain of animals and man as we approach gradually the nodal point of the space-time continuum of the external world of essential biological importance is an unquestionable real fact. What we have to establish is only the influence that continuum exercises on the formation of all behavioural acts.

For the sake of clarity I would like to mention one important stage of development connected with the living being's acquisition of the ability for free locomotion. Without changing the cardinal meaning of the interdependence of the chemical continuum and the space-time continuum of the external world, free locomotion furnishes nevertheless adequate conditions for an immense leap in the development of the animal's adjustive behaviour.

Indeed, now the animal, while moving independently in different directions, creates a continuum of external irritations of its analysers and puts itself under their action, so to speak. The continuum begins directly to influence the construction of purposeful or purpose-oriented behaviour reducing to an active search of such components of the external continuum which satisfy certain needs of the organism. An open system as it is, the organism actively looks for deficient components for its "inputs", strictly programmed by its metabolism.

In this case we come across a new law which runs through all stages of development of life on earth. The onward locomotion of the living being furnished conditions for development of behavioural continuum of animals, since in the consecutive action of external agents on the organism in the process of its active locomotion there is, again, no discontinuity in the chemically conditioned discharging activity of neurons.

However, something new appears here. This new is the useful result of the animal's activity which is bound to arise in its active attitude towards the space-time continuum of the external world. It can be shown by any behavioural act that once inscribed into the space-time continuum descussed above, this act consists at the same time of a chain of useful results passing into each other.

From the point of view of a more general estimation of behaviour, we can see that the reference here is to the same law: man's behaviour in the space-time continuum appears to us as a continuum of large and small results with the inevitable estimation of each through retroactive afference.

Thus, the above formula defines the law of constructing the behaviour of living beings according to which this behaviour is a continuous chain of results with subsequent estimation of their sufficiency.

This is where the role of the "biological screen" comes in, classifying the importance of the result and introducing that element of generalised reinforcement which covers all the previous stages of stimulations that left behind a trace in the central nervous system.

It is biologically important or emotiogenic stimulations consolidating the trace responses to earlier stimulations that make up a necessary condition paving the road for future anticipatory responses under the action of some remote link of the space-time continuum.

Thus, the continuity of external processes is reflected on the "biological screen" as the "intermittence" of vitally important events for animals and man spaced out in time but connected by a continuum of comparatively insignificant results of the entire behavioural act.

6. CONCLUSION

In the present paper we have attempted to demonstrate on the basis of the theory of reflection that the basis or "absolute law" (to use Planck's expression) of the inorganic world–the space-time continuum–has determined all the forms of behaviour of living beings from the most primitive forms and up to man.

The appearance of life on Earth made it possible for the microworld of

molecular reactions of animate matter to reflect all the macro-processes occurring at vast time intervals. Conditions were thus created for "anticipation", and highly adjustive behaviour developed as a result.

The "biological screen" does not reflect passively the continuum of the external world. By introducing "vital needs" into the continuum and ensuring the conservation of life, the biological screen has linked the production of any results with these basic requirements. Thus, there developed the continuum of results in which "small" results lying on the road of production of "great" and "stupendous" results merge into a single behavioural continuum of results and accompany life from birth to death.

We would like to make this reservation: all the general propositions expressed here concerning the structure of interrelation of the inorganic and organic world are not purely theoretical concepts: they are also of essential practical importance.

It is hardly necessary to say that generalisations of this kind, changing considerably the investigator's approach itself, should be discussed in good faith by all those who appreciate the importance of problems raised in this paper: philosophers, physicists, physiologists, biologists, etc. We hope that such discussion will help us to view in broad philosophical terms the activity of the brain, an object of our daily efforts in scientific research.

Summary of Speeches

Prof. L. GABRIEL of Austria, President of the International Federation of Societies of Philosophy, who welcomed the Conference participants, highlighted the scale of Soviet research into the philosophical problems of modern natural science.

The Conference discussed three groups of problems: 1) general problems of the philosophy, methodology and history of natural science; 2) philosophical and methodological problems of the physical sciences; 3) philosophical and methodological problems of the biological sciences.

Of the general problems special attention was paid to an analysis of the revolutionary changes in modern natural science, the interconnection of philosophy and natural science, the subject's activity and the objectivity of knowledge, the methodological function of materialist dialectics and the dialectics of development of natural science.

Reports on these subjects were made by Academician V. AMBARTSUMYAN and V. KAZYUTINSKY, Cand. Sc. (Philos.)—"The Problem of Methodology and Logic in the Development of Natural Science Today" (published in an abridged form in this issue); by P. KOPNIN, Corresponding Member of the USSR Academy of Sciences—"The Marxist-Leninist Theory of Knowledge and Modern Science", and by Academician B. KEDROV—"Lenin and the Dialectics of Development of Natural Science".

In his report KOPNIN criticised the conception which separates philosophy from science and is now increasingly spreading among bourgeois scholars. The insolvency of contraposing philosophy to the special sciences has been proved by Marxism, which considers philosophy as a system of scientific knowledge which has its own subject-matter and method of its theoretical cognition, its own attitude to the world and to the knowledge that cognises it. Philosophy is not simply a sum of the results of the world's cognition, it also elaborates the universal method of the movement of knowledge toward objective truth. On the other hand, the scientific view of the world, according to Kopnin, presupposes a philosophical approach to it, which permeates the fabric of science, and is not an alien body to it. Marxist-Leninist philosophy offers a scientific world outlook which plays a positive part in the advance of knowledge, acts, at times invisibly, as a factor which essentially manifests itself in the most critical moments in the development of science, when the question arises of new ideas and theoretical constructions.

Kopnin raised the question of whether philosophy is still a source of new ideas for different branches of science and noted that only a positive answer could be given to this question. But in what sense should this role of philosophy be understood? Philosophy has always succeeded in advancing bold, "crazy" ideas. There is no doubt that the history of philosophy will always be a treasure-house from which it will be possible to draw ideas that are in unison with the demands of the time. But Kopnin holds that this is not the main way philosophy influences the development of science. It is the natural sciences themselves that give birth to new ideas in travail. They arise in the course of theoretical synthesis which necessarily includes the categories of a world outlook. It is in this sense that philosophy remains a source of new scientific ideas.

Kopnin examined the tremendous changes in science which raised the question of further developing and improving the philosophical method of thinking. Among those changes which directly concern logico-epistemological problems he mentioned the follow-

ing: 1) change of the view of the value and role of a visual image in science, the rapid development of systems of an artificial language, which is farther removed from visuality; 2) reappraisal of the role of experience in the movement towards new scientific results, caused by the fact that increasing significance is acquired here by theoretical thought, which acts as a powerful factor in advancing fundamental ideas that initiate new theories; 3) mathematisation and formalisation of knowledge, the striving to put an end to the intuitive element in it and at the same time the use of the intuitive element as a principal means of advance towards new theoretical constructions; 4) the weaving into the fabric of science of concepts and terms which are of an instrumental character, aimed directly not at the object studied but at the knowledge of it created by a metatheory and metascience; 5) the striving to create fundamental theories which synthesise knowledge from different branches of science; the rise of new methods which are important for cognising objects which come within the field of vision of different sciences; 6) the ever greater immersion into the sphere of paradoxical and "sophisticated" situations which run counter not only to "common sense", but also to rationally understood reality in general; 7) the tendency to split the studied object into the simplest structures and relationships, combined with a systems analysis; 8) the increasing role of the category of probability in cognising the objective world.

These changes have created a situation in science in which it is impossible to advance in it without a logico-epistemological analysis of scientific concepts and theories. The most vivid example is the problem of substantiating mathematics, which is not a logical luxury but a necessary stage in the development of mathematics itself and its problems.

Materialist dialectics is the philosophical method which makes it possible to interpret properly the course of contemporary scientific cognition and influence it. At the same time we face the task—one that is acquiring increasing importance—of changing the form of materialist dialectics in the light of the present-day global scientific and technological revolution. What is needed is a systematic analysis of all the existing categories and the advance of new ones on the basis of a synthetic understanding of the distinctions and regularities of present-day scientific knowledge, its tendencies and trends.

The tendency to enhance the subject's activity in the course of comprehending objective reality was given priority by Kopnin among the main tendencies of modern natural science. The philosophical solution of the problem of the subject's activity given by Marx in the "Theses on Feuerbach" stemmed chiefly from the generalisation of the history of philosophy; but in the 20th century this problem is also solved in the light of the contemporary development of natural science, especially physics. What is characteristic of modern physics (and as a tendency of natural science as a whole) is that the forming conceptual apparatus of science assumes in the functional sense the form of a language of science, superimposed on the results of the experimental study of the object. Mathematics is increasingly acting as this apparatus. What happens is that the conceptual apparatus which acts as the language of the sciences is more and more borrowed from mathematics, is imposed as it were, from the outside on the sciences of nature. The connection of the concepts of these sciences with reality is becoming ever more complex. The concepts are often turned into some kind of auxiliary constructions with the help of which scientists cognise the object. All this offers a pretext for various idealist, including positivist and neo-Thomist, interpretations. But a solution to the problem of the subject's activity has been provided by Marxist philosophy, which has made it possible to disclose the dialectics of the subjective and the objective in man's practical activity. The subject's activity as such is inherently determined by the properties and regularities of the object previously cognised by man. Man acts, both in his thoughts and in practice, in accordance with the laws of objective reality. It is practice which combines objective nature with man's transforming activity that gives rise to human knowledge. The latter, notwithstanding its subjective form, is objective in its source and content. In other words, it purposefully, creatively and actively reflects things, phenomena and processes of objective reality. The dialectics of the subjective and the objective, the coincidence of the former with the latter is, as Kopnin stressed, the key to the epistemological understanding of the results of modern knowledge, the laws and tendencies of its development.

Academician B. KEDROV said that the task set by Lenin before Marxists—to disclose the general laws of scientific cognition by aid of the material of various sciences through its dialectical processing—was of exceptional importance. Knowing the history of science and establishing the laws governing its development, he further noted, it is possible to rely

on this knowledge and have a proper orientation in the present situation in science and, what is most important, to foresee, to forecast its subsequent development.

The general course of scientific knowledge was presented in Kedrov's report as transition from the knowledge of phenomena to the disclosure of their essence. The specific manifestation of this regularity at the earliest stages of natural scientific cognition is the advance of cognition from appearance to reality. This is a process of "turning right side up" former notions, of changing them into their opposites. This was the case in the history of natural science (for example, the replacement of the Ptolemaic geocentric system by the heliocentric system of Copernicus) and also in philosophy (the "turning right side up" by Marx of the relationship of matter to spirit, which was mystified in Hegel's philosophy).

Another expression of the self-same general course of knowledge from direct phenomena to their essence is the movement from coexistence to causality, i.e., from the simple juxtaposition of things and phenomena to the disclosure of the causal-consequential connections between them. This aspect is displayed most saliently in the history of biology. At first living organisms were regarded simply as coexisting among themselves and with the environment; then scientists discovered the laws governing relations between living beings, standing at different stages of their evolutionary ladder, and also between their morphological attributes and conditions of life; lastly Darwin explained these laws from the positions of determinism.

The development of natural science, as Kedrov pointed out, proceeds through the rise and subsequent resolution of contradictions, whose types were analysed in his paper. In some cases the single object is bifurcated into opposite sides (parts), which are first cognised in isolation from one another and even in their antithesis (negation). Next comes the linking together of the opposites which were previously isolated and cognised separately, and the synthetic restoration of cognition consists in that first only one side is singled out of the real contradiction, then it is negated and discarded; the side gaining the upper hand displays its antithesis and then the transition is made to the synthesis of the rival views. Cognition moves along a spiral, according to the law of negation of the negation. This is revealed in the constant repetition, at different stages in the development of science, of similar processes and phenomena. For example, five big "circles" can be singled out in the history of atomistics. In the course of each "circle" the enemies of atomistic concepts from the idealist camp tried to "refute" these ideas, ejecting from science in general the idea of discreteness as applied to the given type of matter, or the form of its motion. But every time the struggle against atomistics has ended in the complete defeat of the anti-atomists.

Kedrov also examined the problem of analysis and synthesis as methods of scientific study and as tendencies in the development of natural science. One of these is the differentiation of the sciences and specialisation of scientific knowledge; the other one is the integration of the sciences and universalisation of scientific knowledge. Prior to the second half of the 19th century the differentiation tendency prevailed, which was fully in harmony with the general analytical stage in the cognition of nature. But since that time the development of natural science has led to the linking together of the formerly separated fundamental sciences, i.e., to the integration of scientific knowledge and its conversion into a single system of sciences.

The tendency towards the integration of the sciences has thus become dominant, but it now operates in complete unity with the deepening tendency towards further differentiation. Both tendencies now penetrate each other and reciprocally determine each other. This is in complete harmony with the synthetic stage of the cognition of nature by modern natural science—analysis is increasingly becoming a subordinate element of cognition, discharging the role of a prerequisite for synthesis.

The principles of development and of the unity of the world are interconnected and are mutually supplementary principles of dialectics. These principles, Lenin wrote, must be linked, tallied with each other. In natural science the principle of development presupposes in particular the ascertainment of the genesis of the objects of nature, while the principle of the unity of the world presupposes the ascertainment of the structure of these objects. Both these principles of dialectics in natural science, as shown in Kedrov's paper, are combined in different ways. In some sciences (cosmogony, geology) first the structure of the object is studied and then processes of their genesis are deduced from the knowledge of the structure. Other sciences—physics, chemistry and, to a large extent, molecular biology—develop according to a directly opposite scheme. A study of the changes and trans-

formations of the respective objects leads to cognition of their structure and makes it possible even to discover formerly unknown structures.

In the concluding part of his paper, Academician Kedrov examined the role of the categories of quantity and quality in the history of natural science. The natural and mathematical sciences can be divided into three groups, depending on how the study of the qualitative and quantitative sides of their objects is interconnected. In sciences of the first group (mathematics, mechanics, thermodynamics, cybernetics) study of the quantitative sides of the respective objects has greatly overshadowed the study of their qualitative sides. Physics and chemistry make up the second group. The study of the qualitative and quantitative sides of their objects proceeds, as it were, along parity lines—none overshadows the other or prevails over it. In sciences of the third group, geology and biology, study of the qualitative side of their objects clearly prevails, overshadowing their quantitative side.

S. MIKULINSKY, Corresponding Member of the USSR Academy of Sciences, Moscow, voiced his agreement with the description of the main distinctions of modern natural science given in Kopnin's report. He pointed out that in our days the sciences of nature examine not only separate objects or separate forms of the motion of matter, but also reveal such distinctions of processes in nature which are inherent in the entire objective world, in any case, are to a very great extent common both to organic and inorganic nature.

Prof. G. SZABÓ, Hungary, criticised the view voiced by the enemies and "pluralisers" of Marxism, according to which philosophy must engage only in the solution of the problems of man, while nature cannot be the object of a philosophical study.

Prof. G. KRÜBER, German Democratic Republic, in his joint communication with Dr. H. Laitko, analysed in detail the relationship of the Marxist-Leninist philosophy of natural science and the theory of science.

Prof. Y. ASKIN, D. Sc. (Philos.), Saratov, spoke about the relationship of philosophical categories and concepts of particular sciences. He emphasised that it was impermissible to identify philosophical categories and concepts of particular sciences, or reduce the former to the latter, and vice versa. There is, however, a difficulty which consists in that philosophical terms in many cases coincide with the terms of the particular sciences and also with words in the ordinary language. Such major categories of materialist dialectics, as matter, motion, development, space, time, quantity and quality coincide in their verbal shell with the corresponding concepts of particular sciences. A proper approach to these categories with due account for their universality is of great philosophical importance.

A. URSUL, D. Sc. (Philos.), Moscow, discussed in his speech the movement of concepts from philosophy to natural science and vice versa.

Dialectics penetrates natural science along two main channels: first, through cognition by natural science itself, second, through philosophical cognition which acts as the methodology of research in natural science. But in no science of nature is dialectics displayed in its entire richness. It is most fully manifested in philosophy, which draws information not only from nature but also from the other spheres of being and cognition. This "overfall of the content" of universal categories advances to a certain extent theories of natural science by adding special knowledge, and by efficiently directing thought to divining the secrets of nature. Natural scientific theory usually concentrates attention on one of the sides of the dialectical contradiction; subsequent theories include in their concepts the other side of this contradiction, making a dialectical synthesis of new knowledge.

The reverse movement of concepts from natural science to philosophy consists in generalising the content of traditional categories of philosophy (space, time, motion, causality and others) and in incorporating in the system of Marxist philosophy of new categories not reducible to the old ones (system, element, structure, function, information, control, probability, model, symmetry, asymmetry, and others). The criterion for introducing such concepts into philosophy is their ability to reflect the most essential sides of objects of being and cognition and to serve, at the same time, as universal methods for the practical and theoretical cognition of reality.

In the opinion of I. NOVIK, D. Sc. (Philos.), Moscow, dialectics should now be elaborated not at the level of macro-assertions, i.e., general propositions which have become part and parcel of dialectics, but at a more concrete level which he called micro-structures in dialectics.

Prof. P. DYSHLEVOI, D. Sc. (Philos.), Kiev, holds that what is now lacking in solving the problem of the interconnection of philosophy and natural science is a concrete

analysis of a concrete situation. So far there is no fundamental work devoted to the philosophical questions of natural science as a special sphere of research.

Twentieth-century natural science has introduced many new concepts (physical reality, relativity, and others) of which there are no fundamental studies either. It is necessary to publish works analysing the new conceptual structures applied in modern natural science. Study of the concrete methodology of modern natural science is an urgent task and its accomplishment would furnish answers to many questions now in the focus of attention of scientists.

F. KANAK, Cand. Sc. (Philos.), Kiev, thinks it is important in analysing the interconnection of philosophy and natural science to single out the following questions: a) philosophical interpretations of changes in cognition in the sphere of natural science; b) philosophical foundations of science; c) the methodology of a concrete science. A philosophical conception is ejected from scientific development if it is unable to cope with new situations, to assimilate the current changes in science.

The natural scientist needs philosophy not so much as prognostication but as a refined expression of the way of thinking in our epoch.

The place of ontology in the system of Marxist-Leninist philosophy was the subject of a lively discussion. Is ontology a relatively independent part of it, or is a special ontological aspect incompatible with the basic principles of Marxist philosophy?

Prof. V. SHTOFF, D. Sc. (Philos.), Leningrad, is inclined to recognise ontology as a relatively independent branch of Marxist philosophy. This means that in interpreting the objective world philosophers face special problems which are not reducible to the problems solved by the theories of natural science and are insoluble without the latter. These are problems solved by objective dialectics (generalisation of natural scientific theories, the discovery and substantiation of universal laws, universal properties and relations in the objective world, an analysis of the content and interconnection of categories reflecting these properties and relations). These problems cannot be exhausted by the dialectics of concrete processes studied by particular sciences. But while admitting the relative independence of ontology, Shtoff rejects ontology contraposed to natural science, which arbitrarily and groundlessly imposes on the latter different demands, bans and frontiers, which proceed from *a priori* principles or considerations of a speculative nature.

The ontological viewed as objectively dialectical was also voiced in the communication by Prof. V. SVIDERSKY, D. Sc. (Philos.), Leningrad, who enumerated a number of ontological principles formulated within the bounds of objective dialectics understood in this way. These are the principle of relativity of the concrete, the principle of interconnection, stability and changeability, the principle of the real infinity, the principle of the attributive understanding of matter and the heterogeneous content of attributes.

The opinion that ontology is a relatively independent part of Marxist philosophy was supported by Candidates of Science (Philos.) V. BRANSKY and A. KARMIN and also by Prof. M. MOSTEPANENKO (all of Leningrad). On the other hand, it was sharply criticised by Y. BUKHALOV, Kharkov, I. ALEXEYEV, Novosibirsk, and B. KEDROV.

Bukhalov regards as insufficiently complete the definition of Marxist-Leninist philosophy only as a science of the more general laws of development of nature, society and thinking (without indicating the Marxist solution of the fundamental question of philosophy). By itself this definition does not bring out the specific features of philosophy, its distinction from other sciences which study some general properties and laws of the world; it leaves unclear the question how philosophy studies and reveals the more general laws of the world, what role it plays in the development of other sciences.

Materialist dialectics, as a science of development and its laws, directly studies the general and essential in the development of nature, society and thinking, the development of cognition as a reflection of the objective world. Moreover, cognition itself is a derivative side of socio-historical practical activity. Objective dialectics is perceived through subjective dialectics, which reflects the former and is displayed in the dialectics of practical activity and cognition. Consequently, in studying the development of cognition, the interconnection of its different aspects, its relationship with practice, materialist dialectics reveals its objective content, deduces its own categories and laws as stages of cognition and the universal forms of reflecting the objective world. That is why materialist dialectics, being the general theory and method of knowledge, is at the same time the science of the more general laws of the development of the world. This, in Bukhalov's opinion, con-

stitutes the essence of Lenin's idea concerning the coincidence of dialectics, the theory of knowledge and logic.

I. ALEXEYEV, Cand. Sc. (Philos.), Novosibirsk, examining the place of ontological problems in the studies of both general questions of materialist dialectics and the philosophical questions of natural science, criticised the views of Svidersky who asserted that it is possible first to formulate some epistemological demands and then look for their objective ontological basis. The ontological, epistemological and logical components of the solution of any concrete philosophical problem are fused, so to say. The general basis for this is provided, in Alexeyev's opinion, by the category of activity. The change of the world pictures in the history of natural science is explained not by a change of the physical world, but by a change of the character of human activity.

As Kedrov stressed, the term "ontological" has been used for a long time in the sense that being is examined as such. But it is not implied in any way that being itself is interpreted dialectically and materialistically. On the contrary, inveterate metaphysicists and idealists, especially those who adhere to objective idealism, often act under the flag of ontology. The identification of ontologism with objective dialectics, made by Svidersky, is absolutely groundless. There was a time when the subject-matter of Marxist philosophy was defined in a way as to fully exclude thought from it. That was a striking manifestation of the truly "ontological" approach to the question because the subject-matter of philosophy, of dialectics, was interpreted fully in the spirit of the universal principles of being, of being as such. But this discarded the fundamental question of philosophy—the relation of thinking to being, consciousness to matter, the subject to the object. Thereby philosophy as a science was eliminated. In this context Kedrov voiced the opinion that the trend elaborated by Svidersky was largely outside philosophy with its fundamental question. The singling out of ontology is in principle alien to Marxist philosophy because this would imply the existence of some part of it outside the fundamental question of philosophy. Svidersky's statement that the epistemological approach alone is insufficient and that it must be supplemented by the ontological is a misunderstanding. The fundamental question of philosophy is epistemological and far from precluding in the least degree the objective basis of the relation of thinking to being, it directly presupposes this basis, and its study.

Prof. L. GABRIEL, Austria, said that the doors previously closed to ontology were now opened before it. It penetrates natural science, blasting the positivist understanding of science. Fundamental theories of physics by themselves do not possess the universality needed to reflect the world. This speaks of the limited nature of physical theories with their special logico-mathematical apparatus and their applicability only to definite physical phenomena. To recreate a picture of the world theory must be released from these narrow confines through a corresponding philosophical interpretation. Without the integrating horizon for philosophy there will always be the danger of making a fetish of certain scientific concepts. It is such a new physicalistic ontology, as Gabriel pointed out, that reveals the need for philosophy, but for a philosophy connected with science and not the one that roams in the sphere of pure conceptual constructing.

The study of the activity of the object of cognition is of particularly great interest, F. KANAK pointed out, in view of the continued theoretisation of the scientific understanding of the world and the divorce of scientific concepts from commonplace notions.

V. STEPIN, Cand. Sc. (Philos.), Minsk, discussed the origin of a scientific theory. He said that a major question of the methodology of science was how a theory which is not deduced from a directly generalised experience is capable of explaining the data known at the moment of its formulation and even to predict new data. Only by solving this question is it possible to obtain concrete methodological recommendations needed by modern natural science. Stepin then examined the main stages of the formulation of theories in physics.

A. KARMIN, in a joint communication with Y. KHAIKIN, Borisoglebsk, discussed the epistemological nature of scientific intuition. The act of intuition is a logical vacuum in the sense that there is no logical bridge from preceding knowledge to knowledge arising as a result of the intuitive process. But the "logical vacuum" does not signify an "epistemological vacuum". Intuition may be regarded as a process of interaction of the sensory and the rational. It may be interpreted as transition from the old concept to a new image (eidetic intuition) and from the existing image to a new concept (conceptual intui-

tion). The initial point in eidetic intuition is the formation of a logical concept in which the essential features of the studied process are highlighted. But no obvious image conforms to this concept. In this case obvious images from other spheres of knowledge are often helpful. A obvious image plays the part of an integrated structure which synthesises the existing images into a new structure. The formation of a new concept proceeds in a similar way but in a reverse order.

Problems of the interaction of reflection and creative endeavour in the process of cognising the world were discussed by A. POLIKAROV, Corresponding Member of the Bulgarian Academy of Sciences. He also examined the role of empirical and theoretical prerequisites in constructing a system of scientific knowledge.

I. NARSKY, D. Sc. (Philos.), Moscow, touching on the methodological function of the system of categories of materialist dialectics, concurred with Kopnin's opinion about the open nature of this system. That is why it develops so that at definite stages the entire system may be reconstructed, with some categories falling away at times. He also supported the idea expressed in the paper of V. Ambartsumyan and V. Kazyutinsky about the role of experimental data in the process of study in natural science.

T. NOVIK criticised the notion that a theory must be based on a direct generalisation of facts. Theory, as he pointed out, is now becoming more active, it is not so much organically linked up with empiricism as before. In many cases it is impossible to decide at once what theory is closer to the truth. The criterion of competitive validity of scientific theories must become the object of a methodological analysis.

Academician M. MITIN, Moscow, discussed the role of the modelling method in the system of dialectical-materialist epistemology. A proper philosophical approach to modelling, in his opinion, should consist in the following: it is necessary, first, to recognise the great significance of this method of cognition, the boundless possibilities of applying it and the ever wider spread of the methods of modelling; second, to understand the place of modelling as a specific methodology in relation to the general philosophical methodology; third, not to draw from the development of this cognition method one-sided conclusions leading to idealist constructions but to see in modelling a means of cognising the objective world.

The systemic-structural method of study and its relationship to materialist dialectics was discussed in a number of speeches.

I. BLAUBERG, Cand. Sc. (Philos.), Moscow, emphasised that there were no grounds whatsoever for contraposing the systemic method to materialist dialectics because they represent different levels of methodology. Materialist dialectics is the general methodological basis of all sciences. The systemic approach is a much narrower methodological instrument. It is a particular methodology for solving concrete problems—systems of technology and control, specific systemic problems in biology, psychology, sociology, linguistics, and other sciences. The elaboration of this approach promotes the development of dialectics, of its conceptual apparatus and its categories.

A. MOGILENKO, Odessa, read a communication by Prof. A. UYEMOV and a group of his associates on the place of the systemic approach in modern natural science. The communication stressed the ever growing need for unifying knowledge, which helps to: a) study isomorphisms in different spheres of knowledge; b) reduce to a minimum duplication in theoretical studies; c) bring out the unity of science and establish the collaboration between specialists in different sciences. The essence of the systemic viewpoint, as the authors state, is in the method of deducing systems from properties of, and relations to, objects, and not vice versa. Before introducing the systemic approach it is necessary to give a "systemic" form to the studied object. Systemic notions are linked with many principles of modern natural science, for example, the principle of relativity and the principle of optimality.

The interconnection of the systemic-structural studies and materialist dialectics was also examined in speeches of S. Mikulinsky, V. Svidersky and I. Novik.

Dr. H. PARTEI, German Democratic Republic, discussed the heuristic and algorithmic methods of study and their relationship to materialist dialectics.

Academician K. FUX, German Democratic Republic, discussed the stages of development of matter in the light of the categories of possibility and reality. In his opinion, the inexhaustible possibilities of the development of matter are the basis for transition from one stage to another. The laws of the lower stage of development are also preserved during transition to the higher stage, but the range of possibilities allowed by them is greatly limited.

Prof. W. HOLLICHER, Austria, dwelt on some aspects of the Marxist concept of man. He criticised as metaphysical the mystification of the differences between man and animal and also their mechanical identification.

In discussing problems of the dialectics of development of natural science, S. MIKULINSKY, H. KRÖBER and A. FRENK, Cand. Sc. (Phys. & Math.), Tiraspol, supported the main propositions of Kedrov's paper. Frenk criticised the notions now spread in foreign literature that Berkley and Mach were the predecessors of Einstein in constructing the theory of relativity. On the other hand, he established the essential connection between Einstein's ideas and the works of Huygens and Leibniz.

Many of the conference participants discussed questions pertaining to the closer ties between philosophers and natural scientists in their joint elaboration of philosophical problems of natural science. Academician Ambartsumyan said that philosophers are increasingly helping natural scientists, while natural scientists are increasingly taking into consideration the studies of philosophers, are taking interest in problems of natural science which have particularly great philosophical importance, and also in the philosophical conclusions from their research work. This point of view was supported by Academicians P. Anokhin, A. Berg, M. Mitin and V. Fok, Corresponding Members of the USSR Academy of Sciences, P. Kopnin and M. Omelyanovsky and also M. Asimov, President of the Academy of Sciences of the Tajik Soviet Socialist Republic, M. Yelyashevich, Academician, Academy of Sciences of the Byelorussian Republic, and practically all other conference participants. It was emphasised that for materialist dialectics to be able to cope with the epistemological, methodological and philosophical problems of contemporary natural science, it itself must develop on the basis of the new results of socio-historical practice and cognition.

The conference examined philosophical and methodological problems of physics, especially the general problems of interconnection of modern physics and materialist dialectics; theoretico-cognitive problems of quantum physics, the physics of elementary particles, the theory of relativity and the interconnection of the micro- and mega-worlds.

Reports were made by M. OMELYANOVSKY, Corresponding Member, USSR Academy of Science—"Lenin and Problems of Dialectics in Modern Physics"; Academician V. FOK—"Quantum Physics and Problems of Philosophy" (published in an abridged form in this issue); Prof. V. BARASHENKOV, D. Sc. (Phys. & Math.) and D. BLOKHINTSEV, Corresponding Member, USSR Academy of Sciences—"The Leninist Idea of the Inexhaustibility of Matter in Modern Physics" and Academician A. ALEXANDROV—"Space and Time in Modern Physics in the Light of Lenin's Philosophical Ideas".

Space and time in the physical sense, as Academician ALEXANDROV stressed, are forms of the existence of matter. Their structure is determined by the fundamental properties of the material world and it is not something into which the world, as it were, is built. Correspondingly, a rational theory of space and time necessarily deduces their properties from the very properties of matter. Such was the source of geometry—it reflected above all the general properties of the relations of solid bodies determined in the first place by the possibility of their motion. The concepts of space and time in Newtonian physics were also inextricably linked with the laws of the motion of bodies established by classical mechanics. The deepening of our knowledge about the motion of matter (the creation of electrodynamics) could not but change and further deepen the laws of space and time, i.e., the general laws of space-time relations of physical processes. Such was the logic of the creation of the modern theory of space and time (Einstein's theory of relativity).

Academician Alexandrov dwelled on two approaches to the theory of relativity. The first is based on the idea of space-time as a real absolute form of the existence of the material world. The motion of a body, understood as a mode of its existence, is its four-dimensional, spatial-temporal trajectory and therefore is also absolute. Only its "projections" in different frames of reference are relative. Alexandrov qualified as "purely relativist" the second approach, in which this space-time relations and properties are applied to one or another frame of reference. The first approach was characterised as materialist, conforming to objective dialectics. The second approach, when it goes as far as refusing to recognise the reality of the four-dimensional world, turns out to be positivist and subjectivist.

Mathematically, the relativist viewpoint is equivalent to the viewpoint of the "absolute world" just as, say, the formulation of the Newtonian laws of mechanics in coordinates is equivalent to their vectorial formulation. But the trend of thought both in solving

problems of the theory itself, and also in exploring and understanding its possible applications and generalisations, depends on the understanding of what is the chief factor. The difference between these two approaches was felt particularly during the transition to the general theory of relativity: it led to a discussion which has not been completed to this day.

The general theory of relativity recognises all systems of coordinates to be equal *a priori* (without ascribing in advance any advantages to some over others). Alexandrov points out that there is nothing new in this. Both classical mechanics and geometry have to do with a choice of arbitrary coordinates. But in constructing the general theory of relativity the transition to arbitrary coordinates seemed so revolutionary that it was given the rank of a special principle named the general principle of relativity. It was formulated as the principle of equality of all frames of reference, irrespective of the motion of bodies with which these systems are connected (specifically, there was even talk of the equality of the systems of Ptolemy and Copernicus). This viewpoint was criticised in the report because it exaggerated the significance of relativity, divorced it from the absolute, from matter. Actually, however, relativity is a side, a facet of the absolute. Without understanding this dialectics of the relative and the absolute it is impossible to grasp with adequate completeness and profundity either the theory of relativity or modern physics in general.

Relativism, Alexandrov said, being a onesided exaggeration of the relativity discovered by Einstein's theory, by itself is not yet idealism. But it is connected with Berkeleianism and itself provides a way to Berkeleianism if it is followed too far.

Analysing the question of defining the concepts of space and time at a level which would offer a basis for constructing a space-time theory, Alexandrov voiced the opinion that space-time is a plurality of all the events in the world abstracted from all its properties except those which are determined by the influence of some events on others. The relations of influence determine in the special theory of relativity Minkowski's four-dimensional space. In the general theory of relativity space-time requires some additional conditions for its definition. This definition of space-time, in Alexandrov's opinion, represents a concrete and precise expression, conforming to modern physics, of the point that space-time is a form of existence of matter.

The report submitted by V. BARASHENKOV and D. BLOKHINTSEV stressed that the Leninist thesis on the inexhaustibility of electron has exerted a profound influence on several generations of physicists. Today too, this thesis remains a guiding principle in physics research. In this connection the reporters analysed how this thesis is reflected and interpreted in the physics of our day, to what new philosophical problems its detalisation leads.

Analysing the difficulties arising in the present-day field theory, V. Barashenkov and D. Blokhintsev held that to overcome these difficulties it was necessary to make substantial modifications in theory with respect to its fundamental concepts—that of field, particle, space, time, etc. It is possible that these concepts will prove unfounded "within" particles possessing structure.

We do not as yet posses sufficient experimental grounds to eschew the ordinary spatio-temporal ideas in the region of scales of the order of $\triangle x \geqslant 10^{-13}$cm., $\triangle t \geqslant 10^{-23}$ sec. Nevertheless, at the present level of the development of science posing the question of the possibility of change in spatio-temporal ideas in the sphere of super-small scales is quite logical. Illustrating this idea the authors of the report make the following reservation: if space and time are regarded as such forms of the existence of matter which express stability and changeability of its being, since the whole world is moving matter, then space and time are universal forms of matter's being. But physicists have always regarded space and time as forms expressing the structure of coexistence of phenomena and succession of states. This approach presupposes that at a given material level it is reasonable to distinguish between two neighbouring points (objects) X_1 and X_2 and two ensuing moments t_1 and t_2. However, the "neighbouring" and "ensuing" properties are concrete and highly specific properties of structure which are not always existent. From this point of view the posing of the question of the "extra-spacial" and "extra-temporal" existence of matter means an assertion that the micro- and macroscopic forms of its being can differ substantially. In other words: it is a question of a new probable step in cognising space and time as objectively real forms of any being.

Further the report analyses the present-day picture of the structure of elementary par-

ticles. The authors note that the present picture on the internal structure of nucleons (that is, protons and neutrons) is far removed from the naive ideas shared by the majority of physicists only ten years ago. Contrary to the earlier views, the structures of proton and neutron turned out to be totally different. Both particles possess an extremely intricate structure which as yet has been outlined very roughly. Research into the inner structure of the electron, the authors stress, will evidently be a matter of the distant future.

Experimental discovery of the structure of nucleons has posed the question of their elementariness in an entirely new way. In the past the term "elementary" was applied to the simplest of the known microobjects which interact as a single whole in all processes accessible to measurement. Now it is obvious that this definition cannot be applied to nucleons. At the same time no simpler elements can be singled out in the nucleons, at least at the present stage of physics. The structure elements here are just as complex as the whole itself. In this sense it can be said that nucleons contain other nucleons within themselves.

At present the group of microobjects which have to be regarded as elementary tiny "building blocks" includes dozens of various particles, and their number continues to grow. That is why the authors of the report consider the quark hypothesis very attractive since it permits to regard all strongly interacting particles as being made up of only two types of particles—the quarks and anti-quarks, each of which has three different states. Quarks can be regarded as the most elementary of all now known physical objects—as the next and deeper level of the material world. Unfortunately, the numerous efforts to discover quarks experimentally have failed as yet.

The report notes that simple models, which at first glance seem highly naive, describing interactions of quarks within the particles often reveal an amazingly good accord with experiment and explain with surprising ease and naturalness many features of elementary particles and their interactions. At the same time, attempts to make models more precise immediately upset, as a rule, the accord between experiment and theory. An impression is created that the quark hypothesis in its present form reflects, very primitively and approximately, certain highly fundamental but as yet absolutely unclear regularities in the field of ultraminute scales and is still far from the real state of affairs. It looks as if we are seeing only the faint outlines of something quite unlike anything we have dealt with until now. That is why any attempt to describe that "something" in the language of familiar notions immediately leads to contradictions.

It is also surprising, the report says, that the quarks seem to have no relation to particles which have not experienced strong interactions. Lastly, there is another circumstance linked with the concept of the elementary particle, that gives food for thought. It can be shown that the direct extension of the concept of the present-day field theory into the region of ultra-high energy (and thereby into the region of ultra-minute spatio-temporal scales) leads to the conclusion that in this aspect the very concept of particle becomes insolvent. At the same time we cannot reject the concept of particle without destroying the entire foundation of the mathematical apparatus of modern theory.

Thus, the reporters stress, the transition to investigating the deep-lying layers of the structure of substance has confronted present-day physics with a number of difficulties and contradictions. In reality, the elementary particle has turned out to be extremely complex, and penetration into it calls for strenuous efforts (at any rate not less then those exerted by the astronomers studying the farthest recesses of the Universe).

That is why the authors attach great importance to understanding Lenin's ideas on the inexhaustability of elementary particles since this makes it possible to choose the correct method of work.

In conclusion the report analyses the interconnection of the micro- and macro-world. The gap between these worlds, the authors believe, is not necessarily as wide and deep as it may seem at first glance. The study of phenomena of the micro-world leads to discussion of the processes of a cosmic order and, vice versa, analysis of cosmological problems becomes suddenly connected with the basic problems of the physics of elementary particles. The electron appears, indeed, to be inexhaustible.

V. BRANSKY, Cand. Sc. (Philos.), Leningrad, discussing the general problems of the interconnection of modern physics and materialist dialectics, emphasised that scientific philosophy influences the shaping not of all but only of fundamental concepts and principles of physics, i.e. it plays a heuristic role only at critical turning points in the development of physics. The heuristic role of philosophical principles is of a local and not of an

integral character—new physical theories are shaped under the influence not of philosophical systems as a whole, but of parts of these systems. Philosophical categories serve as a basis for choosing from a maltitude of fundamentally possible physical principles a sum of principles (or even only one principle) which tally with the given philosophical postulate. Thus, philosophical principles influence physical principles through selection. It is wrong to think, Bransky pointed out, that philosophy plays a heuristic part only in constructing a theory and once this role has been played up philosophical principles become redundant. Actually, however, theory is the unity of the formal apparatus and a definite interpretation. Philosophical principles leave their trace in the very content of the theory through the mechanism of its interpretation.

L. PEKÁREK, D. Sc. (Phys. & Math.), Czechoslovakia, discussed the connection of modern physics with Marxist dialectics focusing attention on the properties of reflection in objects of inorganic nature.

A. ZELMANOV, Cand. Sc. (Phys. & Math.), Moscow, voiced the opinion that the total number of fundamental principles of physics may be small, but this in no way contradicts the idea of the infinite diversity and inexhaustibility of nature.

L. ANTIPENKO, Cand. Sc. (Philos.), Moscow, demonstrated that in creating fundamental theories of physics the principles of immediate action and the principle of action at a distance are indissolubly merged into one dialectical principle. Specifically, it was discovered that the special theory of relativity, which rejected the principle of action at a distance, had to antedate something that could be called "quasi-action at a distance" in order to coordinate logically its conclusions.

Prof. Y. LOMSADZE, D. Sc. (Phys. & Math.), Uzhgorod, in the discussion of philosophical problems of the quantum theory critically analysed the philosophical views of N. Bohr and W. Heisenberg. He pointed out that these scientists tended towards a materialist solution of the fundamental question of philosophy. Lomsadze noted that the modern quantum theory satisfies the demand for the objectivity of the physical theory and in this connection outlined his views of the problem of measurement in the quantum theory.

Prof. J. DESTOUCHES of Sorbonne criticised the positivist interpretations of quantum mechanics and gave substance to a new variant of this theory, the functional theory of corpuscles. Prof. Destouches emphasised that his conception proceeded from the ideas of dialectics, specifically Lenin's thesis of the inexhaustibility of matter.

The inexhaustibility of matter, its infiniteness "in depth" was also discussed by Prof. S. MELYUKHIN D. Sc. (Philos.), Moscow. In his opinion, elementary particles could unconditionally be recognised as being inexhaustible with regard to their properties, internal and external connections and ability to undergo thansformation. But whether the laws of the motion and interaction of elementary particles are as much inexhaustible—that is an open question.

Prof B. PAKHOMOV, D. Sc. (Philos.), Voronezh, discussed the role of instruments in quantum mechanics. Every theory (including quantum mechanics) must reflect not so much the method of gaining knowledge of the object as the object itself. He noted that the transformation of the object in theory, its presentations through the language of science contained an important component which could be called the objectivisation of knowledge. The essence of this process consists in singling out the invariant content which could be related to the object by itself and which possibly does not depend on the nature of the subject and the way the subject gains knowledge.

According to Pakhomov, the specific type of relativity with which quantum mechanics deals is relativity to the type of interaction (the properties of micro-objects depend on the type of interaction which serves as a basis for measuring these properties). But there is no ground for saying that the properties of micro-objects are relative to the instruments.

Discussing the inexhaustibility of matter we deal here with a dialectical unity of opposites—the absolute inexhaustibility of matter and its relative exhaustibility. Without this latter aspect practical activity which provides concrete and, moreover, stable results would be impossible. Indeed, the practice of scientific cognition shows that in most cases it is possible to construct a theory of the object, proceeding from a small number of parameters.

Prof. B. CHENDOV, Bulgaria, spoke about the interconnection of the ideas of quantum physics and mathematical logic. The same problems were also discussed by N. ROZHENKO, Cand. Sc. (Philos.), Kiev. In quantum mechanics the statement that micro-objects are particles is true, but to the same extent as the opposite statement that the micro-objects are of a wave nature. Each of these statements is valid under certain experi-

mental conditions. It is possible to coordinate them with the help of the probabilistic statistical interpretation proposed by M. Born. Rozhenko analysed the different attempts to express the logic of this interpretation in concepts.

Prof. N. BRATOYEV, Bulgaria, expressed a number of considerations concerning the notion "potential abilities" in the behaviour of micro-objects.

In discussing some philosophical problems of the theory of relativity, Prof. L. TYAPKIN, D. Sc. (Phys. & Math.) of the Dubna Joint Nuclear Research Institute, put the following question: What is the reason for ambiguous scientific generalisations, that is, for the rise of different theoretical constructions on the basis of one and the same empirical material? What is the reason for a diversity of forms of notions in one and the same physical theory? In particular, the definition of simultaneity of events accepted by Einstein is in no way unambiguously connected with experimental data. From this it follows that the theory of relativity could be given a somewhat different mathematical formulation that would remain invariant in relation to the known facts. The whole question of defining simultaneity of events is, in Prof. Tyapkin's opinion, a physical and not a philosophical question. He also critically analysed some propositions of Alexandrov's paper.

Prof. E. CHUDINOV, D. Sc. (Philos.), Moscow, put the question: What is the philosophical interest in the categories of space and time? Questions involved in the study of the inner properties of space and time of the real world are often considered philosophical questions. Although the work in this direction done in many cases by philosophers is undoubtedly useful, it, however, does not reveal the aspects of studying space and time which we are entitled to consider philosophical in the strict sense of the word. Philosophical questions originate whenever we uphold an epistemological viewpoint. Prof. Chudinov examined the relation of geometry to reality. It should be recalled that the same mathematical space can be described in the language of different metrical geometries. To what extent can this conclusion be extrapolated to real physical space, Chudinov asked. Criticising the views of H. Reinchenbach and H. Poincaré, he expressed the following viewpoint: the general theory of relativity establishes that the same space can have a different geometry in different frames of reference. But this fact does not prove the correctness of conventionalism. It merely attests to the non-coincidence of the concepts of the objective and the absolute in the question of geometry of physical space. But physical geometry and physical laws are relative in the operational sense, they depend on definite conditions existing on Earth. If, for example, in ascertaining the geometrical properties of space we were to utilise not practically solid bodies, but other standards, we would not have obtained Eucledean geometry and the laws of physics as we know them.

A. ZELMANOV agreed with the physicists who hold that the main thing in the theory of relativity is that it is a theory of gravitation. When we say "a special theory of relativity" and "a general theory of relativity", the latter is more general in relation to the former, but not in terms of relativity. According to Zelmanov, for these theories to reflect more adequately their content they ought to be named: the special space-time theory and the general space-time theory. Notwithstanding its logical coherence and impeccability, the general theory is not free of difficulties caused by the unclear nature of some fundamental moments (the problems of the energy and impulse of a gravitation field, the problem of gravitation waves, the problem of gravitational emission).

N. MITSKEVICH, Cand. Sc. (Phys. & Math.), Moscow, discussed some questions of the interpretation of the four-dimensional spatio-temporal interval in Einstein's theory of relativity.

Thermodynamic aspects of the problem of time were touched upon in the report by F. TSITSIN, researcher of P. K. Shternberg Institute of Astronomy, Moscow. The temporal asymmetry of the fundamental laws of physics, he pointed out, is not necessary and is not sufficient for explaining the temporal asymmetry of the behaviour of systems at a microscopic level. In his opinion, it is incorrect to connect the direction of time with the direction of the change of entropy of a closed system. Tsitsin holds that biophysics knows certain effects which, although they do not directly run counter to the second principle of thermodynamics (of growing entropy), apparently do not find exhaustive explanation within the bounds of this principle. In this context he quoted the statement of Helmholtz that the possibility of converting orderless movement into orderly movement in the finest structures of living fabric is still an open question.

Some aspects of the interconnection of gravitation and the physics of elementary particles, of the microworld and the mega-world were discussed by Prof. K. STANYUKO-

VICH, D. Sc. (Tech.) and S. KOLESNIKOV, Cand. Sc. (Phys. & Math.), Moscow. They outlined a variant of Einstein's generalised theory of gravitation, in which the gravitation constant grows with time, while the Planck constant decreases, the mass of elementary particles and the charge of the electron change, and so on. In this theory it becomes possible to unambiguously express the size of elementary particles through the Planck constant, the velocity of light and the age of the metagalaxy. Proper understanding of the principe of the inexhaustibility of matter enables scientists to hold that the age of the elementary particles is finite. These particles arose in some way (from other forms of matter), undergo an evolution and ultimately are mortal. It is fully possible to recognise the existence of a host of metagalaxies. Moreover, they can penetrate each other and exchange information.

The idea of the structural inexhaustibility of the Universe was also analysed by G. IDLIS, D. Sc. (Phys. & Math.), Alma Ata, who pointed out that different ways lead to this idea: logical analysis, application of the theory of sets, synthesis, the concepts of the general theory of relativity and quantum mechanics (when quasi-closed metagalaxies prove to be equivalent to elementary particles for an outside observer) and, lastly, attempts to resolve different cosmological paradoxes.

In the opinion of Zelmanov, cosmological problems cannot be fully resolved within the bounds of the general theory of relativity. This requires the creation of a more general theory.

The discussion of philosophical and methodological problems of the biological sciences proceeded along the following lines: biological organisation, the essence of the living, the activity of reflection and methodology of biological research.

Reports were made by Academician V. ENGELGARDT—"Integratism: the Way from the Elementary to the Complex in the Cognition of Living Phenomena" and by Academician P. ANOKHIN—"Philosophical Aspects of Functional System Theory" (these reports are published in the present issue of our journal in an abridged form).

The report of Academician N. DUBININ, "Problems of Genetics and Marxist-Leninist Philosophy", was submitted for discussion and was not read owing to the illness of the author.

According to the author, the present place of genetics in the general scientific foundation of philosophical materialism and the scientific understanding of nature is determined by the fact that it is one of the keystones of the theoretical substantiation of agriculture and medical science.

The central task of philosophy in genetics is the methodological analysis of the concept of the gene which is basic for this science.

A. UTEVSKY, Corresponding Member of the Academy of Sciences of the Ukrainian Soviet Socialist Republic, Kharkov, examined the features of the biological form of motion which sets it apart from the chemical form. Biological systems, statistically hardly probable from the viewpoint of thermodynamics, demand the continuous release of energy. In other words, the living is preserved as it is destroyed. For the inanimate, mixing is the most pronounced form of contact with the environment. For the living, mixing spells the end of life; the living is always heterogeneous, it is marked by new methods of contact, namely, it enters into contact by isolating itself from the environment. So-called anticipatory reactions which constitute a signalling function of the living structure, are typical of the living. Lastly, in inanimate nature, the impact of one body on another leaves a trace. But in animate nature, diseases result not in a trace, but in immunity; in other words, what is preserved is not the action but the counter-action to it.

Examining the problem of the interconnection of the animate and the inanimate, Dr. J. KAMARYT, Czechoslovakia, pointed to the inevitable existence of boundaries, of an approach, in which efforts are made to explain life on the basis of the known laws of physics. Hypothetico-deductive methods are only partially fruitful in biology.

R. KARPINSKAYA, Cand. Sc. (Philos.), Moscow, spoke about the need for theoretically generalising the conception of reductionism. Reductionism cannot be understood only as a method of analysis; it is a method of both analysis and synthesis. For reductionism to become an efficient method it is necessary to find the functional concepts which operate at a molecular level and thus warrant the construction of a theoretical biology with their help. The concept of the elementary biological fact is the closest to the principles of reductionism.

Speaking of the principle of reduction, Karpinskaya continued, it is apt to ask the question: is it possible to expect the principles of physics being repeated in theoretical biology?

The rules of Chargaff expressing the principles of conservation have been formulated in molecular biology. But the structure of biological knowledge will be apparently somewhat different from the structure of physical knowledge because the problem of evolution remains the main question of biology and it cannot be studied with the help of the principles of conservation. The principles of conservation in biology will never become as fundamental as in physics.

Prof. N. KOSTYUK, D. Sc. (Philos.), Kiev, analysed the importance of the principle of relativity (taken as a general philosophical principle) for constructing theoretical biology. In her opinion the thesis that life's manifestations are relative depending on the nature of the interaction of the living body with others, including the cognising subject, may now be considered proved. But the cognition of the living should not be restricted only to encompassing as fully as possible the object through all kinds of "sections" and "projections". The systemic approach to the living as something integral is a no less important task. Such a synthesised picture is possible only on the basis of deducing the absolute from the relative. Kostyuk criticised the subjectivist and agnostic conclusions determined by lack of understanding that the subject in the process of interaction with a living object does not create characteristics of the living, but only reveals them.

V. KREMYANSKY, Cand. Sc. (Philos.), Moscow, drew attention to one amazing property of scientific concepts—the property of concentrating a reflection or, in a broader sense, of information and organising this reflection into some discrete formations. Concepts can also regularise relations between other concepts in the given sphere of knowledge. This makes it possible to formulate the notion of a system of information; moreover, it is expedient to single it out into a special class of systems. Kremyansky associates the concept of an information system with the concept of anticipatory reflection which was examined in Anokhin's paper.

Dr. L. GÁRAI, Hungary, pointed out that the concept of information is insufficient for understanding processes under way in nature, specifically the development of biological systems.

Prof. B. UKRAINTSEV, D. Sc. (Philos.), Moscow, spoke about the activity of reflection. He differentiates the absolute activity of matter, expressed in its self-movement, and the relative activity of interaction between concrete material systems. The degree of activity of reflection is determined by the level of organisation of a reflecting system. The main criterion of the distinctly expressed high activity of reflection should be the conversion of the latter into a factor shaping the behaviour of the reflecting system.

A. MAMZIN, Cand. Sc. (Philos.), Leningrad, in his joint communication with Prof. K. ZAVADSKY, dwelt on some philosophical questions of the evolutionary theory. He showed that the emergence of the synthetic theory of evolution, as the present stage in the development of evolutionary theory is called, was indissolubly linked with dialectical materialist ideas. In its objective content, comprehensive approach and profundity of the analysis of contradictions that determine evolution, in the interpretation of categories like rest and motion, cause and effect, chance and necessity, continuity and discontinuity, possible and real, the synthetic theory of evolution is essentially of a dialectically materialist nature. The same must be said about the way this theory solves such important problems as the form of development (progress, regression, development in one plane), the relationship of reversibility and irreversibility, organisation and development, and many others. The creation of the synthetic theory of evolution, it was stressed in the communication, was linked with eliminating a number of shortcomings in Soviet biology and the reappraisal of views that were in the nature of peculiar prejudices (for example, the inheritance of acquired traits).

The Conference also heard a report by Academician A. BERG and Prof. A. SPIRKIN, D. Sc. (Philos.), "Cybernetics and Dialectical Materialist Philosophy", which analysed questions discussed at the All-Union Conference on the Methodological Problems of Cybernetics, held in Moscow in October 1970.

The philosophical importance of cybernetics, it was pointed out in the report, consists above all in that it has discovered a sphere of phenomena to which science previously had no systematic access. This is the sphere of control and the related to it storaging, processing, transmitting, receiving and using information. The authors of the report criticised the views of some bourgeois scientists who contrapose cybernetics to Marxist philosophy. Marxism acts on the principle that there is no motion without matter and vice versa. But, bour-

geois critics argue, information moves, although it is neither matter not consciousness. Such arguments, however, hold no water. The concept of information expresses a definite property of moving matter. The field of information is an integral aspect of objective reality itself. There is no matter without information and neither is there information without its material carrier—matter and field. Information is universal which, far from precluding, presupposes its specificity in different spheres of the real world. The study of this specificity raises an intricate complex of problems connected with the relationship of the material-energy sides of the world and information processes.

The authors analyse the connection between the concepts of information and reflection and express the thought that information represents a qualitative and quantitative characteristic of the organised nature of reflection. Information possesses the ability to enhance orderliness in material systems. This is a factor directed against disorganisation and chaos. It is in this sense that information is inseparable from structurality, the organised nature of material systems.

The development of cybernetics opens up new possibilities for an interpretation of the phenomenon of the ideal by natural science. All the psychical phenomena which are defined as ideal represent nothing else but information given to an individual in a "pure" form. The material carrier of information is a signal which, representing a definite organisation of elements and processes of the nervous system, is fully eliminated for the individual. In the case of a visual perception, for example, the effect of the electromagnetic oscillations reflected by the object in the retina, the stream of frequency-ordered nervous impulses generated at the retina outlet and, lastly, the cerebral neurodynamic complex responsible for the appearance of a visual image in the focus of consciousness, are all fully eliminated for the individual. The capability of receiving information in a "pure" form and using it, of ideal modelling, arises thanks to the application of the principle of the invariance of information to the form of a signal, because information is needed for control, while the form of the signal is inessential. The realisation of this capability ensures a self-organised system, a boundless expansion of possibilities for portrayal of reality and controlling it.

The report also examines the methodological problems of studying and optimising intricate systems in the light of cybernetics.

Cybernetics widely utilises the systemic-structural method which includes the study of both the behaviour (functioning) and the structure of objects. Cybernetics differentiates between the macro-approach designed to reveal the behaviour of a system examined as a whole and the micro-approach, or the study of the structure of the system which ensures this behaviour. The difference in these approaches is relative; in real processes of cybernetic modelling the two supplement each other and are organically combined. Nevertheless the description of a system through the disclosure of its behaviour carries somewhat greater "weight" in cybernetics.

Man is an element of the most intricate systems important for modern scientific analysis. Thus, a cybernetic systemic approach characterises not only reality as such but also the activity of man. Introducing the subjective factor linked with the setting of an aim and the expression of will at the "input of the study", the systemic approach presupposes an objective convincing result at the output. In other words, as Berg and Spirkin stress, cybernetics studying the man-machine system looks for objective information in the sphere of the subjective too. This reflects the form of the dialectical unity of the subject and the object which corresponds to the contemporary intellectual climate.

Academician P. FEDOSEYEV, Vice-President of the USSR Academy of Sciences and Chairman of the Scientific Council on Philosophical Problems of Modern Natural Science, in his summing up speech at the conference said that studies in this sphere were increasingly determining the interests of the future, of the emergent in science. An analysis of the problems in the latest branches of natural science, such as the physics of elementary particles, extragalactical astronomy, molecular biology and cybernetics, are attracting particularly great attention. The new approach to the philosophical problems of natural science, the increased number of research themes and their scientific importance have determined the further development and strengthening of the alliance between Soviet natural scientists and philosophers.

Fedoseyev pointed out that the cardinal task in this field of research is to elaborate the general methodological questions of natural science on the basis of developing materialist dialectics as the logic and theory of knowledge.

The development of modern physics has raised many fundamental philosophical pro-

blems. Fedoseyev pointed to the traditional philosophical problem of the relationship of the subject and the object. Modern physics emphasises the active nature of cognition; in an analysis of this process great importance is attached to the proposition concerning relativity to the instruments of observation in quantum mechanics. Considerable urgency has been acquired by problems linked with elaborating and substantiating the modern form of atomism as the doctrine of the structural organisation of matter. Modern atomism whose basic principles are elaborated in the course of the development of the physics of elementary particles and its philosophical analysis, includes the idea of the synthesis of corpuscular and wave concepts realised in quantum physics. It also relies on such fundamental ideas as the transmutability of elementary particles and symmetry. Striking evidence of the mastery of physics by the spirit of dialectics is the synthesis of the ideas of causality as a rigid relationship and probable quantum connections, which in the past seemed to be incompatible. The problem of time and space is treated in a new way in modern physics. They are regarded in organic unity, which naturally demands concretising the philosophical concepts of space and time as the main forms of being of moving matter. Problems of structure, elementality, space-time, causality and other problems are deeply reappraised in the physics of elementary particles. Since physical knowledge is characterised by the most perfect form of organisation, it is here that questions concerning the form and structure of expressing knowledge, the nature of scientific theories, their logical character and sources of development arise in greater relief. Thus, as Fedoseyev emphasised, the impact of physics on the progress of knowledge is directly told on the scientific world outlook as well.

The need for philosophical generalisations in modern biology too is no less essential, particularly with the ushering in of a new period in the revolutionary development of this science.

New discoveries and radical changes in biology are concentrated around problems of the organisation of the living, its historic and individual functioning and development, problems of the parts and the whole. The main task of philosophical studies in this sphere, according to Fedoseyev, is to formulate concretely and elucidate thoroughly, from positions of the scientific materialist world outlook, the new approaches, principles and concepts which best of all will help to unite and develop the basic tendencies of modern biological research—reductionism, the systemic or integrative approach, the evolutionary approach to living systems at all levels.

A big range of questions arises at the junction of cybernetics and philosophical studies. It is first of all a matter of philosophical analysis of the new principles and concepts introduced by cybernetics in science. Such an analysis is exceedingly important for the further development of the Marxist-Leninist theory of reflection. It creates a major prerequisite for studying the genesis and mechanism of the active reflection of reality, for studying the essence of a qualitative leap towards the creative activity of man, the activity of social systems, for solving the problem of the ideal, which is the principal point of the struggle between materialism and idealism.

Difficult problems of controlling large systems in the economy, production and science arise today, Fedoseyev pointed out. What place does man hold in such a highly intricate system as nature-man-technology? Attention must be paid especially to studying the general philosophical aspect of man's relation to nature. It would be wrong to put to the foreground the consumer aspect of the relation of man to nature and to forget the long-term interests of society, the need for a comprehensive approach to the remaking of nature, for a thrifty utilisation of natural resources, and for the preservation of the potentialities of nature. Academician Fedoseyev spoke of the need to eliminate the wrong notion that the planet's natural resources are inexhaustible and that they can be endlessly used. Already Engels emphasised the complexity of the interaction of man and nature and called for cautious handling of the concept "domination" as applied to characterise the relation of man to nature.

Academician Fedoseyev also referred to the "information explosion", the mounting flood of information with which it is increasingly hard to cope. The task is to solve the problem of the content, or value of information. How to discard meaningless or superfluous information in teaching and in science? This "problem of the century" today faces science as a whole and philosophy in particular, because philosophy has always tried to "compress" information by generalising concepts.

Characterising the programme of future research, Academician Fedoseyev emphasised the need for systematically deepening our understanding of the interconnections and reci-

procal influences of philosophical categories. Old philosophical categories have to be concretised and new ones formulated. But the interconnection of categories must not be understood as a closed system of dialectical categories, as was the case with Hegel. To follow this path would mean to stop the development of dialectics, whereas dialectics is a science, and it cannot remain immutable.

The question of ontology and epistemology, Academician Fedoseyev noted, must be solved not through disputes alone, but in different ways: every materialist philosopher knows very well that without an analysis of thinking, without an epistemological approach to the problems of world outlook there can be no philosophy whatsoever. But it is likewise absolutely clear that the more general laws of development of being must not be ejected from philosophy, because by its very definition Marxist philosophy is a science of the more general laws of the development of nature, society and thought.

Academician Fedoseyev positively assessed the books in the series "Dialectical Materialism and Modern Natural Science", published in recent years. Their aim was to generalise the new achievements of natural science and interpret them from the viewpoint of materialist dialectics. But now it is necessary to create a series of works in which attention would be paid mainly to the elaboration of dialectics itself in the light of the development of natural science, to enriching the theory of knowledge and the logic of Marxism.

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The World Literary Process Today

When we examine the development of creative thinking in the realm of art in the present-day world we must admit that the most essential and fundamental of its features were largely determined by the Great October Socialist Revolution, which has exerted an influence both on the social and spiritual life of mankind.

The revolution revealed for millions of people the motive forces of history, by showing them the importance of their role in the historical process. It also showed that the order which the bourgeois consciousness regarded as normal and natural was in fact unnatural and could be changed by the will of the revolutionary people.

The revolution made obvious the truth that the capitalist system, far from being the crowning achievement of man's social creativity, is now in fact a regressive factor in history, and is forced to give way to a better and more just social system, a system which has now been in existence for over half a century and which has become a world system.

Lenin pointed out that after the victory of the revolution "communism is emerging in positively every sphere of public life; its beginnings are to be seen literally on all sides". [1]

It is quite natural that the social ideals proclaimed by the revolution introduced qualitative changes into art. It developed new criteria for evaluating reality and a new scale of social, ethical and aesthetic values. Inasmuch as it was an art of the masses of people who had carried out the socialist revolution and who were to consolidate and extend its gains, and also of the masses still fighting for the triumph of socialist ideas, its main historically-rooted task became an adequate comprehension and depiction of the social upheavals and changes caused by the revolution in society and in man himself.

The new art brought to life by the revolution took shape as a realistic art resting on the socialist world outlook or gradually drawing closer to it. It is an art that easily revealed the existence of a multiplicity of artistic influences and connections with the art of the preceding period. It was an art that did not arise out of nothing. Such connections should be regarded as natural, considering the relative autonomy of artistic means of expres-

[1] V. I. Lenin, *Collected Works*, Moscow, Vol. 31, p. 101.

sion and their capacity for acquiring different functional meanings in different artistic trends, and considering that it inherited everything that had been of value in the art of the past.

Socialist art, as life itself has proved, possessed a tremendous viability and, enriching its artistic methods and its idiom of expressions, opened a new epoch in world art. From the outset, this art appeared as internationalist both in spirit and substance, attracting to itself everything that is genuinely revolutionary in the capitalist countries, and involving in the sphere of its spiritual and aesthetic influence the forward-looking artists of critical realism. Gorky and Mayakovsky, Tolstoy and Sholokhov, Leonov and Fedin, Reed and Becher, Krleža and Nezval, Smyrnensky and Vaillant-Couturier and Barbusse, Eisenstein and Siqueiros, Meyerhold and Honzl, Arghezi and Sadoveanu, Mancisidor and Alberti, Neruda and Broniewski, Kruczkowski and Eisler, Shostakovich and Prokofyev, Nexö and Laxness, Brecht and Hikmet, Lunacharsky and Gramsci–this brilliant constellation of talents, whose numbers are constantly multiplied by the addition of new names, created a new art, enriching it with lasting artistic values, and formulating its aesthetics.

The new art possessed an exceptional diversity of creative individualities and a broad spectrum of artistic and stylistic manner. The freedom with which it used imagery to depict life, a freedom inherent in it, differed fundamentally from the selfcontained rearrangement of form, and was inseparable from an adequate comprehension and depiction of the true human and social conflicts of the age. The concept of adequacy of artistic depiction of life is far from synonymous with the concept of verisimilitude of the artistic image to life. The art of socialist realism regards as alien any cut-and-dried aesthetic standards and the doctrinaire regulation of the means of artistic expression, as it finds alien the indiscriminate acceptance of any artistic system. It has worked out and is developing its own poetics.

The artistic picture of the world which emerges in it is adequate to reality not because the art of socialist realism tends to reproduce life in forms of outward authenticity as naturalists are apt to do. Let us also recall that verisimilitude of image does not clash, for instance, with expressionist or acmeist poetics. The creative method of the art of socialist realism opens up for the artistic consciousness the possibility of making a deeper penetration beneath the integument of events, beyond the outward cover of the processes under way in social being. To overcome and to destroy the notions which substitute an outwardly objective semblance for the actual course of things, and the true nexus of cause and effect is the most difficult task facing consciousness in general, and art in particular. For instance, in the period when capitalism was taking shape, when its laws swiftly and ruthlessly established themselves in life, romanticism, which undoubtedly perceived some of the essential aspects of the new historical reality, on the whole produced a rather phantasmagoric and flimsy picture of it. In a later historical period the symbolists, for their part, saw the warp and woof of life as consisting of hints, signs and mystical suggestions, but what lay behind these signs and symbols remained a mystery for most of them. Today, with the benefit of hindsight, we can say that behind this mystery lay the crisis of the moribund social system, which the symbolists never divined, a crisis which spread

crepuscular feelings in some sections of society, and the revolution which produced a presentiment of its approach.

The formidable historical developments of our day, with an unprecedented sharpening of the class struggle, which involves millions of peoples; the emergence of fascist tyrannies with their pompous demagogy, idolatry, torch-bearing processions, death camps, racist policy, their myths of blood, soil and nation, with their authoritarian depersonalising discipline, with their apology of war as a boon of life; the great sacrifices and losses suffered by the peoples in the fight against these tyrannies; the failure of the ideals of the Resistance to materialise in the countries of the West—all that produced among some foreign writers and philosophers ideas about the absurdity of life, and the futility of aspiring to a better world for mankind. The frame of mind produced by such conceptions capitulated to the complexities of the historical process and, proclaiming the futility of action, accepted as its creed the myth of Sisyphus. But the point is that this ordeal of bloodshed and torment, the great years of anti-fascism, abounding in the highest nobility and heroism, and the war of liberation against Hitlerism served to prove that the social revolution continued to develop, although the ruling classes were switching to extreme forms of struggle to safeguard their domination.

The alienation of men, who are concentrated under capitalism through private property interests, an alienation inherent in the system, when the results of man's activity are objectively transformed into a force that stands above him and enslaves him, are now regarded by the bourgeois consciousness as a natural and eternal rule of life, or are transferred into the realm of purely human problems arising from the individual's existence in the world, abounding in care, alarm and fear. This kind of switch-over of social problems into a single aesthetical-psychological sphere, and the break in their inter-relationship, result in reality being mythologised, and art converted into a code which needs to be deciphered. The fact is that behind these compounded and ostensibly psychological questions lie the crisis phenomena, contradictions and antagonisms of the capitalist system, which the processes revolutionising the world subject to their destructive influence.

Of all the types of art it was realism that best overcame the influence of objective semblance on the artistic consciousness. It was less inclined than other artistic trends to accept semblance for reality. And not only because its artists were not as endowed with fancy or were more prosaic than the artists following other aesthetic principles. The modern existentialist-minded writer, for instance, tended much more to schematise and rationalise his thinking than the realist. Realism obtained a fuller, deeper and more meaningful picture of reality because it implied social analysis, a study of the mainsprings of man's mentality and vitality. In fact, it was realism alone of all the trends in art which since the revolution has retained and multiplied its gains. The other artistic trends of the pre-revolutionary and the revolutionary periods—symbolism, futurism, acmeism, expressionism, surrealism, and so on—have worked themselves out, leaving their mark on literature and reflecting the spiritual crisis of bourgeois culture, and have now mainly become a part of its history or a "piggy-bank" of arguments for literary discussions. Meanwhile, realism has been living and developing, ac-

quiring new qualities, and producing aesthetic values of abiding importance.

One of the most important reasons why realism has displayed viability as an aesthetic method was the spontaneous historicism in the thinking of its creators, their capacity for subjecting the true conflicts of reality of analysis. In producing an artistic picture of life, they regarded man as a social unit, reaching down to the causal nexus which determined his vital activity. The great art of realism paved the way for the emergence of the new art, the art of socialist realism, which powerfully announced itself in the works of Maxim Gorky. In the post-revolutionary period, relying on the conscious historicism in the thinking of the artists who created, developed and enriched this method, socialist realism depicted the major changes brought about by the revolution and socialism in man's social life and spiritual world. The new creative method enabled the artists of the revolution, and the artists who continued their endeavour under socialism, to show the vast advantages and prospects which the individual obtains from the new social system, and to portray the growth of his social self-consciousness. The conscious historicism of aesthetic thinking enabled them to turn truth into the basic aesthetic category of their art, to turn it into their banner and principle. Nor did the new art remain silent about the objective difficulties which accompanied the struggle for the victory and triumph of socialist ideals. The most outstanding works of socialist realism, making their way across the barriers of lies or the patent hostility of bourgeois criticism, carried to the world the truth about the new society born of the ideas of the October Revolution. Therein lies the great importance of the new art for the art of the whole world. In our day, the art of socialist realism, putting forward the problem of the individual as the fundamental problem of our day, has also suggested the most constructive solution for it. We cannot, of course, assert that in the present-day conditions abiding interest for the individual, his dramas and conflicts, his quest and aspirations is a prerogative of socialist literature. This is a problem of the entire contemporary historical process, and it is a very acute one in the literature of the capitalist world. It would be unforgivable blindness to fail to see the major changes that have taken place in the life of the capitalist countries over the last few decades. The formation of the so-called mass consumption society has had far-reaching consequences. One of these has been the emergence of so-called mass culture, an inferior culture spiced with sex, violence and cruelty. Bondiana and pop art, and the fly-by-night artistic little schools and trends are the marks of this miniculture, which has the face of vulgarity and which plunges man into the atmosphere of the mass society's myths and illusions. Another aspect of the mass society is the suppression of the individual, and the de-personalisation of the individual in modern bourgeois society has been noted with alarm by many critical realists of our day, among them Georges Perec and Max Frisch, Kobo Abe and Goffredo Parise, Max von der Grün and Friedrich Dürrenmatt, to list but a few outstanding names.

The works of these writers are characterised above all by a study of the condition of the average, rank-and-file man as an element of the commercial or industrial mechanism. Their characters are men and women existing in the conditions of mass production as mass consumers of things, which cir-

culate in the market and which variously exert an influence on their mentality, on their way of life and on their perception of the world. These characters naturally show no concern for the problems and worries which faced the characters of novels in the 1930s. They are not as immediately concerned with their daily bread as were their counterparts in the writings of the prewar period. They can even be said to be apolitical and lacking in the keen response to events which rock the modern world. It is true that characters in the novels of Max von der Grün sometimes experience a sense of social protest, but it is vague and less than fully realised. It is swiftly dispelled under the pressure of installment buying, relative comfort and adequate pay. What is more, modern capitalist society, with its high level of technology, ramified communications networks, its concern with machinery, mechanisms, automation, and so on, well suits, say, Max Frisch's characters, because it meets their qualities and inclinations of "men who make" and "men who produce". However, all these works, like many others, in the same series, are characterised by a sense of alarm for man as an individual, who is enslaved by the world of things, who is engulfed and de-personalised by them. But if the character in a novel by Goffredo Parise is de-personalised, you might say, voluntarily, delivering himself into the power of his employers lock, stock and barrel, immersing himself in their needs and accepting their will as the natural thing, the character in a novel by Kobo Abe tends to resist the power of external circumstances, which he fails to understand, and which the writer likens to the quicksand which noiselessly engulfs its victim once and for all.

In these works, the sense of alarm for man now and again develops into a sense of the tragedy of human destiny, because in the world of mass production the individual is deprived of his freedom. The craving to possess a thing or an aggregation of things deprives man's life of its content, impoverishes his personality, narrows it down and shuts off access to it for many human emotions, because they are incompatible with the narrowed down interests offered to the individual by society, which produces things but does not produce any new ideas. Writers who deal with such human problems of our day undoubtedly display great aesthetic perspicacity and a keen understanding of the real specifics of social development under modern capitalism.

Of course, man needs the things which ease his life, but his transformation into nothing more than a consumer–which happens to be the main purpose of the mass consumption society–destroys his personality, and leaves in his soul a vacuum that can be filled by anything that comes along. In one of Parise's novels there is a very precise observation of a character integrated into a system of connections stemming from the so-called neo-capitalist mode of economic operations, who at some moments of his life experiences "a sense of intoxication and great joy", because he is stripped of his human "ego". At such moments, the way of life which tends to dehumanise men, appears to him to be a natural state of existence, because it enables him to dodge the complexities of the real world. This property of capitalism was pointed out back in the early 1920s by Lenin, when he wrote: "Within every class, even in the conditions prevailing in

the most enlightened countries, even within the most advanced class, and even when the circumstances of the moment have aroused all its spiritual forces to an exceptional degree, there always are–and inevitably *will be* as long as classes exist, as long as a classless society has not fully consolidated itself, and has not developed on its own foundations–representatives of the class who do *not* think, and are incapable of thinking, for themselves. Capitalism would not be the oppressor of the masses that it actually is, if things were otherwise." [2] The existence of such representatives of various classes, who do not think and who are incapable of thinking, not only meets the needs of capitalism, but also creates the basis for an invasion of their minds by the darkest and most reactionary preconceptions, including racial prejudice, and nationalistic, fascist and profascist notions and views.

For socialism, the individual is the main value of social progress. Every society has definite historical aims, but the society born of the socialist revolution seeks to create a harmoniously developed individual, or as Lenin put it, "to educate and school people, give them *allround development and allround training*". [3]

Of course, no one over here assumes that this aim can be attained easily or painlessly. Nor does anyone have any illusions about the communist society under construction being free of contradictions and complexities. But it does create the most favourable conditions for the individual's development, for his finding a fitting place in society, and satisfaction of his spiritual and material requirements.

In order to realise the fundamental goal of socialism there is need to change the real conditions of man's existence, which create the appropriate psychological atmosphere in society enabling man to change and improve together with society, and to have the line of his interests, which he pursues in life as an individual, draw closer and eventually to coincide with the line of the common interests. This process has been intensified by material progress in the socialist system and by the Party's drive to clear socialism of the superfluous stratifications produced by the personality cult. Soviet literature, especially in the last few years, has been most actively engaged in various spheres of life, in analysing and depicting the development of the humanistic nature of socialism as a social system and the consciousness it produces. Let us add that this is characteristic not only of Soviet literature but also of the literatures of the other socialist countries, where there is a similar tumultuous process, as art assimilates the realities of the new world.

The dogmatic distortions of the theory of socialist realism in the past have resulted in the fact that in the period when the effects of the personality cult were being eliminated (now and again at some cost and with some twists), a negative attitude took shape here and there to socialist realism as a method allegedly slowing down the development of literature. Moreover, some foreign theorists suggested the need to abandon the coherent

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[2] V. I. Lenin, *Collected Works*, Vol. 31, pp. 68-69.
[3] Ibid., Vol. 31, p. 50.

Marxist aesthetics and the possibility of extending the boundaries of realism by merging it with modern non-realistic trends in art.

However, regardless of the terminology being used, works are being produced in the literatures of the socialist countries which are part of socialist realism. The attempts by some writers to transplant to the soil of these literatures aesthetic principles borrowed from the experience of present-day West European and American literatures (including their most extremist forms) have not only been futile, but have run counter to the general tendency of artistic development in the socialist countries. At the same time, the very fact that such attempts have been made, when considering the complexities of the ideological processes under way in these countries, demands an effort to overcome the oversimplifications which still exist in the theory and practice of socialist art. Nor is there any doubt about the need for more active struggle against bourgeois propaganda, against attempts to undermine art in socialist countries from inside by all manner of "bridge-building", and also by direct denigration of the fundamental principles of Marxist aesthetics in general, and the aesthetics of socialist realism, in particular.

In studying and analysing the formation and development of socialist realism in the socialist countries resolute efforts must be made to overcome the unificatory approach. In the art of each country the formation of socialist realism, with common initial principles, has been a very specific process and has assimilated all the fruitful traditions of the national culture. This fact does not deny the continuity of artistic ideas, or the influence exerted by the experience of the more mature forms of socialist realism on the young revolutionary literatures. But it does demand unfailing consideration of *all the specifics* which have promoted the formation of the method in this or that literature, without reducing them to oversimplified aesthetic conceptions, as a basis for ruling out various artistic phenomena which do not fit within the bounds of verisimilitude (for instance, the poetry of Nezval and the plays of Brecht) from the overall formation of socialist realism, and for relating them to socialist romanticism or to non-realistic trends. An elementary truth that should not be forgotten is that works of art are not evaluated only on their formal merits, but by their general meaning and their message, by the specifics of their analysis and generalisation of the phenomena of life.

Socialist realism has a rich history behind it, and has acquired new specific features at every stage of its development. Moreover, now that the peoples of the former colonies, of the dependent and semi-dependent countries are emerging in the political and cultural arena; now that the culture of the Latin American, African and Asian countries is more broadly entering modern civilisation, the forms of realism, including socialist realism, are bound to be distinguished–and are already distinguished–by exceptional flexibility and breadth. The purely European conceptions and demands on realism do not in every way correspond to the character and specific features of these nations' creative art. If we are to make a full and clear-cut analysis of the problem of realism as a whole, and the problems of socialist realism in the art of these countries, we need substantially to enrich and

improve the methods of our aesthetic analysis. The conception of realism in general, and of socialist realism in particular, cannot and must not be narrow, but neither should it be boundless. Rejecting the unificatory, schematic approach to the theory and practice of socialist realism, we cannot ignore the general, fundamental principles of Marxist aesthetics, or to fragment it into particular aesthetics.

The peoples fighting for their freedom, the peoples who have won this struggle, face and tackle similar problems, naturally, with due consideration for their national-historical specifics. These problems are clearly and unequivocally dealt with by Marxist-Leninist theory, which points out the peculiarity and exceptional importance of the historical period lying between the working people's victory over capitalism and the complete elimination of classes. In this period, the working people and their vanguard must, as Lenin put it, deal with the "problems of re-educating, under the proletarian dictatorship, millions of peasants and small proprietors, hundreds of thousands of office employees, officials and bourgeois intellectuals, of subordinating them all to the proletarian state and to proletarian leadership, of eradicating their bourgeois habits and traditions".[4] In this period, the socialist state carries out a cultural revolution, bringing world culture within the reach of millions of working people creating socialist democracy and the necessary prerequisites for doing away with the distinction between town and country, and preparing the conditions for moulding—and in fact moulding—the new socialist man. Art, genuine revolutionary art, cannot but reflect these most complex processes, cannot but comprehend them in the light of the new socialist outlook, in the light of its conscious historicism. This kind of community of historical tasks naturally tends to produce an aesthetic community of the art of socialist realism, enabling it to take a stand in world art as a coherent ideological-aesthetic phenomenon.

The monumental works of Majerová and Sadoveanu, Seghers and Iwaszkiewicz, Kruczkowski and Mináč, Mesterházi and Darvas, Ćopić and Lalić, as those of other writers in the socialist countries, may by rights be referred to as the epos of the new society, for they are a record of the emergence and development of the new system of social relations, and analyse and depict various forms of mass movement to socialism, the establishment of new relations between men building the socialist society, and the formation of the new individual, for whom socialism is an every-day element of life. Without this socialist epos, the picture of modern literature and art would be less then total and very much poorer.

Since its emergence, realism has always existed simultaneously with other aesthetic trends which relied on different methods of depicting reality. Nor has it been a peaceful coexistence, although, of course, there has been aesthetic interaction between the various trends in art in the past, as there is in our own day, too. Realism took shape in intense aesthetic struggle, a struggle in which it won through because of the inexhaustible artistic potentialities of its method, and the exceptional wealth of its expressive means. Developing almost simultaneously in various modes of art, it constitutes an

[4] V. I. Lenin, *Collected Works*, Vol. 31, p. 116.

aesthetic system which is coherent in its fundamental principles. While taking social analysis to be the basic mark of realism, one should bear in mind its specific use in this or that type or even mode of art so that the current reproaches about there being a "litero-centrist" approach to the problem of realism result from a doctrinaire view of the aesthetics of realism. Social analysis takes place at different levels; nor does the artist always carry it out in the work itself. But with the realist artist it constitutes the subsoil, the rock-bottom basis of his imaginative thinking. Thus, if the lyric is not to seal himself off hermetically, thereby depriving his work of extensive bonds with the external world, he must apparently rely on feelings or ideas which are of universal importance. In order to bring out such feelings and ideas from the stream of emotions and reflections, the lyric, if he is a realist, carries his social analysis outside what may be called the brackets, presenting the ultimate conclusion, something of a summing-up of his reflections and emotional experiences caused by his social being. The difficulties of determining whether a work of art is a realist one or not, a problem which some critics and aesthetics have now brought up, are in fact purely imaginary. They do not arise from the obscurity of the basic principles of the aesthetics of realism but from the inadequate elaboration of the complex approaches to the study of art in the light of their methodological typology. Concrete studies are bound to show that the principles of realism, romanticism and other trends are common for the various types of art.

When studying the development of literature and art, one should bear in mind that their aesthetic effect may be caused by different means and methods, including non-realistic ones. It is quite wrong therefore to ascribe everything of importance in art to realism alone, a practice that has been fairly widespread. Great works of artistic genius were created by pre-realistic art, namely, baroque, classicism and romanticism. Nor can our culture afford to ignore the aesthetic values produced in the latest period by representatives of non-realistic trends in art and literature. Insistence that realism is a total method in all art depicting life in the forms of "life itself" tends to schematise the development of creative thought, obscures the true scale and importance of the processes under way in realism, and makes it hard to find one's bearings in modern art and literature. It is also wrong to take this attitude to realism because, as a trend in art, it contains phenomena which are dissimilar in orientation and ideological principles. Let us merely consider the fact that the bulk of bourgeois literature, with the exception of a very small, avant-garde section, continues to be realistic, as it was in the past.

Art is known always to give expression and to stand up for definite interests and ideals. It has an especially great part to play in our day, when there is an acute struggle of ideas, and when a fierce battle for men's minds is raging throughout the world. In this struggle art cannot be autonomous or stand on the sidelines, especially when it is subjected to vast ideological pressures by the ruling classes of capitalist society, which have all the mass media at their disposal. In the acquisitive world, the artist often finds it hard to sort out the contradictions of the historical situation and to

see which way history is moving. The complexity of the modern world, the vast scale of its social and political conflicts now and again suggest to the artist that it is difficult or impossible to depict the changing face of reality by the means of realistic art; present-day critical realism reveals various features which are to be discerned in non-realistic trends in literature. I feel that the living process of development in art should be viewed from the standpoint of the nature of the aesthetic properties of the work of art, which depend on its general tenor, and it is history which above all provides us with criteria of this type.

The Great October Revolution, its gains, and the changes it has brought to the social structure of human society have turned this epoch of ours into one of transition from capitalism to socialism on a worldwide scale. The complex, contradictory and dramatic process of the revolutionary transformation of reality, which comes up against resistance on the part of the ruling classes, nevertheless steadily undermines the foundations of the old world. It is also reflected in social consciousness, in men's social mentality and, of course, in the sphere of art. In bourgeois society it is refracted both in realist and in non-realist art, resulting in a polarisation of ideas and emotions within these trends. There appear works written in a realistic manner which carry a conservative message, and works written in a non-realistic manner–like those of Erich Mühsam, Garcia Lorca and the early Paul Eluard–with a progressive message. These mutinous-minded artists, two of whom were killed by militarists and fascists, ruptured their spiritual ties with the old, bourgeois society, and rejected the traditional forms of poetic depiction in a quest for new modes of expressing revolutionary ideas. They did not isolate themselves in a pure, self-contained form of art, as many of their contemporaries did, but worked their way through to a civic art capable of participating–and actually participating–in the social struggle. In the final count, it is the artist's attitude to the processes revolutionising the world that is the crucial factor, and it is this attitude that may help to determine the value of the work produced in a non-realistic manner.

However, the connection between art and the revolution is highly intricate and never straightforward. It is not confined to the artist's political sympathies and antipathies. If the artist is a true revolutionary, his whole world outlook is subjected to the fructifying influence of revolutionary ideas, making him feel an organic urge to produce an adequate expression of the processes going forward in society, and this is bound to be reflected in his poetics and to entail a development of realistic features in it. But because today non-realistic trends in art are frequently vehicles of a decadent outlook, it is unscientific, to say the least, to classify their representatives under the heads of "bad" and "good". Non-realistic trends and works should be examined in concrete socio-historical context, without ignoring their attitude to the key issues of historical development. Marxist-Leninist aesthetics must see its way in the dialectics of development of modern artistic thought, distinguishing the boundaries separating realistic art from art which is hostile to realism, and opposing attempts to confuse fundamentally different and intrinsically incompatible modes and types of artistic thinking and creative effort.

The October Revolution and socialist ideas have had a tremendous impact on critical realism. The most outstanding artists of Europe, Asia and the Americas–Anatole France and Romain Rolland, Heinrich Mann and Thomas Mann, Rabindranath Tagore and Lu Hsun, Bernard Shaw and Theodore Dreiser, among others–took a profound interest in the revolution, realising that it created a new reality in which modern man began to live and act. This new reality was fraught with profound conflicts. The revolutionary upheavals and changes rolling across the world sharpened the social instinct of the critical realists to a fine edge, helping them to overcome the illusion that capitalism was steadily progressing, and teaching them to separate its destinies from those of all mankind. Such major works of the post-October period in critical realism as Dreiser's *The American Tragedy*, and Galsworthy's *The Forsyte Saga*, Roger Martin du Gard's *The World of the Thibault*, and Thomas Mann's *The Magic Mountain*, Lion Feuchtwanger's *Success* and Heinrich Mann's *The Chief*, reflected the collapse of many notions which the bourgeois mind had accepted as fundamental and immutable, and the collapse of the faith in the permanence of capitalist progress. The classics of modern German literature, for instance, showed the degeneration of bourgeois democracy and the emergence in the entrails of capitalism of fascism, the most dangerous enemy of progress and humanity. The sense of instability of existence in capitalist society runs through the writings of the leading critical realists of the post-October epoch. The sharpened social sense enabled them very early to join in the anti-fascist struggle, the purpose of which was both to destroy fascism, and the myths and illusions spread by its ideologists.

Many of these artists took part in the anti-fascist movement and were in close touch with the people's struggle, thereby gaining a better understanding of it, and being freshly inspired in their work by its impact. The period of anti-fascist struggle marked an important stage in their spiritual development, preparing them for resistance to Hitlerism during the Second World War. Hemingway's *The Fifth Column* and *For Whom the Bell Tolls*, Čapek's *War with the Newts* and *The Mother*, Remarque's *Three Comrades*, the historical anti-fascist novels of Feuchtwanger and Bruno Frank, the impassioned anti-fascist publicistic writings of Thomas Mann and his novel, *Joseph and His Brothers*, will forever remain memorials to the intricate and difficult historical period bounded on either side by world wars. In those years, the progressive art of the world looked with hope to the Land of Soviets, which it regarded as the most reliable bulwark against fascist reaction. Socialist ideas, backed up and enriched with the experience of the Great October Revolution, gave heart to the Resistance fighters in the years of the war against Hitlerism and constituted an important strand of their world outlook. Neither the cold war nor the wild anti-Soviet propaganda, which the imperialist circles have been conducting in their vain efforts to reverse the tide of history, has helped them to obliterate these powerful ideas from men's minds.

The crisis of bourgeois democracy and the spread of socialist ideas impelled the critical realists to seek new socio-ethical values, and the most farsighted of them discovered these values in the ideals of socialism. Indicative in this respect is the evolution of such outstanding writers of our age as Ro-

main Rolland and Thomas Mann. The final volumes of Rolland's *The Soul Enchanted*, which he conceived as a broad picture of life in European society between the two world wars and as a history of the struggle of progressively-minded men, were written from new ideological-aesthetical positions, showing that the writer had adopted socialist realism. Thomas Mann, settling accounts with bourgeois consciousness and bourgeois art in his *Doctor Faustus*, wrote in his famous article, "Anti-Bolshevism—the Principal Absurdity of Our Time", that the future can hardly be conceived without its communist features, that is, without the fundamental idea of social property and the social use of all the riches of Earth, without a steady obliteration of class distinctions, without the right to work and the duty to work for all. [5]

In our day, as world reaction intensifies its anti-popular activity, the critical realists, analysing the complexified modern world, protest against the de-personalisation of the individual by the so-called industrial society. They turn to the problem of each man's responsibility for mankind's present and future, examining man's quest for a fitting place in the current clash between the forces of reaction and progress. The humanistic aspirations of the critical realists, and their deep yearning for social justice make their art akin to the art of socialist realism, for whom the main task is the struggle for the triumph of genuine humanism.

The role and importance of this art in our complex and rapidly changing world acquire unprecedented importance, because to its lot has fallen the distinguished task of carrying to the world the great ideals born of the October Revolution, and rallying the vibrant forces of world culture.

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[5] See *Einheit*, Berlin, 1946. No. 2.

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Analytical Approach to a Work of Art

What principles underlie an analysis of a work of art as a unity of message and image is a highly complex problem of literary studies.

It may be asked whether an analytical study of artistic unities is possible or advisable in general. Can an artistic phenomenon be cognised in terms of logical concepts or expressed in a scientific form? Arguments on that score are always under way. In this article we shall confine ourselves to a consideration of certain prejudices against a scientific interpretation of a work of art.

Content and form have no separate existence; they are always "together", in an indissoluble unity, as two aspects that mutually penetrate each other, forming a single whole. The borderline between them is a logical notion, not a spatial one. The relation between content and form is not that between a whole and its part, between a kernel and its encasing, the internal and the external, quantity and quality; it is a relation between opposites, each of which is transformed into the other. "Content is nothing else but a *transition of form* into content, while *form* is nothing else but a *transition of content* into form." [1] Such is the philosophical formula that cautions us against any gross or simplified understanding of the complex, mobile and dialectical unity of the categories of form and content in general, and in the sphere of art in particular.

"In a work of art idea and form should be organically merged, like body and soul, in such a way that destroying the form will mean destroying the idea too, and vice versa.... The singular essence of idea and form is so great in art that neither a false idea can exist in a beautiful form nor beautiful form can be an expression of a false idea." [2] "When form is an expression of content, it is so intimately linked with the latter that to separate it from content will mean destroying that very content; vice versa, separating content from form means destroying the latter." [3]

Taken as a whole, a work of art is not only richer than the sum of its component elements, but is qualitatively distinct from the simple sum of those elements. It represents that complex functional and mobile system of

[1] Hegel, *Works*, Moscow-Leningrad, 1930, Vol. I, p. 224 (in Russian).
[2] V. Belinsky, *Collected Works*, Moscow, 1954, Vol. 5, p. 316 (in Russian).
[3] Ibid., Vol. 9, p. 535.

nexuses in which every element interacts organically with the rest, and influences them, experiencing, in its turn, their summary influence and acquiring a weight and significance that it does not possess in its particularised aspect. This is an effect of cohesion.

Leo Tolstoy once said that he could not have expressed the idea of his *Anna Karenina* otherwise than by "writing the same novel I have written, all over again". [4] This opinion by the great writer is frequently quoted to prove the thesis of the indissolubility of an idea and its embodiment in terms of images. Konstantin Fedin voiced a similar notion when he described any divorcement of the artistic from the ideological as "a dangerous splitting of the very nucleus of the art of literature". [5] This statement by the Soviet outstanding writer concerning the impermissibility of "splitting the nucleus" rapidly caught on with the literary critics as a highly authoritative reminder of the need to perceive the ideological and the artistic in their integrity. Although such pronouncements are probably as old as art itself, they preserve all their profound significance, for they characterise the focal point in an understanding of the specificity of art, and bear upon the basic categories of aesthetics in general and literary theory in particular. The literary scholar should never lose sight of the fundamental theoretical proposition of aesthetics regarding the unity of form and content; at the same time, he should not, in our opinion, regard that unity as an imposition of a ban on the analytical approach to the image in art.

There is reason and justification for any protest against one-sided and arbitrary operations that ignore the interpenetration and the mutual determinatedness of form and content, or underestimate the compositional factor. Not infrequently, however, such protests transcend the boundaries of the reasonable and encroach in general on the right of the literary scholar to take apart a whole in the process of its analysis, and to abstract form from content or content from form. It is often supposed in this connection that any logical concept distorts and destroys the wholeness of the impression gained from a work of art.

The extreme adherents of this viewpoint do not consider it possible or necessary to engage in any scientific study of the phenomena of art; they give preference to the immediate perception of the whole and reject the devices of scientific analysis for which they substitute various ways of achieving awareness. In particular, this has also found peculiar expression in present-day arguments about the methods of teaching literature in secondary schools. It has been suggested, for example, that all concepts of literary science and even textbooks be eschewed in secondary education, these to be replaced by expressive reading. [6]

Instances of a primitive analysis of artistic unities come under constant attack from the critics. They fully deserve all the scoffing that comes their

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[4] Leo Tolstoy, *Collected Works*, Moscow, 1953, Vol. 62, pp. 268-269 (in Russian).

[5] *What Is Contemporaneity?* (A collection of articles), Moscow, 1960, p. 286 (in Russian).

[6] See *Problemy literatury*, Issues 8, 12, 1961; Issues 3,8, 1962; L. Kovalyova, "Are Textbooks Necessary?" *Literaturnaya gazeta*, Nov. 29, 1962, Issue 142, (See also Issues 126, 137 and 150).

way. The arguments cited to substantiate the syntheticity of an artistic image are so convincing and so abundant that the thought involuntarily arises: are we not trying too hard to force an unlocked door? Are there such today who do not recognise the unity of form and content? Neither is there any lack of claims that the syntheticity of an artistic image in general does not yield to the scientific form of cognition; that there is very much in art that this form fails to discern; that no logical splitting of form and content is permissible, and so on. This is often done with much talent, and involuntarily induces doubt of the advisability of any scientific interpretation of a work of art.

It is to be regretted that there are far fewer literary scholars who are capable of disproving, with the same energy and the same degree of success, those prejudices that exist against the advisability of a logical analysis of artistic phenomena able to break with such prejudices, and see in the complex syntheticity of an artistic image, not something contradictory but an encouragement for deeper analysis.

As I see it, the opponents of an analytical approach to the artistic image obviously confuse the categories of literature and the principles of the literary science; they identify the specific in literature with the specific in literary studies. Do not split the "nucleus"! Addressed to the creative artists, this call is both justified and necessary. That is how matters stand in the realm of art. But does that mean that the splitting of the whole into its parts, which is contradictive in respect of a work of art, is just as contradictive in respect of the science that studies art? What would be the value of science, and indeed would science be possible at all, if, by adopting this call, it gave up its right to dismember a whole into its parts, abstract form from content, and so on? After all, the science of literature must of necessity study its object in the forms of thinking and understanding inherent in that science. It is common knowledge that Hegel's "Lectures on Aesthetics" resolutely rejected various prejudices regarding the impossibility of gaining an insight into the essence of artistic phenomena through concepts.

Belinsky, who was so subtle, profound and many-sided in his understanding of the indissolubility and the singleness of form and content in works of art, at the same time did not recognise any contraindications to their analytical study. Art, he said, can enter the province of reason, of science. "For that it has only one road and one means—the disuniting of the idea from its form, the resolving into elements that go to make up a given truth or a given phenomenon. This operation of the mind is in no way a disgusting anatomical process that destroys a phenomenon of beauty in order to define its significance. The mind destroys a phenomenon in order to bring it to life for itself, for the mind, in a new beauty and a new life, if it finds itself in it. The mind's process of dissection kills only those phenomena in which it finds nothing of its own, and declares them merely empirically existent, but not actual. It is this process that is called 'Criticism'." [7]

[7] V. Belinsky, *Collected Works*, Vol. 6, p. 270 (in Russian).

The unity and indivisibility of a work of art cannot deny the science of art the right to dissect unities.

What then is the essence of the scientific interpretation of works of art? What are its tasks and aims? No scientific form can exhaust an artistic image, discern the plenitude of its multivalence, or take the place of the impression it produces. If that were possible, art itself would be superfluous. On the other hand, however, if it were impossible to establish any relationships between an artistic image and its scientific expression, there would be no room for the science of art.

An artistic image cannot be reduced to logical concepts, but it can be translated into the language of logical concepts. The question of the cognition of art in a scientific form should not be equated with the question of the reducibility of artistic images to logical concepts. The former is both possible and necessary, and it is the foundation of the entire science of art. The latter is impossible and is an expression of a pedestrian and positivist concept of the illustrative character of art. One may consider equally groundless in any study of art phenomena both the principle of positivist reductionism, which ignores the specific in art, and any neo-Kantian and Rickertian treatment of art as an irrational world of individual phenomena which are not subject to any law and defy any scientific form.

No science does set or can set itself the task of reproducing reality in all its wealth of manifestations and changes. Any scientific generalisation is ultimately some kind of simplification. "We cannot imagine, express, measure, or depict movement, without interrupting continuity, without simplifying, coarsening, dismembering, or strangling that which is living. The representation of movement by means of thought always makes coarse, kills–and not only by means of thought, but also by sense perception, and not only of movement, but *every* concept." [8] Social being is the sum of the changes introduced by individual producers. "The sum total of these changes in all their ramifications in the capitalist world economy could not be grasped even by seventy Marxes. The most important thing is that the *laws* of these changes have been discovered, that the *objective* logic of these changes and of their historical development has in its chief and basic features been disclosed." [9]

Scientific concepts and definitions do not give a full measure of the entire concrete wealth of an artistic image, and cannot be identical with the integrity of the aesthetic impression it produces, and so on. This is all true. However, it is erroneous to think that a logical interpretation provides nothing for an understanding of a work of art, and even distorts it. The purpose of scientific examination does not consist in finding an exhaustive rational formula for an artistic image. The science of art does not and cannot set itself the aim of competing with art in a wealth of its representations. Its purpose is different. "Through the resolving activities of the mind, science abstracts general ideas from living phenomena. Through the creative

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[8] V. I. Lenin, *Collected Works*, Moscow, Vol. 38, pp. 259-260.
[9] Ibid., Vol. 14, p. 325.

activities of the imagination, art presents general ideas in living images." [10]

Scientific cognition is designed, not to replace an artistic image by any logical equivalent, but to represent that image in *different* dimensions, to step back from it so as to gain a better understanding of it, to dismember the whole so as to ascertain the law of its cohesion, to explain it in all its internal and external links, thereby providing the basic notions for orientation in a boundless variety of the phenomena of art. An analysis of a work under study is important not in itself but in the ensuing synthesis, which returns us to the initial whole, the latter now coming forward as something concrete that has been enriched and scientifically cognised.

Dismemberment and fractioning of a complex unity with the aim of cognising its component elements–a profound analysis–must, of course, lead us away from the whole. This is a road along which the quality or specificity of artistic image is impoverished. It would be bad for the study of any work to wind up at the stage of analysis, which would be quite superfluous unless followed up by subsequent synthesis, by an ascent from the abstract to the concrete. "The concrete is concrete because it is a synthesis of many definitions and consequently a unity of the diverse. That is why it operates in thinking as a process of synthesis, as a result, and not as a point of departure, although it represents an actual point of departure and hence it is also a starting point of contemplation and representation. Along the first road, full notion transforms into an abstract definition; along the second road, abstract definitions lead to a reproduction of the concrete by means of thought." [11]

The process of study is a "union of analysis and synthesis–the breakdown of the separate parts and the totality, the summation of these parts". [12] Analysis is merely a necessary condition for the achievement of a higher aim–scientific synthesis. This latter is the more successfully achieved, the deeper, more detailed and differentiated that analysis is which does not break away from the dialectics of the relation between form and content and, on that condition, boldly follows the road of the dismemberment of the complex structure of an artistic image. Logical categories, terms, notions and definitions are moments in the cognition of the artistic image; they isolate and establish what is of the great, essential significance and in conformity with its artistic patterns. Thereby they complement, deepen and enrich our notion of a work of art in comparison with its immediate concretely sensory perception by the reader.

A rejection of rigorous scientific research leaves the scholar merely the possibility of engaging in descriptive literary studies that are close to works of art in the devices used and the style employed. This road is often suggested by those who are consistent in their denial of the advisability of the analytical approach to a work of art. However, if literary studies are to be seen only as a descriptive science that is cognate with *belles lettres*, then such studies are stripped of their independent cognitive significance: after

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[10] V. Belinsky, *Collected Works*, Vol. 9, p. 158 (in Russian).
[11] K. Marx and F. Engels, *Works*, Moscow, 1958, Vol. 12, p. 727 (in Russian).
[12] V. I. Lenin, *Collected Works*, Vol. 38, p. 222.

all, it is a literary work itself that is the most ideal description of itself. Any retelling, repetition or literary duplication of such a work is a road along which literary studies depart from actual science, without themselves turning into art. This is a road that can promise science nothing but the danger of being crushed under the burden of verbose descriptiveness. It often happens that way: when one engages in a vain pursuit of what is alien, he loses what is one's own without achieving anything.

Either of these two modes of studying a work of art–its direct perception or its cognition in terms of notions–has its own sense and significance. They do not exclude or replace each other but are mutually complementary. Here it is absolutely out of place to ask: which is the better? Each of them provides something the other one cannot give.

The thesis on the antagonism between an artistic image and its expression in notions, the utter separateness of the two springs from an obvious misunderstanding. Demands contrary to scientific thinking are presented to it in the expectation of replies in a shape that is in keeping with thought in terms of artistic images, following which the complaint is voiced that scientific thought continues to speak in its own language, that of logical concepts. A phenomenon in art does not and cannot remain the same thing in its immediately sensory form and in the form of scientific concepts. Such, in principle, is the relation, not only between art and the science of art but also between a real object and its expression in all spheres of scientific knowledge. Science "studies the world exclusively in a manner inherent in it, a manner that is different from the artistic, religious, and practically spiritual study of this world". [13] While the unity of concrete and sensory form and of ideological content is an indispensable condition for the existence of an artistic image in a work of art and of its immediate perception as such, any "splitting" of an image is just as indispensable a condition for its becoming part of the process of logical thinking, its existence in concepts. To proceed from the premise of the "impermissibility" of translating art phenomena into the language of logical concepts means liquidating the science of art. Science, for its part, cannot dispense without analysis, without "splitting". Even those students of literature who stubbornly insist on the "infissibility of the nucleus", the "indissolubility of unity", do so in utter contradiction with their scientific practice, that is to say, they, too, analyse and "split".

One could cite from the works of literary scholars and critics a multitude of excellent and, in essence, perfectly correct and sensible ideas, regarding the need to perceive any work of art as an entity, without splitting it into parts, dismembering it into components, elements and so on. However, all this is excellent from the viewpoint of the artist, but not of one engaged in literary research. The best proof of the correctness of this conclusion is provided by the following fact: as soon as those self-same authors who have just advanced the thesis of the "infissibility" of an artistic entity, go over to more concrete characterisations of that entity, they inevitably begin to fractionise, dismember, analyse and study in the abstract

[13] K. Marx and F. Engels, *Works*, Vol. 12, p. 728 (in Russian).

the parts of that entity, that is to say, begin to operate in a way they have themselves condemned.

One might refer to a highly interesting piece of research *The Art of Words* by N. Gay who very skillfully develops the ideas of artistic value and the mobility of the integral structure of a work of art, and the interaction and mutual penetration of all its components, backing his arguments with a multitude of testimonies from artists and scholars. In other words, what he has engaged in, is nothing but a scientific analysis of the whole, so as to convince himself that it is indeed a complex entity. However, certain formulations by this author, which seem to express a distrust of logical analysis, contradict all of this. N. Gay writes: "In defending the idea of the conceptuality of an image and immediately drawing a line of demarcation indicative of the distinction, in principle, between the logical, notional and scientific study of reality, and the artistic and aesthetic study of that reality in terms of images, one should speak of the community between these various forms which mutually complement one another. They are comparable due to the 'principle of complementariness', according to which there exist phenomena that are incompatible but indissolubly linked together." This proposition, which in our opinion is a perfectly correct one, is followed by arguments which leave no room for "community" or "compatibility". Any attempt to express in words the content and essence of works of arts, according to the author, "leads up either to their utter impoverishment or even to interpretations that are mutually contradictory and incompatible.... To enter the world of a work of art, one must repeat that work from cover to cover; to take in the content and the idea of even a short poem, one must repeat that poem as it exists.... By destroying the form of a poem we shall get, not a weakened content, not even a designation of the theme but an absolutely threadbare platitude".

Repeat from cover to cover? In that case, an ideal understanding of that work would stem from its memorisation. However, one can repeat a work *ad nauseum*, memorise it from cover to cover and yet fail to understand its meaning. That is what often happens when children commit verses to memory. The concrete in any scientific cognition calls for logical definitions, and the greater the complexity of the concrete, the greater the number of such definitions.

"It is necessary to reach agreement," the author goes on to say, "that... any attempt to express the poetical through the logical means the expression of another thought, another idea not a simplification of a poetical idea by omitting what is of secondary significance." [14] Hence any interpretation of artistic phenomena by means of logical notions can only impoverish or even distort them. Thus, the initial statement by the author regarding a certain community and comparability between what is expressed in images and in logic is cancelled by his ensuing arguments, his acknowledgement of the complete dissociation between them. In that case, as I see it, no room remains for the science that studies art. Fortunately, formulas that give

[14] N. Gay, *The Art of Words*, Moscow, 1967, pp. 278-279 (in Russian).

grounds for such a conclusion are only separate instances of inconsistency in the author's arguments; his entire book is an attempt to interpret the artistic value of works in terms of scientific concepts.

Their deep-rooted habit of confusing the artist's stand with that of the researcher or, perhaps, their mistrust of the possibilities of their science make some students of literature loth to acknowledge that science is capable of cognising the phenomena of art with methods of cognition inherent in it and distinct from thinking in terms of images. Such arguments regarding the inviolability of the artistic image and its remoteness from the scientific form are somewhat reminiscent of the prayers offered by believers: after praying in front of their icons, they have to set about their sinful mundane affairs. After giving their due to the integrity, or syntheticity of a work of art, one has to set about studying it analytically.

Of course, the difficulties besetting any scientific analysis of a work of art in the unity of its form and content are considerable, and the possibilities of error are quite real here. Dangers lie in lurk to the left and the right of the researcher. One may delve into the content and slide into abstract sociologism; an involvement with form may land one in the morass of formalism. Yet even the cautious researcher who eschews extremes is not guaranteed against error: the danger of making eclectic compromising awaits him in the middle of the road. We have had experience of all these things, we have had our own formalists and vulgar sociologists and even formalist sociologists. The former two would take a half for the whole, chasing one of the halves and forfeiting the other; the latter, who considered that the whole consists of two disparate halves, would pursue each of those halves in turn without reaching either of them. No sooner did they pounce upon their quarry, confident that they had caught it in its entirety, than they discovered that it was only a mechanically severed part of the whole, so that they had to abandon what they had caught and continue their vain pursuit.

Indeed, anyone who would study form and content in their unity is indeed in a predicament. Nevetheless, it is incumbent on the student of literature to seek for a way out of that predicament. The only way out is to engage in analysis, in "splitting" the unity. The formalists' attention has been focused on only one thing—on *how* the object of study is made. This is the narrow and partial significance of the logical analysis of a work of art. The Marxist student of literature is interested in both the *what* and the *how*, because they are intimately interlinked; what he is after is the cognition of a work of art as a unity of the relations of subject and object, and to reveal the social genesis and function of that work. This is a far more complex task than any one-sided sociological, formalist or, finally, formally sociological and eclectic approach to phenomena in art.

Of course, a merely theoretical understanding of a problem is a far from final quarantee against errors in research. It is a far cry from *knowing* to *being able*. Consequently, the nub of the matter is not the invention of ever new prohibitive formulas guaranteeing the integrity of an artistic image against "splitting", but an enhancement of analytical skill, the further development of the logical apparatus of the literary science.

The trouble lies, not in our dividing up a work of art into form and content, into theme, subject, composition, and the like, but in our dismembering being still insufficient, in our halting at the stage of the traditional methods and notions, without revealing the necessary initiative in the search for more refined ways of penetrating into the world of ever more complex artistic phenomena. In inventing formulas to protect the syntheticity of an artistic image against dismemberment we are holding back the development and perfection of methods and skills employed in literary analysis, and hampering the researcher's initiative along that road. A certain scientific apparatus, a range of categories, definitions and terms has been evolved in the science of literature. One can grant that these traditional concepts contain much that is obsolete. One must find one's bearings here while maintaining a reasonable caution. However, one often comes up against ill-considered statements that such things as theme, idea, content, composition and alike are notions fit for the classroom and distort the essence of a work of art. In keeping with this view, some literary scholars have gone so far as to replace the traditional concepts of literary studies by vogue words, formulas and terms borrowed from cybernetics, semiotics, physiology and so on.

The old is not always bad, and the new is not always good. Many traditional concepts have played an important part in the science of literature as points of departure for an understanding of a work of art. They will continue to do so. A reasonable blending of the old and the new is the natural path towards the accumulation and enhancement of knowledge and the ways of acquiring that knowledge. A tradition that has proved its worth should not be rejected in the race after a fashionable novelty. At the same time, there is now an acute need for a critical revision of the established concepts of literary studies, for their being made more precise and distinctive, and especially for their being supplemented with new concepts prompted by the level and the trends of present-day scientific thought. Thus, for instance, frequent attempts have been made in the past, and are still being made, to divide the forms of the work of art into the external and the internal. Though they have been correct in essence and in their striving to specify the many-sided concept of form, such attempts are still, in our opinion, terminologically vulnerable and disputable. Form and content are the maximally general correlative categories. That is why the introduction of two concepts of form would call, in its turn, for two concepts of content. The existence of two pairs of analogous categories would, in its turn, create the need, in accordance with the law of the subordination of categories in materialist dialectics, for the establishment of a third and unifying generic concept of form and content. In a word, terminological duplication in the designation of categories will lead to nothing but muddled logic. In general, definitions of the *external* and the *internal*, which permit the possibility of a spatial distinction of form, vulgarise the notion of the latter.

Present-day philosophical thought has been seeking actively and not without success for differentiating, concretising concepts that would suit the maximally general categories. "It is elements and structures that operate

as such concepts in respect of the categories of content and form." [15]

In respect of language studies, this has found expression in structural linguistics as a particular branch of the science of language. There has been much heated discussion on the use of structural methods in the field of poetics. In its way this may seem justified, though, there do not as yet exist such results of research that can provide grounds today to establish with any degree of convincingness the aspects and limitations of the structural approach to the phenomena of literature, or to show the effectiveness of that approach. For the time being, what has mainly emerged has been a substitution of the concepts of elements and structure for the concepts of form and content. As for attempts to give the structural approach a significance of something more than a partial method in specific fields of literary studies, or of forecasts regarding the replacement of all "classical" literary science by structural literary science, all this belongs to the category of unrealistic thinking. A terminology that is developed, orderly, flexible rich and at the same time precise and motivated by the specificity of the object is of particular importance in so refined a field as the scientific interpretation of the works of art.

In view of the complexity of a scientific understanding of the unity of form and content in a work of art, and of the simplified interpretations engendered by that complexity, attempts have been made to replace two coordinative categories by a single one. This has been prompted by the striving to eliminate the "dualism", the dissociation in the analysis of content and form, so often to be seen in our researches. There have been recommendations, for instance, to replace the dual concept of "form and content" by the single concept of *aesthetic idea*, which, it is claimed, "already of itself precludes the possibility of any mechanical distinction between 'ideological content' and 'artistic form', political tendentiousness and artistic craftsmanship". [16]

However, the elimination of dualism in order to save the integrity of the "unfissile nucleus" means, in practice, not the solution of difficulties but merely their evasion. The problem of the unity of form and content is no invention; it deals with the major actual categories of philosophy. It cannot be abolished but only ignored, the consequences of which being common knowledge. This problem was a hindrance, a stumbling block, both for the vulgar sociologists and the formalist aesthetes. The former ignored the specificity of the artistic form, restricting its function to the purely external and illustrative; they underestimated its cognitive significance and its effect on content, treating the latter as simply prosaic material. The formalist aesthetes simply rejected content, which they considered a category "standing outside of aesthetics", and treated the form of a work of art as a phenomenon independent of content and valuable in itself. Such are the consequences of any break-up of unity. The reduction of two interpenetrative but relatively independent categories to a single imaginary one—that of the

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[15] V. Svidersky, "Elements and Structure as Categories in Dialectics", in the book: *The Dialectics and Logic of Scientific Cognition*, Moscow, 1966, p. 249 (in Russian).

[16] S. Batrakova, *On the Ideological Nature of Art*, Moscow, 1960, p. 5 (in Russian).

aesthetic idea–is nothing more than a stylistic contrivance, one that not merely gives nothing to the methodology of research but contains within itself the danger of sliding into formalist positions. This is something that Alexander Blok once drew attenion to. He wrote: "...form and content are inseparable, they form a unity; form *is* content, while content *is* form; yes, that's how it is; but no sooner was this pronounced and heard than there appeared the ranks of the verse-writers–gifted people at that–that seemed to have succumbed to form and were stripped of content." [17] The problem of form and content exists, and no verbal ploys can help do away with it. In one way or another, this problem makes itself felt in each concrete instance.

The essence and the difficulty of the problem lie in discerning the mutual transition of form and content not in ignoring them or breaking with the unity of these two categories, which should be understood as a mobile interaction between opposites, now separating, now closing up with each other until they become identical. In works of art, the link between form and content manifests itself in various ways, in various degrees of fusion. "It is only in the highest art that an idea and its embodiment genuinely correspond to each other" [18]; "the organic unity and identity between idea and form, and between form and idea belongs to a genius alone". [19] In these ideal manifestations of unity, the degree in which form has developed harmoniously is determined by the degree of development of content. As for the general run of instances, these represent an infinite scale of deviations from a harmonious correspondence between form and content, right up to contradictions and conflict. Here the degree of conformity between form and content, as a condition of artistic value, cannot of itself indicate that a work is worthwhile. Form can also be in harmony with an insignificant or petty idea. This is characteristic, for example, of the works of representatives of the "art for art's sake" trend. On the other hand, any new trend in art, progressive in the ideological and social sense, and rich in its aesthetic possibilities, often paves a way for itself even if it does not yet possess a developed form.

Form and content do not condition each other automatically, in unambiguous terms or with finality. One can support the other in different degrees. Works of varying ideological value can stand at the same artistic level. In a word, the link between form and content is not a calm unity that is always equal to itself, but that complex, mobile and contradictory unity in which one does not disappear without trace in the other, but preserves its relative independence.

The multiplicity of distinctions and qualities in the correlation between form and content calls for its own scientific explanation. The simultaneous scientific verification of a work with the aid of a double criterion–in the aspect of form and in the aspect of content does not, therefore, prove to have been in vain. The idea of the indivisibility, the fusion and the unity

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[17] A. Blok, *Collected Works*, Leningrad, 1935, Vol. 10, p. 336 (in Russian).
[18] Hegel, *Works*, Vol. 12, p. 79 (in Russian).
[19] V. Belinsky, *Collected Works*, Vol. 9, p. 535 (in Russian).

of form and content in an artistic image does not preclude the need to distinguish between these two dialectic opposites and the relative independence of the two aspects of this unity, and to dismember them in any scientific analysis.

Objections both to any disregard for problems of form, and to dissociation into two unconnected acts in an analysis of content and form are well-grounded. That kind of study of a work of art which is able in the highest degree to discern the nature of the mutually penetrative unity of ideology and image has always been an ideal analysis in literary studies. However, it would be pedantic to insist, in all instances, on a simultaneous analysis of form and content. The researcher is entitled to concentrate either preferably on form, without, however, forgetting that he has to do with a form that is involved in a definite content, or on content, again without losing sight of that content being artistic. The division of an object under study into its component elements, the singling out of certain of its aspects in the process of analysis, and priority to one or other aspect is not only permissible but often essential.

Abstract discussions on how to begin any analysis–with form or with content–are also of little significance. Everything depends on the character of the work, the concrete aims of the research in question, and, in greater measure, on the individuality of the researcher. For instance, it is not at all obligatory to begin research with content, guided by the principle that it is content that determines form, and without other and more concrete grounds for doing so. Nevertheless, it is this sequence in the examination of a work of art that has become a hackneyed scheme fairly widespread in school teaching, text-books and in some scientific writings on literature. A dogmatic transposition of a correct general proposition of literary theory into the method of a concrete study of works of art can only engender drab stereotypes. Scholars who apply such stereotypes and think that they are thereby following the principles of the Marxist method resemble those who would be more Marxist than the founders of our scientific world outlook were. The doctrine of the primacy of content over form did not prevent Frederick Engels from commencing his review of Ferdinand Lassalle's play *Franz von Sickingen* with the words "first of all, I shall deal with the form".

A scientific understanding of the unity of content and form, the ideological and artistic value of a work of art, does not prescribe a levelling-out of devices in any concrete research or an invariable sequence in their application. The researcher can focus his attention mainly on the formal or on the ideological aspect of a work, or he can conduct his studies of these aspects simultaneously or in any sequence; this variety of concrete approaches in no way contravenes scientific methodology, if only the researcher is equipped with the knowledge and the art of applying the fundamental principles of Marxist aesthetics. If he is not so equipped, no particular order in the consideration of the unity of ideology and image can save him from vulgarisation.

We cannot regard as grounded the arguments on the impossibility or the inadvisability, in principle, of an analytical study of the integrity, or

the syntheticity of an artistic image. No unity, no syntheticity and no complexity of phenomena, not excluding even the most artistic intuition, are contraindicative in scientific studies. The more complex and the more synthetic a phenomenon under study, the greater the right of the scientist to intervene with all the methods of research at his disposal and, in particular, to resort to an abstract consideration of individual aspects of the whole and dismembering it into parts in the process of cognition in such a way that, as a result of cognition, the initial, the sensually perceived and the concrete should also appear as a scientifically comprehended concrete entity. Therefore, one cannot speak of a rejection of any analytical study of complex artistic unities, but only of the evolving of more rigorous and precise principles and devices in such studies, of their being in keeping with the specificity of artistic creativity. This, of course is a highly complex matter, and it is for that reason that methodological searches are of such particular importance in the study of the unity between form and content in a work of art.

One of the most important and complex tasks in the methodology of literary studies is to search for ways and means of analysis, of dismembering artistic unities and then synthetising them, and being guided by the principle of the unity of essence in form and content and thereby to achieve an understanding of the laws governing the structure of the entity and to represent that entity as a clearly understood unity. Without dismemberment of the whole into parts, without a consideration of artistic phenomena in the system of logical concepts, and without analysis and synthesis, the science of literature cannot successfully accomplish its tasks.

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The Problems of the Development of Literary Languages

Studies into problems of literary languages have been conducted in Soviet linguistics on the basis of the Marxist concept of the emergence of national languages in connection with the formation of nations. That is why the question of the relationship between the concepts of "national language" and "literary language" has been posed in so many works. The problem of the formation and development of national languages attracted the attention of Soviet linguists as far back as the '30s of the current century. This problem was elaborated on the material provided both by the Russian language (the writings of L. Yakubinsky and numerous works by V. Vinogradov and his pupils) and West European languages (primarily in the works of V. Zhirmunsky on the German language). The work done in those years was marked by heightened attention to the socio-economic factors in language development; in the sphere of the formation of national languages emphasis was placed on the special role of language as used in writing and books.

The sociological approach to the question of the emergence of written language was reflected in the writings of L. Yakubinsky in whose opinion Old Church Slavonic was the state language of Kievan Rus in the 10th and early 11th centuries. Its ousting by Russian literary language in the second half of the 11th century was the result of the growth of the cities, the enhanced political importance of the urban population and the expanded activities of the urban assemblies (*Veche*). [1]

In dealing with the specific conditions of the emergence of a national language in Germany, V. Zhirmunsky laid special emphasis on "the written and book character of the normalisation of language, this going together with the preservation of considerable differences in oral speech, even in the colloquial language of the ruling classes". He arrived at the conclusion that "the German national language was based not on the colloquial language of some major economic, political and cultural centre (such as London or Paris), a language which had become normalised through the agency of writing, but on the written language of city and princely chancelleries, the language of Luther's Bible and the clerical literature of the Reformation, the language of the normalising grammarians, the language

[1] L. Yakubinsky, *A History of Old Russian*, Moscow, 1953, pp. 280-297 (in Russian).

of 18th and 19th century bourgeois literature".[2] Works referring to the 1930s (like the writings of language historians of the previous period, such as A. Shakhmatov) did not distninguish sufficiently between the concepts of national language in a general sense, and national literary language. In particular the concept of norms as a specific problem of the literary language during the emergence of a nation had not yet been formulated. However, the onset of consciousness of the role played by a native language functioning in all spheres of social life had already been made a point of by a number of Soviet scholars, who qualified the appearance of that consciousness as a new stage in the history of literary languages.

Of course, the very term "literary language" calls for an historical approach. As very correctly pointed out by V. Vinogradov, language ". . .distinctions are conditioned, first and foremost, by differences in the social and cultural functions of the literary language in various periods of a people's history. However they also depend on the concrete historical features in the development of a literary language in connection with the individual features in the history of the people in question".[3]

A national language at a definite historical stage in the development of a people's language includes the literary language in its written and colloquial oral forms. The literary language is linked through complex and changing relationships with non-literary variants of the spoken language (dialects, semi-dialects, various forms of popular speech and so on), which it transforms and adapts to the general national norms. In the period during which a particular nation is emerging as such, the literary language gradually accumulates a number of qualitative features that distinguish it from preceding historical periods.

To the credit of Soviet linguistic science stands the publication of a number of studies on the history of various literary languages in connection with the concrete historical conditions of their functioning. Methodologically important propositions have been evolved in studies on the history of the Russian literary language made by V. Vinogradov, S. Obnorsky, L. Yakubinsky, R. Avanesov, F. Filin, G. Vinokur, M. Peterson, B. Larin and other scholars. Here much attention has been devoted to the question of the relationship between the Church Slavonic (Old Slavonic) and the Old Russian elements in various periods of the traditions of the written language. This problem has been of general theoretical significance since the early history of many peoples has shown that some cognate language was used in writing. This could not but have influenced the development of the literary language which arose on a nationwide scale.

The concrete results of the interaction between these two streams depended, of course, on the historical conditions in which a nation came into being. However three possibilities may well be considered: 1) the coexisten-

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[2] V. Zhirmunsky, *National Language and Social Dialects*, Leningrad, 1936, pp. 222-223 (in Russian).

[3] V. Vinogradov, "Fundamental Problems in the Study of the Formation and Development of the Old Russian Literary Lanugage", *The Fourth International Congress of Slavists*, Moscow, 1958, p. 25 (in Russian).

ce of two written languages prior to the emergence of a nation, the alien language being later ousted by the language rooted in the people. Here the appearance of a national literary language is accompanied, on a greater or smaller scale, by elements of the ousted alien language; 2) the creation of a literary language on the basis of a closely related language with an established system of writing. This is achieved through its gradual democratisation, i. e., the inclusion of a considerable vocabulary stock and grammatical forms characteristic of the people as a whole; 3) a complete break with the written tradition, i. e., the existence, during the prenational period, of writing in an alien language, the mother tongue functioning in the sphere of oral communication (with a literature of the folklore type), this being followed by the formation of a new literary written language on an exclusively popular basis.

Bilingualism existed in many countries prior to the creation of a single normative system of literary language. By this is meant the parallel use of two languages, one alien and the other native, the spheres of the use of these languages and the links between them depending on the history of the country in question. Bilingualism was widespread in mediaeval Europe first and foremost because of the use of Latin in written communication. The specific feature of bilingualism among the Eastern and Southern Slavs consisted in languages existing side by side. As pointed out by F. Filin, two cognate languages were in use in the sphere of writing in Russia during the 15th, 16th and 17th centuries–the Church Slavonic and the popular literary Russian. Here the mixing of the Russian and the Church Slavonic streams took effect in various and often highly unstable forms which depended not only on the genre of the written documents but also on various other causes (the scribe's school and the educational level). [4]

The works of V. Zhirmunsky, M. Gukhman and their numerous pupils have been of major importance in the sphere of German studies. V. Zhirmunsky, in particular, worked on the problem of the historical relationship between the written and the living popular languages. In an analysis of monuments dating back to the emergence of a literary norm in a national language, particular attention should be devoted not only to the local character of the memorial in question but also to its social background.

In V. Zhirmunsky's opinion, certain distinctions were already existent, by the onset of the New High German period, between the social dialects within the framework of the regional features of the German language. Extreme dialectisms were characteristic of the oral speech of the peasantry while the more conspicuous local features disappeared from the speech of townsmen and the feudal aristocracy, inasmuch as the latter's social conditions led them to use language in the process of inter-territorial contacts. To quote Zhirmunsky: "The process of the unification of language was based on the registration of any emerging national norm in the written form of the literary language. In view of primacy, in the life of language, of pro-

[4] F. Filin, "On the Question of the So-Called Dialectal Foundation of the Russian National Language", in the collection: *Questions of the Formation of the East-Slavic National Language*, Moscow, 1962, p. 24 (in Russian).

cesses taking place in living popular speech, there appears a dialectic interaction between the latter and the written form of the language. Once it has taken shape as a reflection of the oral language of the people, the written form of a language itself becomes, within certain limits, an authoritative regulative norm of pronunciation and grammar in particular when this is in keeping with the new requirements of the national and linguistic unification." [5]

The formation of the German national language and its literary norm is dealt with in a two-volume work by M. Gukhman entitled *From the Language of the German Nationality to the German National Language* (Moscow, Part I, 1955, Part II, 1959), a study based on detailed research into written memorials of differing genres. The author has attempted to differentiate between the concepts of "national language" and "literary language", with special emphasis on the concept of "norm", whose content varied at different stages of the development of the literary German language. A detailed analysis of the language of official documents (the materials of various 14th and early 15th century chancelleries) have allowed this scholar to find a correct solution to the question of the part played by the imperial chancellery in creating written norms of the literary language. The conclusion arrived at by the author is that the language of official documents reflected the reality of the general processes of development and the linguistic unification of the regions of East Germany, though it does not reveal a single norm in the field of phonetics and morphology. In the following centuries it was prose literature that established the trends determining the lexical and grammatical features of the German literary language. At this point M. Gukhman draws a conclusion of methodological importance, namely, that the changes in the social significance of the various forms of the existence of language and the relations between those forms make it possible to distinguish new stages in the development of the literary language.

In the field of Romance philology, the problem of literary language has attracted particular attention from scholars because, in a number of Romance countries, a literary tradition of writing took shape long before the emergence of national language. That is why the historical approach to the concept of "literary language" has proved of such great importance.

In her monograph, N. Katagoshchina has shown that the existence of a definite written standard, as evidenced by a number of memorials, makes it possible to speak of the sources in the formation of the French written literary language as far back as the 11th and 12th centuries, on the basis of Western French dialects. Despite the large number of dialects and the absence of language norms operating throughout the country, a number of memorials dating back to that period are not merely registrations of individual dialects with their distinctive features, but reveal an entire range of features of similarity (both in the field of phonetics and particularly in morphology) which were further developed in the written language of the whole country. However, as shown by the author, the sphere of the func-

[5] V. Zhirmunsky, *A History of the German Language*, Moscow, 1965, p. 79 (in Russian).

tioning of the French written language of the times was a limited one: it was confined to secular literature and to literature of a religiously didactic character; in the field of science, schooling, the administration of justice and the like, Latin was the predominant language. The author convincingly shows that, though a written literary language was emerging in 11th- and 12th-century France, the absence of a range of characteristics (multiplicity of functions, supra-dialectical character, distribution over a wide territory, established norms, and the like) would make it historically erroneous to equate that language with a national literary written language. The latter began to take definite shape only in the 15th century, when a language system close to Modern French was coming into being. [6]

Despite the variety of local conditions, trends towards the emergence and development of literary languages have proved common to various countries, inasmuch as such trends hinge upon similar social causes. "The history of most Romance literary languages," R. Budagov wrote in this connection, "falls into three periods: the first is marked by a literary language, which has acquired a certain 'polish' and has revealed a tendency to establish certain norms, is not as yet based exclusively on a single dialect, and does not yet have sufficiently definitive language norms; the second period sets in given an obvious prevalence of one dialect, operating as the basis of the literary language whose norms gradually become ever stricter and 'polish' ever higher. Finally, the third period pertains to a time when literary languages turn into national languages and literary national languages come into being." [7]

This consideration of the social and historical conditions of language development has helped Soviet linguists to find a scientific solution to the problem of the relationship between the language of a nationality and that of a nation, between a national language and its local dialects and the distribution of the dialects of cognate languages. In the work cited above F. Filin has noted very correctly that, taken by themselves, the features of a language system cannot be regarded as characteristics of a national language as distinct from the language of a nationality. In exactly the same way, the number of differentiating features distinguishing one cognate language from another cannot play a decisive part in defining a national language, since instances may be met of the dialects of one and the same language being marked by greater structural distinctions than independent national languages (e.g., the Bavarian and the Low-German dialects of the German language, on the one hand, and the Russian and the Byelorussian national languages, on the other). That is why a definition of a national language should proceed, not only from internal language indicators but also from such that are external to the language, i. e., due account should be taken of the social conditions of users of a given language.

In focussing attention on the social conditions in which the languages

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[6] See N. Katagoshchina, *On the Relationship Between the Literary Language and Dialects in Old French (Prior to the 13th Century)* Doctoral thesis, Moscow, 1955 (in Russian).

[7] R. Budagov, *Problems in the Study of Romance Literary Languages*, Moscow, 1961, p. 18 (in Russian).

of the Soviet peoples have functioned at various stages of their history, Soviet linguists have revealed the forms in which literary languages have developed in the conditions of the socialist state. This refers not only to languages with recently established systems of writing, for which the creation of such systems and the evolution of literary norms have been a direct consequence of the Leninist national policy, but also to languages with long-established systems of writing, which, however, prior to the Great October Socialist Revolution, did not play a part in all spheres of social life. For example, the Byelorussian national literary language of the 19th century had no opportunity of spreading in the various spheres of the social and cultural activities of the people. Of course, there was a literature, mostly poetical, but, as L. Shakun wrote: "In connection with the functional and stylistic confines of the Byelorussian national literary language of the 19th century, its vocabulary, set expressions, and its figurative means were restricted mainly to notions connected with everyday life. The grammatical and orthographical norms of the Byelorussian national literary language were not yet unified and properly registered." [8]

The broader social functions of this language after the establishment of the Byelorussian Soviet Socialist Republic called for an intensive enhancement of its lexical and phraseological level and the stabilisation of its orthoepical norms, and exerted an influence both on the written and the spoken varieties of the national literary language. In considerable degree, the same can be said of the development of the Ukrainian language before and after the Revolution.

The question of the dialect basis in the emergence of a literary language has attracted particular attention from Soviet linguists. For many peoples of our country the problem of the literary language has been of great topical importance: only following the Great October Socialist Revolution did the conditions appear for the functioning of these languages as literary ones. The question of the dialectal form as the basis for literary normatives became particularly acute. Work on this problem is also of considerable significance for languages with long-established systems of writing.

In their solution of the problem of the dialectal basis of a literary language Soviet linguists have advanced an important proposition which establishes the historical mutability of the relations between different local dialects inherited from the pre-national epoch, and between the literary language, on the one hand, and the local dialects themselves, on the other. In the work we have already quoted, F. Filin has noted that some kind of inter-dialectal Koine emerged in the major urban centres as far back as the period of feudalism, but the influence of such kinds of Koine did not extend to the entire territory of the Russian language. In the 17th and 18th centuries, the Moscow Koine extended to the entire country, striking roots in the large cities, the speech of the urban population escaping from the general system of local dialects. With the development of culture, various strata of the population went over to the literary language on a wide scale. The social foundation of the local dialects

[8] L. Shakun, "The Formation of the Byelorussian National Literary Language" in the collection: *Problems of the Formation of the East Slavonic National Languages*, Moscow, 1962, p. 124 (in Russian).

grew ever narrower, such dialects being used, in the main, by the peasantry.

Strictly speaking, the term "local dialect" is applicable only to dialects of the pre-national epoch. With the development of the nation, local dialects turn into "territorial-social dialects". The dialect of an important city–a country's economic, political and cultural centre–arising as it does on a mixed dialectal basis, sheds its local restriction with the passage of time, in fact ceases being a dialectical unit, and becomes the basis for the emergence of the national literary language; in the development of the latter, modifications and shifts may take place in the dialectal basis. This proposition, in its general form, can also be applied to the history of the languages of many European peoples. Thus, the author of this article has shown, in one of her writings, [9] that although the national literary English language emerged on the basis of the London dialect, which itself took shape as a local dialect of a mixed nature, the London dialect itself was not homogeneous throughout the history of its development. During the second half of the 13th and the first half of the 14th centuries, certain southern dialectal features were ousted from the language of London, yielding place to features borrowed from the East and centre. Later, in connection with the stabilisation of literary norms, the ousted south dialectal forms became obsolete and archaic, thus creating conditions for their stylistic applications.

The complex processes of interaction between dialects and the mixing of dialects during the emergence of a literary language often go hand in hand with distinctions between its written and spoken forms. Like the history of the German language the history of the formation of the Dutch national language is marked by an earlier evolution of a single supradialectal written form. To quote S. Mironov: "The formation of a single literary norm of the Dutch national language is a complex and contradictory process of interaction and interlacing between two factors: the old written literary tradition of the south Dutch variant of the literary language, which became the basis of the written variety of the Dutch language, and a new Dutch dialectal basis of a mixed character, which served as the foundation of its spoken form." [10]

As a rule, a national literary language is based on a dialect of a mixed type, as is borne out by the history of a wide variety of languages, in particular, by the history of the languages of peoples inhabiting the Soviet Union. Thus, in the opinion of S. Kenesbayev, the question of the basic dialect in respect of the Kazakh literary language is highly disputable. It cannot be asserted that any particular dialect was the foundation of present-day literary Kazakh. The materials collected by Kazakh dialectologists give reason to believe that the Kazakh literary language could have adopted phonetical or lexico-grammatical features from a number of dialects. [11]

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[9] V. Yartseva, "On the Change in the Dialectal Basis of the English Literary Language", *Transactions of the Institute of Linguistics, USSR Academy of Sciences*, Vol. 10, Moscow, 1960 (in Russian).

[10] S. Mironov, "The Dialectal Basis of the Literary Norm of the Dutch National Language", Op. cit., p. 88 (in Russian).

[11] See *Problems of the Development of the Literary Languages of the Peoples of the USSR*, Alma-Ata, 1964, p. 240 (in Russian).

The Uzbeks have a long-standing literary tradition. The emergence of the literary Old Uzbek language dates back to the 14th and 15th centuries. However, the written language was almost beyond the reach of the mass of the people. Most of the numerous lexical borrowings from Arabic and Tajik remained within the confines of the written language. In the late 19th and the early 20th centuries there was a tendency towards democratisation of the Uzbek literary (written) language under the influence of the democratic poets (Furkat, Mukimi, Hakim-zadé and Niyazi) who introduced elements of colloquial speech into their works and tried to approximate the written language to the popular.

However, it was only after the October revolution that the Uzbek literary language became widespread throughout Uzbekistan as a result of the socialist changes in urban and rural life and the access of the population to cultural values. The attempts made to orientate the present-day literary language exclusively towards the language of 14th and 15th century memorials have been rejected. As pointed out by V. Reshetov, the Uzbek literary language of today is based on the Tashkent-Ferghana group of urban dialects, the orthoepical norms of the literary language being in keeping, in the main, with the chief features of the Tashkent pronunciation, while the greater part of the morphology is based on the Ferghana sub-dialect. [12]

Thus, the question of the dialectal basis and the relations between characteristic features of the various local dialects is of importance to the literary language, not only during its formation but also given the existence of a long-standing literary tradition. While the written and spoken varieties of a national literary language are not opposed to each other in the sense of literary norms, despite the existence of certain distinctions, languages with long-established systems of writing have been marked by a certain divorcement from the folk speech, this bordering on a kind of "bilingualism" which, as many Soviet scholars have pointed out, was highly characteristic of the epoch of feudalism.

On the emergence of a literary language during the formation of a nation, its dialectal roots may prove different from those of the established written language used by a given people. Of course, many elements of the established written language may enter the national literary language. Yet the relationship between the latter and the local dialects changes as a result of complex historical processes. The work done by Soviet scholars has shown that the relation between the literary language and the local dialects is historically variable because literary language's functions differ at various stages of the development of society.

The well known Soviet scholar N. Konrad has formulated important theoretical propositions regarding the links between a literary language and society that uses that language. He has emphasised that the literary language operates in various historical forms which "are correlative with the historical stages in the development of a people, so we can speak of a mediaeval literary language and a modern literary language, these two languages differing in

[12] See V. Reshetov "On the Dialectal Basis of the Uzbek Literary Language", *Voprosy yazykoznaniya*, 1955, No. I, p. 142.

the scope of their social significance. In the former instance, the social significance of the literary language is restricted to definite and comparatively small social strata, mainly belonging to the ruling class; in the second instance, the literary language acquires an extensive, almost nationwide significance, which becomes the more effective, the more decisively the process of the democratisation of the social system proceeds." [13] The author goes on to say that, in canonising its forms, the mediaeval literary language gradually becomes divorced from the language of living practice, lags behind the general development of a given people's language, becomes restricted to written literature, and stands opposed to the spoken colloquial language.

In many writings, Soviet linguists have devoted considerable attention to the links between the literary language and colloquial speech, a question which presents special interest in the study of languages with long-established literary traditions. The Tajik language of the "classical period", which took shape as the literary language in the Maverannahr territory and was represented by a galaxy of outstanding writers–Rudaki, and Ferdowsi, to name but two–was used by Tajiks, with minor modifications, in the capacity of the written language right down to the October Revolution. It was marked by the preservation of numerous archaisms, neologisms characteristic of colloquial speech being eschewed in it. Despite the enlighteners' efforts, towards the end of the 19th century, to somewhat democratise the literary language, it was only in the 1930s that, as a result of the cultural advances made in the Tajik Soviet Socialist Republic, the literary language was brought closer to the colloquial (superfluous Arabisms being replaced by Tajik words, and lexical and syntactical material common in colloquial speech being introduced). [14]

This establishment of literary norms and their adaptation to the practice and needs of users of a language have proved possible in the conditions of our socialist State and have been carried out on the basis both of research and of an extensive public discussion of the problem. Similar processes have also taken place in other republics and autonomous regions of the Soviet Union.

Students of the Bashkir language have pointed out that the development of overall literary norms began following the formation of the Bashkir Autonomous Soviet Socialist Republic. Prior to the October Revolution, literates used a written language containing numerous elements of the Central Asian variant of the Turki language and greatly differing from the popular speech. A. Yuldashev has described the approximation between the written and spoken language in the conditions of the elimination of Central Asian Turki elements alien to the Bashkir language, and a search for the dialectal basis that would best of all reflect all the characteristic features of the Bashkir language. A. Yuldashev has dwelt on the organising role played by scientific and

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[13] N. Konrad, "On the Literary Language in China and Japan", *Voprosy yazykoznaniya*, 1954, No. 3, pp. 48-49.

[14] See V. Rastorguyeva, "On the Development of the Contemporary Tajik Literary Language", *Problems of the Development of the Literary Languages of the Peoples of the USSR*, Alma-Ata, 1964 (in Russian).

cultural institutions in the Bashkir Autonomous Soviet Socialist Republic and the work done by the State Commission on Terminology under the Republic's Council of Ministers, and has shown how the conditions of socialist statehood ensure effective solutions of problems of the creation of national languages. [15]

Consequently, during the emergence of the literary norms of a given language, problems of language relationships arise that are not purely of an historical order: the old literary language (which is sometimes an alien one) and the folk speech. The problems may be of a purely dialectal character: the orientation of the literary language towards a single basic dialect or a mixed dialect. Soviet scholars have devoted much attention to this problem in view of its importance to a number of languages of Soviet peoples with recently established systems of writing.

The selection of basic dialects (more rarely of a single basic dialect); the establishment of orthoepical, lexical and grammatical norms; the extension of the vocabulary, especially in the field of terminology; expansion of the functions performed by the literary language, i. e., its use in all spheres of state, cultural and everyday life, and, in this connection, the clashes between it and local dialects still employed for some time in every-day life, especially in rural localities–these are some of the problems which have in equal measure confronted our experts on recently established systems of writing. The summarising work carried out by V. Lytkin and others has shown the urgency of the problems enumerated above and the ways in which they can be solved in conditions of an organised influence on the development of literary languages as ensured by the cultural advances in our country following the October Revolution. [16]

In the conditions of the stabilisation of literary norms, particular urgency attaches to the question of variants of the literary norm, i. e., the permissible limits of departures from the accepted norm. This problem, which is new in linguistics, is posed, on the one hand, on the historical plane (what is permissible as variant during one period of the history of a literary language may disappear in the course of its further development) and, on the other hand, on the plane of the genre and stylistic varieties of a literary language. These problems are a special case in those countries where two literary languages, i. e., two literary norms exist as in Norway, for instance. Here one can clearly see the close links between the history of the literary language and that of society, the influence of the historical conditions of a given people's life on the specific character in the formation of a literary language in its written and spoken varieties.

Soviet linguists have shown that the nationwide functioning of a literary

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[15] A. Yuldashev, "Questions of the Formation of Common Norms of the Bashkir National Language", *Transactions of the Institute of Linguistics, USSR Academy of Sciences*, Moscow, 1960, Vol. 10, p. 281 (in Russian).

[16] See V. Lytkin, N. Pengitov, P. Perevoschchikov, and A. Feoktistov "On the Contemporary State of the Literary Languages of Finno-Ugric Peoples with Recently-Established Systems of Writing", *Problems of the Development of the Literary Languages of the Peoples of the USSR*, Alma-Ata, 1964 (in Russian).

language without any territorial or social restrictions ensures (and at the same time demands) unity in its norms. As shown, for instance, by A. Garibyan, the victory of Ashksarhabar over Grabar in Armenia was the result of the extension of its use in all spheres of literature during the 19th and the 20th centuries (especially thanks to the activities of such public figures as M. Nalbandyan and S. Nazaryants) and of establishment of norms and, in particular, the discarding of parochially dialectal features. [17] Thus the functional aspect of the linguistic process exerts a direct influence on the shaping of literary norms.

Mention has already been made of the historical mutability of the concept of "literary norm" and of the importance of an adopted norm being realised as a specific quality in a literary language in the epoch of a nation's formation. During the existence of a nation, the literary language usually operates in the capacity of vector of a nationwide norm: in these conditions it is in fact called upon to represent the language unity of a given people and to perform a nationwide function. This accounts for the interest Soviet linguists have displayed to appraising the activities of the normalisers–lexicographers and grammarians–in developing the literary language in various countries.

Regarding the Russian language G. Vinokur wrote: "The point of departure in the development of a language during the first half of the 18th century was the crossing of two indigenous sources of the Russian written word–of books and the every-day language which was effected in its own way in various departments of Russian writing, after the reign of Peter the Great, including literature. By the middle of the 18th century, thanks to the efforts of such theoreticians of the literary language as Kantemir, Trediakovsky and Lomonosov, a normalising principle was introduced in considerable degree in this process, a principle that exerted a tangible and fruitful influence on literary practice and theory in the second half of the 18th century. [18]

The activities of 18th- and 19th-century Russian grammarians and orthoepists have been studied in the light of the Soviet theory of the formation of the literary norm dealt with in numerous works of a general and particular nature. Attention has been paid to the establishment of appraisals and recommendations given by contemporaries in respect of the literary language. An important part in this respect has been played by V. Vinogradov's *Essays on the History of the Russian Literary Language in the 17th-19th Centuries* (Moscow, 1938) in which an historiographical study is brilliantly blended with a profound analysis of the development of the Russian literary language and its styles. Many works on the history of the written languages of the Soviet peoples and the history of foreign languages have dealt with an important problem–the contribution made by writers to the establishment of norms in the literary language. Special mention should be made of numerous works

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[17] See A. Garibyan, "On the Armenian National Literary Language", *Transactions of the Institute of Linguistics, USSR Academy of Sciences*, Moscow, 1960, Vol. 10 (in Russian).

[18] G. Vinokur, "A History of the Russian Literary Language", in the collection: *Collected Works on the Russian Language*, Moscow, 1959, p. 138 (in Russian).

which analyse the language practice of leading writers who have expressed new trends in the sphere of language during the formation of the respective literary languages.

The language of a writer's work may be studied both as testimony to the state of a language in a certain period and as a definite historical stage in the development of the literary norm. At the same time, a leading writer, as one who expresses the language trends of a given period, may exert a powerful influence on the literary language through his writings. V. Vinogradov wrote: "A writer's style, in keeping with the artistic aims he pursues, unites, internally links up and aesthetically justifies all the means of language he has employed. At the same time, the stylistic features in individual art creativity sometimes reveal more tellingly elements of the future system of a national literary language and reflect more vividly functional survivals of a language's past. The voice of a great writer often expresses the voice of an entire people." [19]

Thus, in his polemic with the Pan-Iranists, who believed that the Tajik literary language should be based on modern literary Persian, S. Aini, founder of present-day Tajik prose, was the first to make wide use in his writing of grammatical forms and lexical neologisms borrowed from the colloquial popular. At the same time, he was skilful in distinguishing between the nationally general and the narrowly dialectal, and did not bring dialectisms excessively into the literary language.

N. Corlăteanu, the Moldavian scholar, has pointed out that, besides generally accepted norms, a national literary language is also marked by a) multiplicity of functions, b) its general use throughout the territory in which a given language is spoken, and c) its being supra-dialectal. It is also characterised by stylistic differentiation. [20]

Considerable theoretical interest is also presented, in my opinion, by the question of the appearance of variants of the literary norm in several literary languages as a result of the spread of a given language beyond the territory of its original formation. This is a question not only of the appearance of distinctions resulting, in certain measure, from the evolution of literary norms on the basis of different dialects (for example, the differences in the German language of Germany and Austria, or the even sharper differences between Afrikaans and literary Dutch), but of the relations between British English and American English, or between the Romance languages of Latin America and those of the Pyrenean Peninsula.

In his examination of the latter problem, the Soviet scholar G. Stepanov has pointed out that such divergences do not affect the basic structural features of Spanish speech so that there are no grounds to consider Hispano-American and Hispano-European speech as different languages. He attributes the existing divergences to the development of the language in new conditions. A major role in the linguistic Hispanisation of America was played

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[19] V. Vinogradov, *On the Language of Literature*, Moscow, 1959, p. 169 (in Russian).

[20] See N. Corlăteanu, "A Study Into the Lexical System of the Moldavian Language Between 1870 and 1899", *The Vocabulary of the Writings of I. Creanga and His Contemporaries*, Kishinev, 1964 (in Russian).

by the oral form of speech, which in certain respects was more homogeneous than in the home country, since it was based on a single dialectal variety. Besides, a break in the literary tradition made it possible, after the appearance of a native Latin American literature, to draw more extensively on the oral form of Hispano-American speech, not on the old Castilian norm of the written language, which was felt to be somewhat artificial. In his examination of the language divergencies in individual Spanish-speaking Latin American countries (Peru, Argentina and Mexico), G. Stepanov points out that divergencies are to be met only in oral speech, not in writing, the number and the character of such divergencies being determined by the historical conditions of colonisation, the social composition of the colonising elements, the specific relations between colonisers and the native population, the specific nature of the development of literature, political factors, and the like. [21]

Of course, this proposition is of a general character and is applicable to all literary languages brought into new territories in conditions of the colonisation of such areas. The relations between the oral and written forms of a language and between the literary language and the dialects, as well as its clash with local languages in various spheres of their functioning are wholy determined by the concrete historical conditions.

V. Belkin has emphasised that spoken Arabic spread more slowly than literary Arabic, since it met resistance from the old local languages (Aramaic and Coptic). Literary Arabic spread rapidly throughout the Mediaeval East because it was the language of government, the language of a new religion (Islam), of science and poetry. However, the Arabs were rapidly assimilated by the local population of many areas and adopted their language.

The conditions of the subsequent development of written and literary Arabic and the colloquial forms of Arabic led to their diverging, since the majority of the population being illiterate, it was the local dialects that were means of communication in every-day life, the literary language being used by a limited group of people. The Arab states of today are therefore confronted by a dilemma: they can either introduce the literary language so as to preserve its cultural continuity and Arab cultural unity, or else they can convert individual dialects into literary languages. In our opinion, V. Belkin is right in pointing out that the solution of the problem of the literary language goes hand in hand with the solution of the economic, social and cultural problems of the Arab world. The growing interlinks between these countries and the interchange of populations between city and countryside as well as between various countries lead to changes in the state of the local dialects. At the same time an Arabic colloquial language is developing among the educated strata of the population, a language drawn immediately from the literary norm, though with certain distinctions. [22]

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[21] See G. Stepanov, "On National Language in the Countries of Latin America", *Transactions of the Institute of Linguistics, USSR Academy of Sciences*, Moscow, 1960, Vol. 10.

[22] See V. Belkin, "The Problem of Literary Language and Dialect in the Arab Countries", *Transactions of the Institute of Linguistics, USSR Academy of Sciences*, Moscow, 1960, Vol. 10.

Thus, the important methodological proposition of Soviet linguistics—a consideration of the functioning of a literary language in the concrete historical conditions of its social use—is applied in works on individual philologies. The fate of individual languages, as we have tried to show in this brief consideration of the subject, reveals similar problems, despite the range of individual divergencies: the relation between the literary language and dialects; the links between the written and the colloquial varieties of literary speech; the choice of the dialectal basis of the literary language on an historical plane; the conditions of the stabilisation of the literary norm and the part played by writers, grammarians and lexicographers in a conscious selection of variant linguistic units.

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The Origin of the East Slavic Languages

This article represents a brief outline of the fundamental propositions included in my book *The Origin of the Russian, Ukrainian and Byelorussian Languages* which is now in press.

The main attention is paid to tracing local linguistic phenomena inherited by the East Slavic (Old Russian) language from the earlier Common Slavic epoch, and those formed at different stages of its development. The bases of separate East Slavic languages with their specific linguistic systems formed as a result of the accumulation of local linguistic features and their grouping and regrouping. I am fully aware of the fact that all reconstructions of old dialectisms, their territorial distribution and chronology (especially, absolute chronology) will be always of relative accuracy, because we have no means of overcoming all the difficulties existing in this field.

An expert of Old Russian dialectology must always be prepared to see his territorial and chronological determinations disputed, corrected, and even refuted by other scholars. Nevertheless, in my view, the presence of considerable quantity of dialectal differences in the Old Slavic and in the Old Russian is an indisputable fact. To deny this is either to pay tribute to an outmoded tradition, established in Schleicher's time, or else to labour under a delusion. At the same time it should be noted that the development of dialectal divergencies did not preclude unifying linguistic tendencies in the epoch of the tribal system and in the feudal epoch alike.

The relative unity of the Old Russian at the time of the disintegration of the tribal system and the transition to feudal society is indisputable. This unity was sustained by various extralinguistic factors such as the absence of territorial dissociation among the East Slavic tribes, and the subsequent absence of stable boundaries between feudal possessions; by the development of a supratribal language used in folk poetry and closely connected with the language of the religious cults widespread over the entire East Slavic territory; by the emergence of rudimentary public speech necessary for concluding intertribal treaties and for normal court procedures (partially reflected in *Russkaya pravda),* and so on.

There have never been any marked ethnolinguistic discontinuity among the Eastern Slavs. "The development of common types of speech, not only in the national but also in the pre-national epochs were, in the final count, of a decisive and determining significance in language history, since they alone

were instrumental in developing the forms of speech communication." [1] The coexistence of dialectal differentiation and common types of speech is a quite frequent case in linguistic development in the concluding phase of the tribal system and under feudalism.

The understanding of the character of the boundaries of dialectal phenomena at different periods of their history is of paramount importance. There is a widespread opinion in linguistic literature that dialectal isoglossal lines normally coincided with the tribal boundaries in primitive society, and with the boundaries of the feudal possessions in later epochs. This approach to dialectal boundaries generally corresponds to the idea of a language hierarchically divided into clearly defined dialects (a language falls apart into dialects; dialects, in their turn, into subdialects, vernaculars and other subdivisions).

There is no doubt that tribal and feudal boundaries dividing the single population influence the development of dialectal features and their grouping. Nevertheless, modern historical dialectology shows that this influence has yielded varying results, depending on concrete historical conditions. We shall see later that attempts at establishing hierarchal relations between dialects and drawing any clear-cut boundary lines dividing them run into insurmountable obstacles. Dealing with dialectal phenomena we must only see what is in them.

However, dialectologists sometimes applied socio-geographic criteria, instead of linguistic ones to dialectal groupings, thereby dimming the true picture of the distribution of dialectal peculiarities with such notions as tribes, feudal lands, amalgamation of feudal principalities, etc. As a result, our knowledge of the dialectal division of a language proved rather superficial and inaccurate.

A. Desnitskaya is quite right in saying: "We cannot deny the fact that in certain cases dialectal boundaries appearing on linguistic maps in the form of bundles of isoglosses correspond to the boundaries of once existing feudal territories. However, in general, this point of view requires more precise definitions and amendments. Neither the present level of the dialectological studies of languages of the world, nor general historical considerations based on a more profound research into the peculiarities and various social feudal structures allow us to continue adhering to the abovementioned theory in determining the common characteristics of the linguistic relations under feudalism. The drawback of this theory is that it proceeds from only one of the types of dialectal developments that were possible under feudalism. This approach is not corroborated either by the facts of social history, or by those of language history." [2]

Not all countries by any means were characterised by feudal territorial dissociation with more or less stable borders between separate principalities. Even in those West European countries which were split into feudal possessions, there were frequent cases of the early rise of bureaucratic centralised power which obliterated internal political borderlines (France and some other

[1] A. Desnitskaya, "The Historical Content in the Conception of Dialect", *Leninism and Theoretical Linguistic Problems*, Moscow, 1970, p. 353 (in Russian).

[2] Ibid., p. 356.

states can serve as an example here). In many countries feudal principalities had no stable borders at all. Borders dividing local political formations were constantly changing and could not serve as a serious obstacle to the communication of people from various places. Population concentrated around local cultural and economic centres which over many centuries could be shifted more than once, and various groups of the population communicated via rivers and other trade routes. This, for instance, was the case in Ancient Rus.

It is only natural, therefore, that all kinds of local linguistic innovations were not limited by stable and definite borders: numerous zones took shape whose boundaries were interwoven most intricately. Within the Old Russian language a linguistic continuity gradually formed. Local dialectal differences were expressed in a continuous accumulation of local linguistic features. Mention should also be made here of the presence of the residual dialectal zones, dating back to the epoch of the tribal system. The latter were often considerably modified, which complicated the general network of the isoglossal lines still further.

I agree with A. Desnitskaya who writes: "As for the dialectal differences in the Russian language, I must say that although the thesis of their historical correlation to the territorial dissociation inherent in the feudal epoch is considered to be universally accepted, it nevertheless remains unproved" because as she says, "we must admit that so far no one has succeeded in tying up the boundaries of Russian dialectal units with the borders of the then existing feudal territories." [3]

The variety of concrete historical communications between people living on the Russian-speaking territory over several centuries have determined the intricate character of dialectal structure, as seen from linguistic maps. "This intricate character is obviously at variance with the hitherto accepted classification of dialects and vernaculars, whose features form a complicated network of crossing and intercrossing isoglossal lines." [4] The same can be said about the dialectal division of the Ukrainian and Byelorussian languages.

Most probably, at the time of the classical tribal society, each tribe had its dialect and its own specific language system. Proceeding from this premise, we can say that the Old Common Slavic was divided into several tribal dialects which, however, should not be regarded as isolated units having clearly defined boundaries. Old Slavic tribal dialects had a common linguistic base, and were in a state of constant interaction with one another and with neighbouring languages over many centuries. The closer the relationships between dialects, the greater opportunities for their linguistic innovations to cross tribal boundaries.

The picture of isoglossal lines becomes increasingly complicated when the tribal society begins to disintegrate. An intensive regrouping of tribes takes place, and tribal unions are formed and fall apart. We know nothing (except the unconfirmed suppositions of some researchers) about the dialectal division of the Old Common Slavic language in the classical tribal epoch. The earliest

[3] A. Desnitskaya, Op. sit., p. 360.
[4] Ibidem.

traceable intra-Slavic linguistic isoglosses date back to the epoch of the tribal society's disintegration and of the settlement of Slavs over vast territories. It is interesting to note that the earliest, more or less established intra-Slavic isoglosses do not fence off separate tribes, but rather large territories which do not coincide with tribal lands.

Vocabularies help to trace a vast Northern Slavic zone where the bundles of lexical isoglossal lines do not coincide, but retreat in the east and southwest and move far ahead in other places. Other zones traced include the South-Eastern, the Southern, and the Eastern. As a rule, the earliest phonetical and morphological trends in different dialects divide the Slav territory into two counterposed areas, where the boundaries of the zones of linguistic peculiarities do not coincide at all. [5]

Beginning approximately with the 7th century A.D. Slavic tribes, settled to the east of the Carpathians and the Western Bug, were isolating from the rest of the Slavs. This led to the emergence of innovations in their dialects, which provided the specific features of the East Slavic language that was being formed. [6] The East Slavic language had no alphabet and was rich in dialects; its complex dialect structure was based on the dialectal zones inherited or preserved (probably in a modified form) from the Proto-Slavic period, which were of more ancient origin than the East Slavic, and on the local innovations formed in the East Slav. From old Russian chronicles and other sources we know of the East Slavic tribes of the period shortly before the establishment of the Old Russian State, and of the initial phase of its existence.

We are naturally most interested in the possibility of showing the correlation of the dialectal boundaries of the Old Russian language, as it existed in the first centuries of its development, with the borders of the tribes mentioned in the records. Attempts in this direction were made in the 19th century by P. Lavrovsky, A. Sobolevsky and others, but with no success. Though we can speak with a certain degree of authenticity about the linguistic peculiarities of the Krivichi and the Slovene, but what linguistically differentiated the Polyane from the Drevlyane or Severyane, the Radimichi from the Dregovichi, the Tivertsy from the Ulichi, and so on, remains a mystery. Either the epoch of feudalism deleted almost completely the dialectal boundaries of the separate tribes or those boundaries did not exist at all.

Despite the considerable achievements of East Slav archaeology and history, we do not know what earlier ethnic units helped to form the tribes, how long they were in existence, and how stable they were. Suppositions have been voiced that at least some of them were actually tribal unions and not separate tribes, and that the records did not mention all the really existing tribes (the records we have at our disposal date back to the early 12th century, when the tribes were no longer extant and were only mentioned in reminiscences).

Old Russian tribes were closely interrelated; they were linked by a rami-

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[5] See F. Filin, *The Formation of the East Slavic Language*, Moscow-Leningrad, 1962, pp. 152-223 (in Russian).

[6] See Ibid., pp. 223-292.

fied network of waterways. Therefore, they had extensive opportunities for reciprocal dialectal influence and a broad spread of linguistic changes.

All Slavists studying old Russian dialects have singled out vast dialectal areas, and not limited tribal units. A. Shakhmatov divided the Old Russian linguistic area into Northern Russian, Eastern (or Central) Russian, and Southern Russian dialects. T. Lehr-Splawinski, N. Trubetskoy, R. Avanesov and others spoke of the Northern and Southern dialects. The necessity of marking out large dialectal areas was dictated not only by the state of the East Slavic historical dialectology, but also by the fact that the dialectal boundaries of each separate tribe defied all efforts to trace them.

These dialectal reconstructions suffer from two considerable drawbacks: 1) they rest on scanty traces of phonetical differences which do not exhaust the dialectal variety of the Old Russian; 2) theoretically they proceed from a preconceived premise concerning a hierarchical segmentation of the original Proto-language, which presupposes the existence of dialects or dialectal groups divided by more or less clear-cut boundaries. In reality such monolithic dialectal units did not exist in the Old Russian epoch. Different isoglossal lines did not coincide with one another, as a rule, but crossed the East Slavic territory in various directions. Even if the reconstructions I suggest in my book do not withstand the test of time and are replaced by others, I believe that the general dialectal picture of the Old Russian will not undergo very great modifications. The earliest isoglosses emerged at different periods and later they were affected by important changes.

The preservation of groups *dl* and *tl*, later changed into *gl* and *kl*, should be considered a specific feature of the old East Slavic north-west which, according to this and some other peculiarities, was part of the vast Baltic linguistic union. The same can be said about the full and partial *tsokanye* (a coincidence of the hushing and sibilant consonants) whose territory, however, was considerably greater than the area of the *dl* and *tl* (>*gl* and *kl*). The *akannye*, a fusion of the unstressed *a* and *o* into one sound (provided our hypothesis of its emergence about the 7th and 8th centuries is correct) achieved a totally different distribution and spread throughout the central zone of the East Slavic lands.

The evolution of the explosive *g* into the fricative ɣ was characteristic of the Central Slavic dialectal area. This means that at first it appeared in the East Slavic south-west, and only later spread northward (to Byelorussia, then to the southern part of the Pskov region and the adjoining lands) and the north-east (as far as the River Oka).

The ancient grammatic isoglossal lines provide a geographically complicated picture. The *ya* (I, me) variant of the personal pronoun, 1st person sing., used side by side with *yazъ*, was not known in the north-east of the East Slavic territory, where the form *yazъ* persisted as far as the 15th and 16th centuries. The coexistence of verbal forms ending in *-t-* and lacking this ending in the 3rd person, present-future, dates back to the Old Common Slavic epoch. The rules determining the use of both variants, which represent different types in modern vernaculars, were probably somewhat different in the ancient days too, although we have no means so far of reconstructing their

original form. There were, however, zones where *-t-* reigned supreme. Vernaculars using exclusively the *-t-* ending left their marks in the Old Russian northe-astern written language. Another specifically north-eastern feature was the *-mъ* form in the 1st person pl., present-future, whereas in other localities this form coexisted with others: *-mo* in the remaining part of the East Slavic territory, and *-me* in the north-west.

Ancient lexical isoglosses were varied and numerous. We have succeeded in tracing about a hundred and ten lexical dialectisms dating back to the early period of the Eastern Slavs' existence and referring to the most various notional spheres. Their number, however, was certainly much greater. That is why the lexical isoglosses present a criss-crossed network, in which it is difficult to trace the clear-cut boundaries dividing various East Slavic tribes or monolithic dialectal areas. Such words as *bagno* (mud, swamp, marsh) and *pushcha* (large forest) divide the East Slavic territory into its south-west and north-east (their isoglosses not coinciding either with each other or with the boundaries of modern East Slavic nations), whereas words like *buy* (elevated terrain), *guba* (bay) and others each in its way marks off the north or the north-west; *cherevik* (shoe)–the south; *polonina* (alpine pasture)–the extreme south-west (cis-Carpathian regions); *zeremya* (a beavers' colony)–the south-west and the north-west, *volmina* (willow bush)–the Novgorod north only, and so on.

In general, the ancient isoglosses cross the East Slavic lands latitudinally, longitudinally, and in other directions, and it would be in vain to try and use them for reconstructing clearly defined dialects, subdialects and vernaculars. The really existing were zones of separate dialectal phenomena which probably only in some places formed groups of coinciding zones. This does not mean that ancient vernaculars spoken in different localities were distinguished only by individual, diffused peculiarities. There is no doubt that each vernacular represented a dialectal system based on a single language of the ancient Russian nationality.

Dialectal distinction between different regions accumulated gradually. We can be sure that the Polyane and the Slovene noticed their linguistic peculiarities, in the same manner as the Drevlyane could have seen that the Vyatichi were speaking in a slightly different way from themselves. Tribes and tribal unions were formed and fell apart; their geographic boundaries were constantly changing; there were frequent cases of migration and colonialisation of new lands. Such relative ethnogeographic instability could hardly be expected to lead to the formation of monolithic dialectal groups.

It should also be noted that at the time of the East Slavic tribes and the formation of the Old Russian State such historically well attested languages as Russian, Ukrainian and Byelorussian were not even in their embryonic state. They appeared much later, although certain elements of the ancient dialects were incorporated in their structures. There existed a single language spoken by the East Slavic (Old Russian) people, which had dialectal peculiarities in different localities. It can be seen from what has been said above that we have no factual grounds to speak about the division of the Old Russian language into two or three clear-cut dialectal groups.

After the formation of the Old Russian State and with the development of feudal relations, dialectal differences increased. The ancient tribal segmentation disappeared, feudal principalities emerged. At the beginning they were all governed from one centre, Kiev, but when the latter lost its role as the capital of Ancient Rus, they all broke away from their previous hub. Particular prominence was achieved by the Galicia-Volyn, Kiev, Chernigov, Vladimir-Suzdal, Pinsk-Turov, Smolensk-Polotsk and Novgorod-Pskov lands, but their geographic boundaries and significance were very unstable. New territories were colonised (primarily in the north-east), non-Slavic ethnic groups (Finno-Ugric, Baltic, Turkic, and probably partially Iranian) were assimilated, the population spread in different directions (along the Dnieper, from the middle reaches of the Dnieper to the Oka Basin and other places). Considerable changes, particularly the migration of the population, were caused by the Mongolian-Tatar invasion in the 13th century. There were no secluded feudal principalities with centuries-old history, as in some of the European countries, for instance, Germany. The Lithuanian and Polish conquests severed the East Slavic south-west from the north-east for a long period of time, but this will be dealt with later.

All these extremely important historical factors could not but exercise an influence on the evolution of the language. Favourable conditions emerged for a more intensive development of dialectisms. At the same time, the situation for the formation of stable dialects bounded by dense bundles of more or less coinciding isoglosses was rather unfavourable.

In our view, a number of dialectal phenomena of various linguistic levels emerged before the fall of reduced vowels. Approximately in the 11th and 12th centuries, a new intonation system (with expiratory stress) replaced an old one in the south-west, whereas in the north-east the old system persisted until the 13th century. Its disintegration led to the contrast, in certain positions of *o* (an open vowel) and *ô* (closed). The Smolensk-Polotsk zone stood somewhat apart because this opposition was not developed there.

Several zones (Novgorod, Smolensk-Polotsk, Rostov-Suzdal, Pinsk-Turov, etc.) developed a specific pronunciation of different variants of *ě* (of different origin). Approximately by the 11th century the vowel *e* in the south begins to change into *o* (after hushing sibilants and *j*) whereas in other dialects this change took place later in the process of developing opposition of hard and soft consonants.

By the 12th and 13th centuries the following zones of *e* shifting took shape: (1) southern, *e*>*o* after hushing sibilants and *j* irrespective of the stress; (2) western, *e*>*o* after soft and palatalised consonants in stressed position; (3) northern and north-eastern, *e*>*o* after the same consonants and in stressed position everywhere, and in unstressed positions only in some of the vernaculars; (4) the Oka Basin and the upper reaches of the Don, *e* preserved in all positions; (5) cis-Carpathian, *e* preserved in all positions. Subsequently these zones have undergone different changes. Many more examples of the geographic variety of phonetical dialectisms could be cited.

The number of dialectisms in the phonetical system of the Old Russian increased particularly after, and as a result of, the fall of reduced vowels, but the character of the geographic distribution of dialectal innovations remained

practically the same. The same holds true about the early grammatical changes and the vocabulary, i. e. about the whole set of local variations existing in the East Slavic language system as a whole.

In the memorials dating back to the 11th and 12th centuries we can already detect a noticeable shift in using the *-ovi, -evi* endings in the Dative singular, masculine nouns: in Novgorodian texts it was used much less frequently than in Kievan. Later both endings disappeared completely in the north, the limits of their use gradually moving southwards during several centuries. From the 11th century at least, in the Novgorodian north there began a process of the generalisation of the declension of the *-g, -k* and *-kh* stems; later this process spread throughout the Great Russian territory. From the 11th century onwards there was a loss of the vocative forms, In the northwest (including the Smolensk-Polotsk lands) the vocative form in *-e* began to be used in the meaning of the Nominative.

In the 11th century (or earlier) a separate area was formed in the north by the Past Participal in *-le.* No satisfactory explanation for its origin has been given so far. Beginning with the 13th century there emerged three large zones according to the usage of verbs in the 3rd person of the Present-Future with their particular variants: 1) northern *-t* (prevailing); 2) central (two forms *-t* and without *-t* ѣ), 3) south-western (*-tѣ, -t* and without *-t*).

The new (for the Old Russian period) dialectal isoglosses covered more ancient isoglossal lines, making the picture of the dialectal segmentation of the Old Russian language increasingly complicated. Speaking of its complicated nature we do not reject the possibility that some of the isoglossal lines coincided with the tribal and, even more so, with the feudal borders. Such coincidences had to exist, and they can be discovered (or are supposedly being discovered), but they must be qualified as an exception and not the general rule.

The contemporary East Slavic languages did not emerge on the basis of tribal associations or feudal principalities. The East Slavs, who populated vast territories, gradually divided into large territorial and ethnic groups, whose formation is largely unclear and gives rise to all sorts of surmises. Simultaneously, local linguistic features were accumulating on these territories; this was followed by the almost complete cessation of the formation of linguistic innovations which would have been common for the entire Old Russian language. The fall of the reduced vowels in the 12th and first half of the 13th centuries, which happened in all the East Slavic dialects (and, at different times, all the Slavic languages), produced different results in different localities.

The independent formation, in different areas, of dialectal innovations, side by side with the reduction and, moreover, the absence of common changes, heralds the beginning of a language disintegration. Local differences are accumulated, layer after layer, on a common genetic basis and render mutual understanding increasingly difficult if not altogether impossible.

N. Trubetskoy attached particular importance to increasing differences in vocabulary and the semantics of the lexemes. He was right in this, because the essence of linguistic information is concentrated in the meaning of the words. The number of words and their possible combinations is immeasu-

rably greater than all the phonetic-phonemic and grammatical phenomena. We can consider it an established fact that in the East Slavic languages, despite their close relations, there are hundreds of thousands of differences in vocabulary and semantics.

In the 14th and 15th centuries, lexico-semantic distinctions were already evident in the north-eastern, western and southern manuscripts, although in the south-west a common chancellary language was used throughout the whole territory.

In the 14th and 15th centuries, distinctive features typical for the Russian, Ukrainian and Byelorussian languages became widespread. These features have been many times described in lingustic writtings, but their study (particularly word-formation, syntax and vocabulary) is far from being completed and in some cases is only in its initial stage. Cf., the hardening of consonants before *e* and *i* in the Ukrainian, the *dzekanye* and *tsekanye* and the hardening of *p* in all positions in Byelorussian, the emergence of the endings *-ovo* and *-evo*, and the loss of the vocative forms in Russian.

Phenomena typical for each East Slavic language continued accumulating at later periods as well. The process has not stopped in our day (primarily in vocabulary and word-formation). For instance, in the 14th and 15th centuries the ending *-a*, typical of the Nom.-Acc., pl., of Russian masc. nouns, was represented only by isolated examples. In the 16th and 17th centuries it was rarely met. The considerable accumulation of words in *-a* began in the 18th and 19th centuries, and continues today. In other words, the disintegration of the Old Russian and the emergence of the East Slavic languages on its basis, was not a brief act in linguistic history but a long historical process.

Having arisen and isolated, the Russian and Byelorussian languages preserved noticeable traits of other linguistic divisions of the East Slavic territory, which preceded their birth. They have exercised a considerable influence on each other, and are still doing so. There are quite a few ancient isoglosses which do not coincide with the modern boundaries between the two languages (cf., the *akanye*, the spread of the bilabial *w* and its descendants, the *tsokanye*, and so on).

In the 14th-17th centuries, Byelorussian influence was strong on the south Pskovian and other north-western and western vernaculars. A broad zone of transitional vernaculars was formed between the Russian and the Byelorussian. Consequently, it is impossible to draw a definite borderline between them. Dialectologists have long noted a certain relationship between the Byelorussian language and the Southern Great Russian vernaculars. A considerable, if not major, part of these common characteristics emerged between the 14th and 17th centuries.

The boundary between the Russian and the Ukrainian is more definite, they are more counterposed to each other. (In the group of the East Slavic languages the Byelorussian stands somewhat in the middle.) However the differences between the Russian and the Ukrainian are not so great as to serve as an insurmountable obstacle for a reciprocal penetration, at a dialectal level, of phonetical, grammatical and even more so lexical phenomena. In the Belgorod, Voronezh, Bryansk and some other southern Great Russian regions there are some Russian vernaculars studded with Ukrainian elements. On the

contrary, borderline Ukrainian vernaculars have experienced a considerable Russian influence. (Cf., the *akanye* in the Northern Ukrainian vernaculars.)

As was mentioned above, before the formation of the East Slavic languages there existed different dialectal zones which had emerged at different times (partially in the Common Slavic epoch). This means that the basis of modern dialects in each of these languages is older than the languages themselves. The Northern Great Russian, the Southern Great Russian, the Northern and Southern Ukrainian, the South-Western and Northern Byelorussian dialects have their roots in the period somewhere before the 14th and 15th centuries.

Speaking about dialects, however, we must not forget the somewhat conditional character of this term. Dialectologists who single out these dialectal units proceed from scanty and to a considerable extent arbitrarily selected dialectal phenomena. The most recent attempt at dividing the Russian language into dialects, undertaken in *Russian Dialectology*, edited by R. Avanesov and V. Orlova, is no exception in this respect. I particularly doubt their expansion of the borderlines of the Central Russian dialects. According to their chart, even Novgorod was a borderline point of the Central Russian zone, because its modern dialect has the intervocalic *j* and does not have contracted vowels by the absence of which the Northern Great Russian dialect is counterposed to the Southern Great Russian dialect. However, this phenomenon is found in a number of Southern Great Russian vernaculars, so it cannot be used to counterpose the North and the South.

The abovementioned book provides extensive information which indicates the presence in the Russian language of numerous isoglosses crossing the Russian territory in different directions. The reader often finds here a term "dialectal zone" made up by isoglossal lines denoting several separate phenomena, but the chronology of Northern Great Russian and Southern Great Russian counterposing characteristics and phenomena, which formed the zones, remains untraced. The authors have deliberately avoided the historical aspect, and have tried to give a purely synchronic division of the Russian dialects according to structural opposition, or its absence, of dialect phenomena. This method is, certainly, legitimate and rather interesting.

However, the basic task of dialectologists consists in exploring the historical past of the local linguistic characteristics, their emergence and development. At present, dialects are dying under the powerful impact of the literary language, and the shifts occurring in the isoglossal lines are purely temporal. A synchronic and the structural-systemic discription of contemporary dialects just give a picture of their extinction. Their full-fledged past can only be proved by documentary evidence and historical-linguistic reconstructions.

When speaking about the origin of Russian, Byelorussian and Ukrainian, we must mention what makes it possible to classify these languages as independent. It is doubtful whether we can find exact criteria for distinguishing between closely related languages, as well as dialects that lie far apart within one language, if only we proceed from their purely linguistic peculiarities. The northern and southern German dialects, for instance, have deviated so far apart that people who speak them fail to understand one another, and can

only communicate with the help of the literary language. However, no one classifies these dialects as separate languages. One could cite many examples of dialects differing from one another much more than the East Slavic languages.

Consequently, when trying to determine the independence of closely related languages it is necessary to take into consideration not only their linguistic, but also their cultural and historic features. In the 8th-10th centuries the North-Eastern group of the East Slavic tribes differed linguistically from their South-Western counterparts much more than the Southern group differed from the Western group. In the 11th and 12th centuries the North (Novgorod) differed linguistically from Kiev to a greater extent than Kiev differed from Turov and Pinsk. The ethnolinguistic development of the East Slavs would probably have been different had it not been affected by the grim events of the 13th-15th centuries. The north-eastern and northern lands fell under a heavy Mongolian-Tatar yoke and remained so for 250 years. The people rallied to the struggle for their existence. Cultural and political centres were formed, developing independently of Kiev, which had lost its unifying role, and of other cities in the South and the West.

In the 14th century Moscow emerged to the foreground, and gradually came to be regarded as the capital of a centralised state. Centrifugal tendencies in politics, literature and culture in general had no conditions for development. The East Slavs of the North East acquired a sense of inner unity and isolation. The Russian nationality had arisen, which used its own language. This language developed according to its own inherent laws.

In the South and the West historical developments assumed a different course. The Western lands fell under the rule of Lithuania and became the core of the Lithuanian-Russian State. For some time the powerful Galicia-Volyn principality defended its independence, but then fell prey to Polish invaders. The Polish-Lithuanian alliance was formed, with Poland playing the leading role. The South-Western and North-Eastern Slavs found themselves isolated for a long period. Two closely related nationalities, Ukrainian and Byelorussian, emerged in the hard struggle for their ethnocultural independence. The Tatar-devastated Kiev began to play a unifying role among the Ukrainians; the Byelorussians rallied around Minsk. One of the indispensable characteristics of a nationality is the language, no matter how closely related this language may be to the other cognate languages. The previously formed intricate network of dialectisms in each of the East Slavic nationalities came to be regarded as a set of distinctive linguistic features. Later innovations spread mostly within the territories occupied by each nationality, thereby accentuating linguistic differentiation. Many Polish words penetrated into the Ukrainian and Byelorussian languages (primarily in their vocabularies and lexical semantics).

The events which led to the formation of separate East Slavic nationalities did not, in themselves, cause the emergence of linguistic phenomena (with the exception of certain lexical layers.) However, they directed linguistic developments and served as a social basis for the practical realisation of the laws inherent in the language. In the final count, differences between the East Slavic languages proved much more fundamental than those between dialects

existing in each of the languages. In other words, beginning with the 13th-15th centuries, linguistic differences between separate East Slavic territories increased considerably as compared with the preceding periods.

A big role in the formation of the East Slavic languages was played by the peculiar features of their developing of alphabets. Later their existence was largely influenced by their literary languages, but this topic will be dealt with in another book. It is however necessary, I think, to mention the discussion about the genetic basis of the Russian literary language. Two opposing hypotheses have been advanced. S. Obnorsky believed that the Old Russian literary language developed on a folk speech basis, independently of the Old Church Slavonic language, and only during the period of the so-called second Southern Slavic influence it was "bulgarised" or "church-slavonised". Attacks on S. Obnorsky's theory were poorly reasoned. So far it has not been subjected to serious critical analysis founded on extensive facts.

Another extreme viewpoint was advanced by B. Unbegaun, who went further than the well-known hypothesis of A. Shakhmatov, maintaining that the Russian literary language not only stems from the Old (Church) Slavonic but remains such (in some respects syntactically and, to a great extent, lexically) even today. This hypothesis is rather based on general considerations than on facts. To solve the problem of the origin of East Slavic literary languages it is necessary to carry out extensive research using data derived from their written memorials throughout their history, as well as oral sub-systems with more or less precise definitions as to what should be regarded as elements of the Old Church Slavonic at all levels, and what was their share at different epochs in different genres of writings, and in colloquial language. Meanwhile we have to deal with charts which can be modified depending on newly acquired information.

Incidentally, I have always maintained that the Old Church Slavonic has played a considerable role in the development of the Russian (Old Russian) literary language throughout all the epochs. What was, however, of decisive importance? Was it the Old Church Slavonic? Then it is not clear why, in the final analysis, the specific East Slavic languages emerged and not some local variants of the Old Church Slavonic, although they had a common source—the Old Russian written language of the 11th-13th centuries. The most characteristic features which distinguish one Eastern Slavonic language from another, and the literary languages also, emerged in the 13th-15th centuries on a folk speech basis. If it had not been for the abovementioned historical events and the development of dialect peculiarities there would be no East Slavic languages, which are separate languages, despite their kinship. I do not deny the importance of the Old Slavonic (Church Slavonic) elements in the development of their literary languages, especially of the Russian literary language, but I think we must admit that the basic creative element in their history was folk speech, which adapted all and sundry foreign linguistic influences to itself, becoming modified in the process.

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Problems of Industrialisation in Developing Countries*

The record of history shows that to eliminate a country's technical and economic backwardness it is necessary first of all to diversify the economic structure by providing the economy with the latest equipment and utilising modern technological methods of production. Industrialisation forms the basis for remaking the economic structure, but a discussion about the essence of the industrialisation process still continues to this day. Both under capitalism and in the specific conditions of the USSR, the world's first socialist country, industrialisation began with building up an industrial basis and only after this was accomplished, the other sectors of the economy were reconstructed. As a result, industrialisation was understood to mean only the first stage of the process, and the most widespread view now is that industrialisation is nothing else but the development of a country's industry.

Indeed, it is not easy to define the concept "industrialisation" because it represents a multifaceted process. Its purposes are by far not the same in different countries and in different socio-economic and historical conditions. The methods, forms, sequence and stages of the process are also quite diverse. No wonder that attempts to cover all this diversity of forms by a single definition often result in intricate and cumbersome formulations. [1]

In analysing the essence of industrialisation the technico-economic side of the process often overshadows the other—the social side. Yet it must not be forgotten that whatever the technico-economic difficulties facing a country, the possibilities and scale of overcoming them depend on socio-economic factors. A major distinction of industrialisation is that it is simultaneously a *technico-economic* and *socio-economic process.* Industrialisation leads to the elimination of technical backwardness and equips the national economy with the latest achievements of science and technology. At the same time it is most intimately intertwined with abolishing socio-economic backwardness and transforming all social relations.

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* The article is a supplemented text of the Conclusion of a collective monograph prepared by the Institute of World Economics and International Relations, USSR Academy of Sciences (*Problems of Industrialisation in Developing Countries*, Moscow, Mysl Publishers, 1971, 406 pages). Progress Publishers intend to issue the book in English and Arabic translations.

[1] See, for example, the definition examined at the Third Session of the UN Committee for Industrial Development (UN E/3781, EC 5/37, pp. 44-45).

The concrete methods of industrialisation and the nature of the problems it encounters greatly depend on the socio-economic conditions in which it is conducted. This is seen most vividly in the methods of mobilising resources for industrialisation. In the case of socialist industrialisation the state mobilises and concentrates all the resources which could be utilised for building larger modern enterprises; under private capitalist accumulation such possibilities are more limited, and small and medium enterprises account for a considerably bigger share. Deep-going land reforms create important prerequisites for the development of industry, expand the markets for manufactured goods, ensure the supply of food and raw materials, and so on. The preservation of archaic agrarian relations, on the contrary, impedes industrial growth. A more even distribution of incomes facilitates the formation of a large market, though for a narrower assortment of goods; thereby conditions are created for organising modern serial production in a number of industries. Greater unevenness in the distribution of incomes, which inevitably accompanies capitalist development, on the contrary, curtails the markets for separate commodities and hampers their mass production.

The scale and pace of industrialisation, in turn, largely predetermine many social processes in a country. Social and class shifts under way in society, in the first place the relationship between the working class and the bourgeoisie, largely depend on the concrete forms of industrialisation. The creation of the material and technical basis of a more advanced society and accordingly the possibilities of social progress hinge to a considerable extent on the rates and forms of industrialisation.

Were industrialisation only a technico-economic problem it would proceed in all countries in the same way and would have similar social consequences everywhere. But the point is that under capitalism industrialisation leads to the polarisation of classes, the enrichment of the bourgeoisie and the impoverishment of the working people, while under socialism it strengthens the social economy and ultimately raises the living standard of the mass of the population.

At the initial stages of industrialisation which include the creation of basic enterprises in key sectors of the economy—power, metallurgical, mineral fertilisers and engineering—most often outside economic and technical assistance is required, although its scale, types and forms can be different in various countries. Yet at the subsequent stages of development, when a country builds up its own scientific, technical and production basis for further industrialisation, prerequisites will be created for shaping new external economic relations based on a new international division of labour.

Drawing on the assistance and support of socialist states, the developing countries are also getting economic, scientific and technical assistance of imperialist powers. In a number of cases young states can also count on mutual assistance and support.

Industrialisation is a broad process encompassing in present-day conditions a reconstruction of all the sectors of the economy, the building of a country's new material and technical basis. Alongside this, industrialisation presupposes remaking the social structure of society, changing the place and role

of the developing countries in the world economy and turning them from agrarian-raw material appendages of a few imperialist powers into equal members of the world economy. The basic process of industrialisation of developing countries consists in applying industrial methods of production and modern scientific and technological achievements in all sectors of the economy.

In the developing countries industrialisation is a component of the struggle for economic independence from imperialism, and because of this is objectively of an anti-imperialist nature. While utilising at the initial stage the know-how and technology of the imperialist states for accelerating their economic development, young states at the same time create material prerequisites for their complete emancipation. Many Asian, African and Latin American states already now, while attracting foreign capital, try to curb its exploiting essence. [2]

Industrialisation of the developing countries is thus an important link in the anti-imperialist struggle waged by the progressive people of the world. For its historic role and consequences industrialisation can be likened to a revolution because it qualitatively changes society's material foundations and its social structure. Through industrialisation the developing countries can achieve their final liberation.

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Industrialisation is closely linked with the entire complex of socio-economic changes under way in the developing countries. This is determined above all by the fact that in industrialisation the young states see the most tangible way for reconstructing the national economies and accelerating growth rates. The industrialisation policy adopted by the overwhelming majority of the developing nations in Asia and Africa and also in Latin America is designed to diversify their economies and introduce modern methods of production in all key branches. What makes this process particularly involved is that it takes place in conditions when different economic structures exist in the economy, for example the patriarchal-communal and the capitalist ones. Naturally, similar measures effected by national governments often exert a diametrically opposite influences on different structures. [3]

Industrialisation is proceeding amidst a keen struggle over the ways of further development and therefore acquires in different countries by far not the same socio-economic nature. In present-day conditions, considering the need for a structural remaking of the economy, the vast scale of technical reconstruction and the application of scientific achievements, there is hardly a country which could cope with this task just by imports of machinery and

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[2] This problem is examined in greater detail by V. Tyagunenko in the article "Prospects of National-Liberation Revolutions" in *Social Sciences*, 1971, No. 2(4).

[3] On this question see the article by A. Levkovsky "The Third World Countries: Their Multiform Economic Structures" published in *Social Sciences*, 1971, No. 2 (4).

equipment (especially considering the unfavourable prospects of extending exports from developing countries to imperialist states). That is why, ultimately, the tasks of industrialising Asian, African and Latin American countries should be accomplished chiefly by building up their own industrial basis and organising their national production of means of production. The objective possibilities and the development levels of separate countries and regions are by far not the same in this respect. Among the developing countries Argentina, Brazil, Mexico, and India are already agrarian-industrial to some extent, while most countries of Tropical Africa have in fact no manufacturing industry.

In this respect all developing countries could be conventionally divided into the following groups according to the development level of their modern factory industry:

1. Agrarian-industrial countries with a relatively developed manufacturing and swiftly developing heavy industry, including engineering (although it is still not substantial for its share). This group includes first of all Argentina, Brazil, Mexico, India and also the Arab Republic of Egypt.

2. Countries with a developed mining industry and also some manufacturing, chiefly light and food industries, oriented primarily on the home market. This group includes the Philippines, Pakistan, Iran, Syria, Algeria, Tunisia, Morocco, Uruguay, Chile, Colombia and some other countries.

3. Agrarian-raw material countries which have a comparatively developed extractive industry and in some places a manufacturing industry engaged chiefly in the primary processing of exported commodities, Malaysia, Indonesia, Iraq, Kuwait, Liberia, Zambia, the Congo (Kinshasa), Bolivia, Venezuela and Peru are the most typical countries in this group.

4. The economically most backward countries, predominantly agricultural for the structure of their economy, have only some enterprises of the extractive and manufacturing industries. These are most of the countries of Tropical Africa, Jordan, Yemen, Cambodia, Laos, Nepal and Afghanistan in Asia, some Central American countries and young states located on small islands in the oceans.

The comparison of these groups warrants the conclusion that there is a fundamental difference in their approach to industrialisation. This difference stands out in greater relief if we consider that of the 90 countries which can be considered developing, 72 have a population of less than 15 million, among them 53 countries less than 5 million, while 26 have less than two million each. The differences in their territory are also tremendous. For this reason alone the industrialisation of Brazil differs, and will differ from the industrialisation of Burundi. However, both need an industrial base for their economic independence.

The specific features of industrialisation in different countries stem from the availability of natural resources, which can form the only basis for industrial development. Each country which studies the possibilities of industrialisation or is engaged in it has to consider these objective factors.

But this process is affected not only by objective but also by subjective

factors which at times introduce no less, and perhaps even more, differences in the approach to this problem. In this respect a special place is held by the state. Both the increased role of the state, characteristic of the economic advance of all developing countries, and the industrialisation process in all its forms and at every stage are inseverably linked with greater state participation in the economy. A country's ways of development largely depend on the purposes of industrialisation determined by the state. In the economically most backward countries, as a rule, only vitally important tasks are put to the foreground such as: a) an increase in the employment of the population, or b) improvement in the quality and degree of processing of export goods, or c) a reduction of the expenditure for imports by organising the local production of manufactured goods. In larger countries, which have already made certain progress in eliminating economic backwardness, the task are formulated somewhat broader: a) abolition of the country's general technico-economic backwardness; b) ensuring its defence capability, and so on.

It should be noted that each of these tasks appears very seldom in a "pure form". Usually several tasks are combined, one of which prevails at a definite stage. Depending on the prevailing aim (and also on the general economic development level), the appropriate methods of achieving it are adopted. These methods usually are as follows: a) the building of enterprises for the manufacture of prime necessities by importing the requisite equipment; b) mechanisation of the extraction (production) of raw material, its primary processing and at times obtaining the final product, likewise by importing equipment; c) the rapid development of labour-intensive jobs without the employment of the latest equipment; d) development of traditional branches and their mechanisation by organising the national manufacture of some means of production for them; e) the organisation of the national manufacture of the means of production on the basis of the latest technology and the subsequent reconstruction of the entire national economy either through the import of the latest equipment and patents or its own production, and more often by combining both.

In considering all these circumstances, different countries elaborate a definite "trend of industrialisation", determine what sectors and on what scale should be developed first. On what should the emphasis be, with what should a country start—the infrastructure or the building of industrial projects, industry or agriculture, small or large-scale industry? An extremely keen struggle is waged on these problems. For the developing countries these are not academic disputes, but highly practical issues.

Originally the task of formulating a "development strategy" or "industrialisation strategy" was approached quite schematically in most developing countries. It was supposed that for this purpose it was sufficient to outline one or two main trends (most often the building up of some new industries), while other aspects of development would become clear of themselves. Such an approach inevitably leads not to the creation of prerequisites for accelerated growth but to the rise of new disproportions in the national economy.

Proportionality is one of the most important and intricate problems of eliminating economic backwardness. Its intricacy consists in that these countries

have to ensure the development of the most different sectors and trends in the economy, culture and social life, dovetail and coordinate this development in diverse spheres. Insufficient consideration or disregard for separate links of the economy and social life are bound to bring about disproportions and hamper the general development process.

It will be recalled that in the 1950s many experts of the International Bank for Reconstruction and Development, the International Monetary Fund and the US Export-Import Bank advised developing countries, especially those most backward technically, to concentrate all efforts on a production infrastructure and only then undertake to build industrial projects. There was also an opposite viewpoint which in effect belittled the significance of the infrastructure. Life has demonstrated the untenability of such extreme decisions. To determine the scale and priority of building projects of the infrastructure many socio-economic factors have to be taken into account.

The policy of priority building of the infrastructure objectively proceeds from the premise that the existence of a ready production infrastructure should spur on private entrepreneurs to make new investments. In other words, such a policy is a component of the more general strategy of development along the capitalist path. The experience of Brazil, Iran, Pakistan and other countries graphically shows that in many cases the infrastructure built in expectation of subsequent greater activity of private capital is by far not always justified. The upshot is that the huge resources invested in the infrastructure are frozen or idle. On the other hand, the absence of a requisite infrastructure may in different forms hamper development, may lead to the discontinuance of work on new projects and encourage technicaly backward enterprises, raise the production costs at modern factories, and so on. A rational scale of developing the infrastructure can be determined only in the context of a general analysis of the entire structure of the economy, interaction of the different sectors of the economy and different regions in a country.

The relationship between industry and agriculture is an exceedingly intricate question for most developing countries. The one-sided recommendations of imperialist ideologists that most newly-free countries should abandon the idea of building up their own industry and concentrate efforts on stepping up agricultural development, have already visibly demonstrated their insolvency. The agriculture of developing countries, based on primitive production methods, cannot ensure accumulation, food, and markets for the manufactured goods these countries need. The grave situation in world markets of such staple commodities as coffee, cocoa, tea, jute and rubber doom to failure the attempts at development by stepping up agricultural exports. The need to build up a national industrial basis in a number of countries is graphically revealed in that they are unable to obtain through imports either the mineral fertilisers or the farm machines they need, without which no advance of agriculture is possible.

From this it does not follow that the developing countries must not utilise their agricultural potential to the utmost. Countries which are especially backward may find themselves in a position when without the preliminary development of agriculture, increasing its marketability and improve-

ment of its structure they will be unable to secure accumulations and markets needed for industry. Countries with favourable soil, climatic and other conditions can make one or two sectors of agriculture the leading ones by utilising these advantages at the initial stages of development. But the very logic of building up an independent national economy will turn these sectors into the centre of a wider national economic complex and in the course of its development a country's new economic structure will gradually be shaped.

If, for example, sugar cane is the initial basis for industrial development, the economy will not be able to base itself for a long time only on growing and harvesting the crop even if yields are high and the work is fully mechanised. A need will naturally arise to build sugar refineries and to develop productive animal husbandry on the basis of by-products of processed sugar cane; a need will also arise to build up a chemical industry. Animal husbandry, in turn, will need enterprises to process its products. After a certain time the processing and chemical industries will reach a scale when they demand the development of specialised machine building and other industries. The same may be said about countries which have particularly favourable conditions for a highly productive animal husbandry, the growing of tropical crops and also about countries which have unique reserves of raw materials and fuel.

Most developing countries have already embarked on the path of diversifying their economies and developing their own industries. Many Asian, African and Latin American countries in their plans which outline development programmes provide for a substantial rise of the share of industry in the national income and in the general allocation of new investments.

But the possibilities of even such an evolution of the national economy largely depend on the class character of power, on the nature of the economic policy and its ability to uphold the country's independent development. A consistently anti-imperialist policy and the expansion of economic ties with socialist states increase possibilities and raise industrial growth rates. A capitalist orientation and renunciation of the anti-imperialist struggle either sharply impede these processes or extend the spheres for the application of foreign capital and the establishment of new forms of economic dependence.

The results of recent economic development show that the question of the relationship between agriculture and industry has not been settled as yet. In a number of cases the stepped-up development of industry is accompanied by an underestimation of the need to expand agricultural production. Preservation of archaic production relations in the coutryside greatly hampers the ties between town and country, curtails the market for industry and often reduces to naught even the modest measures for raising the scientific and technical level of production in agriculture, for introducing fertilizers and applying machines. The low level of agriculture increasingly compels the developing countries to spend a substantial part of their foreign exchange recources for food, not for equipment.

The point, however, is not only that the lag of agriculture impedes and warps industrial development. An analysis of the relationship between industry and agriculture is closely connected with another, no less important ques-

tion: what sectors of industry should be given priority in order to ensure the most rational ties between town and country, and the proportional and swift advance of the national economy as a whole.

It goes without saying that in every country and at every concrete stage the relationship and interaction of industry and agriculture must be determined with due account of all conditions. There can be no single recipe in this respect. In some cases the biggest national economic effect may be produced by the accelerated expansion of the production of fertilizers or pumps for irrigation. In countries where the density of the population is not very high it is probably advisable to organise the local manufacture of tractors and agricultural machinery. In many cases the organisation of the local processing of farm produce or the expansion of raw-material production in accordance with available industrial capacity may be the most advantageous way.

Lively discussions are conducted on the role of small production in the industrialisation of developing countries. Most scientists, both Soviet and foreign, now agree that small-scale and artisan production cannot serve as the basis for industrialisation but it should be paid much attention in this process. Small production does not require big investments, it is capable of increasing employment and mobilising small individual savings. To a certain extent small production enlarges the home market, ensures the production of some scarce goods and facilitates the training of personnel (people who have mastered a definite craft, learn modern industrial trades much easier and faster), and so on.

Some proponents of small-scale production think it is least dependent on foreign capital, supposedly increases economic independence and makes economic development harmonious and gradual. They often cite Japan as an example, forgetting one very important point: there, too, small production has played, and is playing, only a subsidiary part in the country's industrialisation.

Small production undoubtedly can play a substantial part in a country's general economic advance and it demands every support as an important subsidiary form of expanding production and increasing employment. It were these aims, for example, that were set to small production in the USSR in the past. But recognition of the importance of small production and its considerable potentialities by far does not imply agreement with theoreticians who hold that it can serve as the basis for industrialising the developing countries. While solving some problems facing these states, small production exacerbates many others. On the basis of small production it is impossible to ensure high rates of extended reproduction. Moreover, small production is marked by very low productivity of labour and therefore cannot serve as some kind of a basis for eliminating economic backwardness and winning a more equal position in international economic relations. The output of small enterprises is in a very poor competitive position in the world market; as a rule, it demands sizable subsidies and can be exported only in small quantities. Moreover, the history of many countries shows that as they were being drawn into the world economy, small production had to retreat in face of imports. In present-day conditions small production can survive only behind the wall of various protectionist measures thanks to different privileges and subsi-

dies. The preserved big share of small production in the developing countries above all reflects their backwardness and unequal position in the world economy.

Another major reason for the preservation and, at times, the growth of small production in the developing countries is the acute unemployment problem. The striving to increase the number of employed compels the governments of many developing countries to utilise on a large scale manual and little-mechanised labour in construction and ancillary jobs, in building and operating modern big enterpises. While in highly developed countries the scientific and technological revolution dictates the continuous and swift replacement of old technology by new and the latter by the latest technology, the developing countries often still avoid modern machinery, preferring to provide employment to a bigger number of people. At the same time the need to boost production, to modernise the productive machinery and to win a more equal position in the world economy impels the developing countries build up large-scale modern industry in every way.

As a result the constant and diverse combination of small and large-scale production is a specific feature of industrialisation in the newly-free countries. Small establishments, alongside serving the needs of the population, are widely enlisted in the production of auxiliary materials, separate parts and packaging for large specialised enterprises. Large-scale industry, in turn, provides small enterprises with its by-products which serve as raw materials. Such cooperation, should it become widespread, would promote rational specialisation and increase the efficiency of production as a whole.

But here we have an important socio-economic problem: to whom should small production be subordinate, to large-scale private production or to the state sector? In the former case it would serve as a basis for accelerated capitalist development, in the latter. it would restrict it to one or another extent. In countries which have taken the non-capitalist path, subordination of small production to the state sector can serve as a basis for future socialist development.

The relationship of heavy and light industry is a no less intricate problem. At present only a small group of countries, such as Mexico, Brazil, Chile, Argentina, India and the Arab Republic of Egypt are really faced with the task of accelerating the development of heavy industry, of building up their own extensive basis for the manufacture of the means of production. They have sufficient prerequisits for coping with such a task, namely, accumulation sources, markets, and skilled personnel (although the limited nature of the available prerequisites is bound to be clear in the course of building up a national heavy industry).

The stepped-up development of heavy industry (as demonstrated by the experience of the USSR) opens up before these countries the possibility of re-equipping the entire national economy in shorter periods, and accelerating growth rates. But most developing countries have no tangible prospect of building up a wide range of heavy industries in the immediate future. It is obvious that the home market of the developing countries, based on small peasant production, so far presents a very limited demand for the output of heavy

industy. The narrow specialisation of the economy, which is chiefly export-oriented, leads to the slow expansion of the market for local producer goods.

A conclusion may be drawn that the degree to which the home market has been developed is exerting a tremendous impact on the course of industrialisation in every country.

The combination of the expanding light industry with the creation of a construction and power industries and a transport network is more expedient from different angles at the present stage in the independent economic development of many Asian, African and Latin American countries. Light industry does not require simultaneous big investments and a large contingent of highly skilled workers; the period for recouping investments, as a rule, is not large and profitability is relatively high. At the same time it makes it possible to reduce the imports of many consumer goods and thereby save foreign exchange badly needed for the purchase of more sophisticated machinery and payment for the scientific and technical information obtained in other countries. The simultaneous development of the light and food industries promotes an increase in output for local consumption. The comparatively low technical level of light industry factories determines their quite high labour intensity and, consequently, sends up employment. The development of the light and allied industries contributes to a considerable expansion of the home market, increases accumulations and promotes the training of personnel necessary for the country's progress.

For the overwhelming majority of the developing countries the most rational approach to industrialisation is to choose a group of key sectors, taking into account the historically shaped structure of the economy, its potentialities and also the existing international division of labour and its future tendencies.

Naturally, one of the decisive factors in elaborating this problem at the initial stage is an analysis of the possibilities for utilising the available (and prospective) natural resources. For example, for large oil-producing countries it is advantageous to build up a national economic complex based on the petro-chemical industry, which will make it possible swiftly to introduce the latest scientific and technological achievements and utilise the advantages of this process in the world market. But this factor can be decisive, as a rule, at the initial stages of development. Subsequently, the immanent factors of industrial progress, including the interconnection and interdependence within the national economic complex and the demands of the world market will begin to play an increasing part.

Thus, the diversity of objective and subjective factors is responsible for different variants of approach to, and elaboration of, the strategy of the initial industrialisation stages in different economically backward countries of Asia, Africa and Latin America. For some countries it may be advisable to concentrate efforts on building up an infrastructure and developing the existing export sectors, on further improving their output in order to increase accumulation. For others it may be more advisable to step up the development of light industry and small production so as to increase employment and

accumulation. The third group of countries may begin development with several sectors most rational (from the viewpoint of available raw material, know-how and the capacity of the market) for accumulating the necessary resources and training personnel for the subsequent reconstruction of the entire national economy. Some of these countries are already able to take up the building of heavy industry, engineering, and the reconstruction of the entire economy on their basis. A combination of these variants in one or another proportion is optimal for many of them.

Choice of the most expedient priorities of development and combination of separate sectors, and establishment of optimal proportions between the main links of the economy are an extremely intricate task which demands consideration and analysis of numerous factors. Practically, in the course of breaking up the colonial pattern of the economy serious disproportions are constantly arising which adversely affect the entire process of reproduction and slow down the general rates of economic growth. The swift increase of underemployed productive capacity in the entire economy and specifically in industry is one of the most important indicators of this effect.

Underemployment of industrial capacity in developing countries is caused by the most diverse causes: a shortage of raw material and fuel, foreign exchange difficulties, the absence of skilled workers and the narrowness of the home market. Be that as it may, these facts conclusively show that industrialisation is not simply a process of building industrial enterprises but a problem of shaping the most rational mechanism for economic regulation. This process is inextricably linked with a deep-going reconstruction of the entire socio-economic structure of society.

Industrialisation of economically backward countries is inevitably a long and intricate process which presupposes the consistent and purposeful remaking of the national economy. Therefore, successful industrialisation implies more effective control over the economy by the state, making economic processes more governable and extending the basis for the exertion of planned influence on all the economic and social aspects of a country's life.

Socio-economic development and specifically industrialisation also largely depend on the conscious participation of the people in social development. The pernicious legacy of colonialism, the low level of the productive forces and the acute shortage of material resources–all this attaches special significance to the active participation of the masses in developing the economy, their conscious approach to the difficulties facing their countries, to their readiness to work and make sacrifices in order to eliminate national economic backwardness. Without this it is impossible to solve many acute problems or to tap important reserves for expanding production. The sum total of social relations emerging in countries with a capitalist orientation–exploitation of man by man, the quest for enrichment, socio-economic inequality–undermine the basis for the active, conscious participation of the people in economic development.

In these conditions the developing nations urgently require deep democratic changes both in the economic and the social spheres, changes that would help rally the masses for conscious action in advancing the

economy and building the new society. In countries which follow the non-capitalist path the people are fully aware of this need. Appropriate measures for creating new driving forces of social advance, for progressively remaking a country's socio-economic pattern hold an important place in respective plans and development programmes. These measures include expansion and strengthening of the state sector, democratic land reforms and subordination of foreing capital to the needs of the national economy. Great effort is exerted to re-educate people, and thereby an important basis (although it is difficult to define it in conventional economic terms) is laid for more successful economic development.

The experience of industrialising Asian, African and Latin American countries shows that the break-up of the former socio-economic structure and the elimination of economic backwardness are an intricate and multifaceted process. Each group of countries, each country naturally undertakes industrialisation in its particular conditions, and this process has its specific features in every state. At the same time, as the record of history demonstrates, acceleration of socio-economic progress on the basis of industrialisation is possible only when it is accompanied by deep-going social changes, by the triumph of new, more advanced relations of production.

BOOK REVIEWS

М. ИОВЧУК. *Ленинизм, философские традиции и современность.* М., Изд-во «Мысль», 1970, 344 стр.

M. IOVCHUK, *Leninism, Philosophical Traditions and Our Age,* Moscow, Mysl Publishers, 1970, 344 pp.

The history of philosophy is by no means a strictly academic subject. Its study is a form of cognising our age, as graphically demonstrated by the book of M. Iovchuk, Corresponding Member of the USSR Academy of Sciences. He examines the traditions of the history of Marxist philosophy in close connection with urgent social problems of our time.

The author is a well-known historian of Russian and Marxist philosophy who has written a number of works on the philosophy of the Russian revolutionary democrats, on Plekhanov, Lenin and others. The present book sums up many years of research into the essence of the Leninist stage in the history of Marxist philosophy and of contemporary Marxist thought both in the Soviet Union and abroad.

For many years Iovchuk guided a number of scientific groups, and many propositions expounded in this book offer a reply to methodological questions which arose in the course of work on the history of philosophy (these above all are *History of Philosophy*. Moscow, 1957-1965; *Leninism and Philosophical Problems of Our Time,* Moscow, 1970, and *Leninism and Important Problems of Historico-Philosophical Science,* Moscow, 1970).

The author sets out to propound the idea that in the present epoch the highroad of creative Marxism is that of Leninism represented by the works of Lenin and his colleagues and continued now in the theoretical and political activity of the CPSU and other Communist and Workers' Parties guided by the revolutionary principles of Leninism. The vast literature examined by the author makes the book a systematised analytical review of Soviet and foreign Marxist thought on major socio-philosophical problems of our time and gives the reader an idea of the many lines along which present-day Marxists are working.

Disclosure of the dialectical interconnection between tradition and innovation, the national and the international, the general and the particular, the world outlook and cognitive elements in Marxist philosophy—such is the main thread which binds together all the ideas of the author. It is from this angle that he examines the vast material from the history of philosophy and contemporary Marxist philosophy, and criticises some or other concepts.

Iovchuk convincingly shows that the creative nature of the proletariat's revolution, of which Marxism is the theoretical basis, far from running counter to progressive traditions in culture and philosophy, on the contrary, stems from these traditions and relies on them. On the other hand, many things from the present-day fruitful solution of philosophical problems enriches the historical traditions and helps to shape new traditions. The main merit of the book is that the author reveals this dialectical interconnection of innovation and continuity at different stages in the history of the emergence and development of the philosophy of Marxism.

A number of fundamental methodological problems of the history of 19th-century Marxist philosophy is examined from the angle of the interconnection between creative endeavour and tradition. Turning to the period when the philosophy of Marxism arose, Iovchuk quotes and analyses Lenin's statements about the role of traditions in philosophy in the process of its crystallisation. He conclusively demonstrates the insolvency of the method, widespread in bourgeois Marxology, of contraposing the early Marx to the later, of Marx to Engels and Lenin, and so on. Such an artificial break of the single continuous process in the development of the philosophy of Marx, Engels and Lenin is now often used by the enemies of Marx-

ism, specifically to prove the need for a "plurality of Marxism", to claim that the ideas of Leninism are applicable only in Russia because they, supposedly, stand outside the cultural traditions of Western Europe, and so on, and so forth. All this, in turn, is used to justify far-reaching political conclusions. The entire experience of the historical development of Marxist philosophy, the theoretical and practical activity of outstanding leaders of the communist movement attest to the international importance of Marxism-Leninism which rests on progressive philosophical traditions and enriches them.

The reader will find in the book a brief summary of the author's studies of the genesis, subject matter and structure of Marxist philosophy as they emerged in the course of history, the place held by the problem of man in the philosophy of Marx and other questions.

Here too is a summary of conclusions by many other Marxists on these problems. Their analysis enables the author to offer a convincing periodisation of the development of Marxist philosophy, well-argumented principles and formulate major laws of the development of Marxist philosophical thought. The proposed periodisation was elaborated in the course of practical work on the respective volumes of the *History of Philosophy* (Moscow, 1957-1965) and other collective monographs written under Iovchuk's guidance and participation. In other words, it passed the stage of tests and gained wide recognition.

The Leninist stage in the history of Marxist philosophy, an analysis of its traditions and main problems in the present century, is central in the book. The author traces the emergence of the Leninist stage in Marxist philosophy, singles out its major historical periods, reveals their content and characteristic features, emphasising the fundamental novelty of Leninism as compared with the concepts expounded by the theoreticians of the Second International. Here, as in other parts of the book, the author formulates conclusions stemming from a study of abundant material and advances fundamentally important evaluations of earlier periods in the development of Marxist philosophy, especially in the Soviet Union. He specifically criticises the assertions that the period from the mid-1930s to the mid-1950s was marked by stagnation in Marxist thought. Although the personality cult did inflict serious harm on its development during those years, on the whole, Marxist thought in the CPSU and the international communist movement developed in the mainstream of Leninism.

A special chapter deals with the problems of the Leninist stage in the history of Soviet Marxist science. The author examines the positions of Leninism in relation to different philosophical traditions in the period after the October Revolution. What is characteristic of the Soviet epoch is the struggle against reactionary philosophical traditions which arose in the country during the prerevolutionary period, on the one hand, and the desire to enlist the old intelligentsia into activity and reorient its work along the lines of Marxist-Leninist methodology, on the other. Iovchuk shows what was done by Marxist scientists, especially historians of philosophy, in the study and utilisation of the traditions of pre-Marxist philosophical thought, the philosophy of antiquity, the Middle Ages and modern times.

The role played by the Leninist philosophical ideas in the international communist movement and in the contemporary ideological struggle is clearly revealed. The reader will find a wealth of material about the spread of Leninism in Germany, France, Italy, the United States and East European countries from 1917 to our days. The author analyses the material both in a historical plane and according to subjects, particularly as applied to the last decade. Examining the continuation of the Leninist tradition of a partisan approach to bourgeois philosophy in the works of contemporary Soviet and foreign Marxists, Iovchuk notes the deeper and more differentiated approach of researchers in the 1960s to non-Marxist doctrines as compared with the literature of the 1940s and 1950s. The need to consider the real achievements in a number of non-Marxist doctrines does not signify, the author emphasises, that it is permissible to forget or gloss over the fundamental boundaries existing between the Marxist and the bourgeois world outlook. In this context Iovchuk criticises the erroneous positions of a number of authors who seek to "supplement" Marxist philosophy with existentialism, phenomenalism, or some other non-Marxist doctrines, which is a form of display of the vaunted concept of science's "de-ideologisation", "the convergence" of bourgeois and Marxist thought. Authors who exaggerate the importance of the systematic structural analysis, mathematical and cybernetic methods as universal methods of cognition are likewise wrong. Leninism is distinguished by a tradition of close interaction between philosophy and science. It is not the adaptation to the empiri-

cal specifics of methods of separate sciences but comprehensive creative elaboration of the dialectical materialist methodology, combined with the wide use of methods of scientific cognition, that represents the future of Marxist-Leninist philosophy.

The fundamental methodological importance of the conclusions and evaluations offered by the author, the wealth of adduced material, and the profound disclosure of the organic interconnection of traditions and new contemporary philosophical problems make the book a valuable study which introduces much that is new in the development of philosophy.

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Cand. Sc. (Philos.)

В. ВИНОГРАДОВ. *Ленинские идеи рабочего контроля в действии.* М., Изд-во «Наука», 1969, 389 стр.

V. VINOGRADOV, *Lenin's Ideas of Workers' Control in Action*, Moscow, Nauka Publishers, 1969, 389 pp.

Lenin's ideas of workers' control form the subject of a vast literature. Vinogradov's book stands out among others because of the author's attempt—and in our opinion, a successful one—not only to analyse Lenin's rich theoretical legacy on this problem but also to show workers' control in action for more than 50 years.

Let us recall that Lenin with great sagacity was able to discern in the spontaneous movement of the masses elements of revolutionary creative endeavour, theoreticaly analyse them, and recast them into programmes of political action.

The workers' control bodies which arose in the course of the 1905 revolution not only supplemented the activities of the Soviets of Workers' Deputies and were an instrument for carrying out the decisions of the Soviets. They also represented the first attempt in history to limit the power of the capitalists at the enterprises. But even this initial experience was of international significance. In the course of the revolutions which flared up in a number of West European countries after the First World War workers' control bodies arose, patterned after those which operated in Russia in 1905, and they performed almost similar functions.

As the revolutionary situation matured in Russia on the eve of 1917 and in the course of different stages of the revolution itself, the concept of workers' control, as expounded in Lenin's works and statements, was filled with broader meaning and its content was steadily enriched. Having deeply analysed the essence of state-monopoly control of production and distribution, Lenin set the task of mastering the methods and forms of control in the interests of the whole people. He regarded as an indispensable condition the organisation of democratic management by the entire people, by the whole mass of the working people, of the means of production appropriated from the bourgeoisie. [1]

The victory of the February Revolution led Lenin to a fundamentally new formulation of the question. He held that in that period struggle for workers' control was of great significance for stimulating the creative energies and initiative of the masses, for the education of the proletariat and its ideological schooling. A new feature was that in Russia, as the author rightly notes, there matured not only the need but also the "objective possibility for revolutionary intervention by the working class in the sphere of production and circulation".

The importance of workers' control bodies (factory committees) in that period is demonstrated by the fact that the Bolshevik Party won predominant influence in them at the time when the majority in the Soviets and some trade unions was still held by parties ready to strike a compromise with the bourgeoisie.

The abundant material studied by the author proves that in the months prior to the October Revolution the workers of Russia passed through a great school of future production management. This path was far from peaceful, because the bourgeoisie disdained no means to break up the workers' control bodies. Summing up the experience of the first months of the revolution, Lenin stressed: "For control over industry to be effectively carried out it must be a *workers' control* with a workers' majority in all the leading bodies, and the management must give an account of its actions to all the authoritative workers' organisations." [2]

Workers' control acquired fundamentally

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[1] See V. I. Lenin, *Collected Works*, Moscow, Vol. 23, p. 24.

[2] V. I. Lenin, *Collected Works*, Vol. 24, p. 557.

new functions after the victory of the October Revolution. On October 26 and 27, 1917, Lenin directly participated and guided the preparing of a draft and on November 15 signed Regulations Governing Workers' Control which were introduced "in the interests of the planned regulation of the national economy" at all enterprises which employed wage workers. Control extended to production, supply and sales and also financial activity. Commercial secrecy was abolished, owners of enterprises had to submit all documents to control commissions, decisions of workers' control bodies were made binding on the owners.[3]

Thus, the sphere of operation of workers' control was not only greatly extended but it acquired a fundamentally new content. Factory committees began to prepare for socialist nationalisation, in the course of which the science of management was put to the foreground. Analysing this sphere of the Leninist legacy and illustrating it with concrete examples, Vinogradov rightly singles out two sides of the problem: 1) enlistment of specialists in management; 2) advancement of the best workers and training them to manage production.

The book devotes much space to an analysis of the international experience of workers' control and the struggle of workers in capitalist countries for participation in factory management. The author shows that even the shortlived experience of workers' control in the course of the revolutionary events of 1918-1923 in Hungary, Slovakia, Austria, Germany and Italy greatly added to the means of struggle in the arsenal of the working class, and, moreover, compelled the bourgeoisie of some countries to make important socio-economic concessions to the proletariat.

During the Second World War the national-liberation movement spread in European countries and in the course of it the antifascist, patriotic forces united. As East European countries were liberated by the Soviet Army, workers' control committees sprang up; at a number of big factories they were organised already in underground conditions. The working people led by the Communists regarded them as an important factor of the people's democratic revolution, as an instrument of struggle against starvation and economic chaos. From the very beginning factory committees were also bodies of struggle against the power of the capitalists at private enterprises. At factories belonging to the state or collaborationists they assumed direct management at the initial stage. It was from them that the main part of industrial executive personnel subsequently developed.

The last chapter describes the embodiment of Lenin's ideas in the present-day struggle of the proletariat in developed capitalist countries for democratising the management of production.

The author rightly emphasises that the demand for workers' control over the economy, just as for the nationalisation of industry, was characteristic for most West European countries. In face of the postwar advance of the working class movement the ruling circles of France, Italy and Austria were compelled to sanction the existence of workers' control committees which were set up at enterprises. In France such committees were organised at 9,000 out of the 25,000 enterprises employing more than 50 people each. In Austria, under the law of 1947, production councils were set up at all factories employing not less than 20 people.

But subsequently as the bourgeoisie consolidated its power, workers' control bodies turned into bodies of workers' representation at enterprises.

The author, however, does not confine himself merely to noting this fact. He shows that the initial positions won by the working class, specifically the factory committees, production councils, and so on, are exceedingly important at present.

The complexity of the problem—and the author is fully aware of it—is not confined only to the theoretical side; it also involves many practical questions. But the most important thing is to link the struggle for the daily interests of the working class with the struggle for its ultimate aim—socialism. An attitude to this point is the main dividing line between the position of a reformist and a genuinely socialist trend in the working-class movement. Vinogradov rightly remarks that in conditions of the contemporary scientific and technological revolution employers in principle are not against the "trade unions sharing responsibility with them for the management of capitalist enterprises".

This, however, would be merely one of the elements of integrating the working class into the system of bourgeois society. To Right-wing Social Democrats this way seems fully acceptable. For the revolutionary work-

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[3] See *Nationalisation of Industry in the USSR. A Collection of Documents and Materials. 1917-1920*, Moscow, 1954, pp. 74-75 (in Russian).

ing-class movement the crux of the matter lies elsewhere: to prevent the foisting of the "social partnership" system of the working class under the guise of participation in management.

Of decisive importance for Communist parties is the theoretical elaboration and practical application of such forms and methods of struggle in which every step, every gain, would signify limiting and undermining the power of capital both directly at the factory and on a nationwide scale. It is in the sphere of economic domination that the possibilities of the monopoly bourgeoisie for manoeuvring are limited.

Referring to the experience of the international communist movement, the author once again emphasises that in present-day conditions "without democracy in the economic sphere in developed capitalist countries there can be no genuine democracy in social and political life". At the same time genuine economic democracy is impossible without determined restriction of the political power of the bourgeoisie.

The book fully lives up to its name; it expounds Lenin's ideas of workers' control and demonstrates their vitality and applicability in the communist and working-class movement.

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Статистический ежегодник стран — членов Совета Экономической Взаимопомощи. М., Секретариат СЭВ, 1970, 463 стр.

Statistical Yearbook of Member Countries of the Council for Mutual Economic Assistance, Moscow, CMEA Secretariat, 1970, 463 pp.

The *Statistical Yearbook* contains highly important data which give a comprehensive picture of the economic and cultural progress of CMEA member countries mainly since 1950, in other words, in the 20 years after the establishment of the Council for Mutual Economic Assistance. It is the first scientific publication of this type. It furnishes statistics of sectors of the national economy like industry, construction, agriculture, transport, home and foreign trade and also data on education, culture, the arts and the health service.

One of the chief distinctions of the volume is that methodologically the statistics have a uniform basis and are comparable by countries and years. Explanations of the published figures are given at the end of the book. The methodological elaboration of uniform and comparable indices for the entire group of states is an important scientific service rendered by economists of socialist countries and the CMEA Secretariat.

The overall section of the *Yearbook* presents figures on changes in the share of the socialist sector in the national economy of CMEA countries; it now plays not only a dominant part in fixed productive assets, the national income, gross output of industry and agriculture, and retail trade, but in a number of countries fully encompasses these spheres.

The figures show that in the last 20 years production grew at high and stable rates (1969, in per cent to 1950):

	National income	Gross output of industry	Total capital investments	Gross output of agriculture	Freight carriage by all modes of transport	Foreign trade
Bulgaria	554	11 times	961	241	16 times	14 times
Czechoslovakia	309	450	473	140	433	466
German Democratic Republic	378	490	845	179	587	942
Hungary	293	481	354	154	393	617
Poland	355	701	521	155	461	488
Rumania	557	10 times	11 times	223	943	739
USSR	488	635	585	204	495	676

Industry plays now the decisive part in producing the national income. Its share in the total national income ranges from 44 to 61 per cent in CMEA countries, except Mongolia. In most countries three-fourths of the national income goes for consumption, including personal consumption. About one-fourth of the national income is used for the expansion of socialist production and other social needs. As a result of building new and reconstructing operating enterprises fixed productive assets in 1969 increased as follows as compared with 1950: Hungary, the German Democratic Republic and Czechoslovakia, 2.2-2.8 times; Rumania, 3.8 times and the USSR, 5.5 times.

In recent years economic development in these countries was of a clearly pronounced industrial character. Alongside the expansion of capacity in existing industries, new branches and categories of production were built up.

It should be noted that the average annual growth rates of industrial production in each CMEA country in the last 20 years were higher than in developed capitalist countries, including the United States, Britain, France and West Germany. CMEA members now produce about one-third of the world industrial output as against 18 per cent in 1950. The rise in industrial output was achieved mainly through the priority development of industries which contribute means of production (group A). This made for an increase in the share of means of production in total industrial output. In 1969 it ranged from 62 to 74 per cent in Czechoslovakia, the German Democratic Republic, Hungary, Poland, Rumania and the USSR.

Key industries developed at the fastest pace. Particularly swift was the expansion of the electrical equipment, radio and electronic, instrument making and chemical industries. The consumption of power resources increased with a resultant change in the pattern of industry. The power, chemical and engineering industries now contribute a bigger share of total output.

The growth of industrial production, especially in recent years, was largely due to higher labour productivity. In the last 20 years labour productivity of industrial personnel in state and cooperative enterprises more than trebled in most CMEA countries.

Of great interest are data on capital investments in the economy, and construction indices of the scale and growth rates of total investments and their breakdown by sectors. They have been steadily expanded in every country. Particularly high were the average annual growth rates in 1951-1960. Investments increased both in sectors of material production and in the non-productive sphere. Moreover, the pace in the former was higher and it outstripped the rate of increase in the national income.

Industrial construction assumed a huge scale. Big capital investments were channelled into agriculture and transport and a big programme of housing, cultural and service establishments was carried out.

The structure of investments in the economy also changed. The share of machinery and equipment increased in total investment, with the share of building and assembly work declining in all countries.

The number of factory and office workers and their labour productivity rose. Expansion in the number of building machines and their better use greatly raised the level of mechanisation of main building jobs and of labour productivity in construction. Important economic and organisational measures for intensifying agricultural production were implemented. Investments in agriculture steadily went up and they were used mainly for mechanisation and introduction of the achievements of chemical industry in agriculture, the building of livestock departments and other projects, and for extending and renewing the fixed assets. The result was an increase in the gross output of agriculture. No essential changes in its pattern occurred in recent years. In Bulgaria, Hungary, Poland and Rumania crop husbandry, as hitherto, prevails considerably over animal husbandry, while in the German Democratic Republic, Czechoslovakia, and, especially, Mongolia, the opposite is the case. In the USSR the output of these two sectors of agriculture is about equal.

The *Yearbook* shows that main attention in CMEA countries was paid to increasing the production of grain. The harvest of oil-bearing seeds, sugar beet, tobacco, potatoes, and other vegetables, root fodder crops and fruit rose in recent years, and yields of the main crops increased.

As a result of the socialist reconstruction of agriculture large cattle-breeding farms have been set up in agricultural cooperatives and they make up the basis of animal husbandry in CMEA countries.

The material and technical facilities of large-scale socialist agriculture have been consolidated. More tractors, grain combines and other farm machinery and equipment work in this sector and more mineral fertilisers are used.

Notable achievements were registered in

the transport system. From 1950 to 1969 freight carriage by all modes of transport increased five times in all CMEA countries.

The railways, as hitherto, remain the leading mode of transport. An essential part is played by the mercantile marine. It has more and better vessels, new ports were built and old ones reconstructed. Motor transport was highly developed and it holds now an important place in freight carriage. The role of air transport is mounting with every passing year.

CMEA member states trade with many countries. Between 1950 and 1969 their total foreign commerce increased 6.6 times (exports 6.5 times and imports 6.7 times). The foreign trade of all CMEA countries in 1969 amounted to about 48,900 million rubles. Of this sum the USSR contributed 40 per cent; the German Democratic Republic, over 15 per cent; Czechoslovakia, more than 12 per cent and Poland, almost 12 per cent. All CMEA countries account now for about 10 per cent of world trade.

In recent years more than 60 per cent of the total foreign commerce of CMEA countries consisted of reciprocal trade. At the first stage in the development of their economic relations trade was conducted on the basis of annual agreements and since 1951, of long-term agreements. Trade with developed capitalist countries holds quite a substantial place in their goods exchange. West European countries are the main trading partners in the capitalist world.

The composition of exports and imports changed considerably in recent years. This applies above all to the expansion of trade in machinery and equipment and a rise in the share of this group in total foreign commerce. The figures in the *Yearbook* reveal a tendency towards extending and deepening the ties between the national economies of the socialist countries.

Development of social production has created the conditions for improving the material and cultural standards of the population in CMEA countries.

In the last 20 years their population increased by almost 75 million and at the end of 1969 reached 346 million or about 10 per cent of the world population. The life-span was lengthened and mortality, especially of infants, was sharply reduced. For average longevity the population of CMEA countries stands now in one rank with countries having the biggest life-span. The size of the urban population substantially increased.

Improvement of the living standard is shown by the rise in real wages of persons employed in the national economy. Between 1960 and 1969 real wages increased by 35 per cent in Bulgaria, 24 per cent in Hungary, 17 per cent in Poland, 35 per cent in Rumania, 27 per cent in the USSR (real income) and 21 per cent in Czechoslovakia (1968).

The rise in real wages was accompanied by a sharp increase in retail trade; moreover, the share of non-food goods is growing in total purchases. Considerable changes also occurred in the composition of the consumed foodstuffs.

Notable successes were registered in education, culture and the arts in the last 20 years. Particularly notable are the achievements in higher and specialised secondary education. The number of libraries and their book fund increased as did the attendance of theatres and cinemas and the number of newspapers and magazines. The radio and TV network was extended. In 1950 there were only two TV centres (in the USSR), while now there are 221. To cope with the swift and ever-wider flow of information national communication facilities were extended and automatic communication systems were established between CMEA countries.

The working conditions are steadily improving and appropriations for the health services and recreation facilities are being extended. The network of medical establishments was considerably enlarged. No capitalist country has as many doctors per 10,000 of population as the CMEA countries.

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The economic achievements of CMEA members are a result of the devoted work of their peoples led by the communist and workers' parties.

The 23rd and 24th sessions of the Council for Mutual Economic Assistance emphasised that the community of socialist states, welded together by common fundamental class interests and aims and guided by the single ideology of Marxism-Leninism, must rely on a system of a stable international socialist division of labour which ensures the close interaction of the national economies of CMEA member countries. Data given in the *Statistical Yearbook* show that these countries created the prerequisites for carrying out the long-term comprehensive programme of socialist economic integration.

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С. ТЮЛЬПАНОВ. *Очерки политической экономии. Развивающиеся страны.* М., Изд-во «Мысль», 1969, 375 стр.

S. TYULPANOV, *Essays on Political Economy. Developing Countries,* Moscow, Mysl Publishers, 1969, 375 pp.

The monograph of Sergei Tyulpanov, Professor of Leningrad University, seeks to elaborate from Marxist-Leninist positions the problem of the rise of a new mode of production in developing countries. What this new mode will be—capitalist or socialist—depends on a complex of internal and external factors, the intricate interaction and contradictory tendencies the development of which are thoroughly examined by the author.

The Soviet scientist arrives at the conclusion that the leading law of the epoch is the emergence of the socialist mode of production in former colonies with precapitalist relations. Alongside general questions of political economy, the author examines such important problems like the relationship of economics and politics in newly-free countries, specific features and contradictions of the reproduction process, the role of external and internal factors of economic growth and the economic functions of the state, the laws of socio-economic changes, and so on.

S. Tyulpanov regards accumulation as a key problem of the developing economy and discusses the role of different structures in its solution. On the basis of the available material he formulates the conclusion that the community, if it preserves features typical of this structure, has no conditions for accumulation; the possibilities of accumulation in the feudal and semi-feudal structures are extremely limited. The petty-bourgeois structure, though it quantitatively prevails, cannot be a big source of accumulation owing to its low productivity and also the insufficient development of the financial and banking system, as a result of which savings of the small-commodity sector usually do not go beyond its bounds and are used for consumption.

Theoretically, the private-capitalist structure has to be the main source of accumulation in countries which develop along the capitalist path. But in most of the newly-free countries the private-capitalist structure is insignificant for its size and cannot create sufficient accumulations.

S. Tyulpanov holds that in developing countries a sharp rise in the rate of accumulation on a national-economic scale and, consequently, the attainment of stable and high growth rates can be achieved only by extending and deepening the economic function of the state.

Analysing the economic function of the state in developing countries, the author considers its consistent development an indispensable requisite for progressive socio-economic changes. In different combinations, with a differing degree of consistency and depth this function of new sovereign states is associated with the creation of state forms of property, control over foreign monopolies in the country and activity aimed at a general change in the working conditions and a rise in the living standard of the people; with a restriction and abolition of different forms of precapitalist exploitation of the peasants and a purposeful use of internal and external accumulation sources.

The objective necessity for socio-economic changes stems from the internal and international conditions of development of the national-liberation revolution. Irrespective of whether the anticolonial revolution occurred in a peaceful way or through armed struggle, socio-economic and national changes raise approximately equal problems. The measures spontaneously carried out by the masses, effected from below in the course of the struggle for national liberation and forcible measures by the state show great similarity. This provides weighty evidence of the existence of an objective basis for socio-economic reforms. It is utilised increasingly, with the state acting as organiser and employing the force of law. The book has a special section analysing the laws governing socio-economic changes in developing countries in which much attention is given to measures for restricting and abolishing the positions of foreign capital in the national economy.

Marxists have always opposed the domination of foreign capital in developing countries because it forms the basis for neocolonialism, foreign exploitation and oppression. The domination of foreign capital is incompatible with the economic and political independence of new sovereign countries. At the same time life shows that the growth of some sectors of the economy in developing countries demands the temporary attraction of foreign capital into a country. In view of this, the author puts forth three main criteria linked with the attraction and the functioning of foreign capital.

1. Economic efficiency on a national-economic scale. A considerable part of the value

created with the participation of foreign capital must remain in the country where it is produced.

2. Minimum autonomy to foreign capital in a country's economy, maximum control over it, its diffusion and prohibition of economic and political concentration.

3. Foreign capital must not reinforce the elements of the economy's colonial structure but promote its diversification, greater stability and the building of the industrial and technical basis of national independence.

Success of the struggle against foreign capital, its enlistment and control over it, naturally depends on how the international situation is shaping concretely for the given country, the alignment of classes and social groups on the given question within it, how stable and consistent is the anti-imperialist tendency of the state.

It is impossible to enumerate all the main questions which have been elaborated or scientifically analysed in the monograph. We shall merely say that the author has examined problems important for economic and social progress, like industrialisation, land reforms, expansion of the home market, reconstruction of external economic ties, the problem of mixed enterprises, the role of the infrastructure in economic development, finances, credit, money circulation and other problems. All these questions are examined from the viewpoint of the prospects of the further intensification of the anti-imperialist tendencies in developing countries and the prospects of their effecting changes of a non-capitalist, pre-socialist and socialist nature.

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Политические партии Африки. М., Изд-во «Наука», 1970, 343 стр.

Political Parties of Africa, Moscow, Nauka Publishers, 1970, 343 pp.

This volume prepared by a group of researchers of the Africa Institute, USSR Academy of Sciences, is neither a collection of articles about Africa's parties, nor a political handbook. It presents a broad canvas of present-day Africa's political life. An analysis of the history, programme documents and practical activities of African parties reveals their main distinctions and major tendencies of development. The authors cover such important problems like the prerequisites and distinctions in the formation of these parties, including their origin and social basis; the role of preclass contradictions in political activities; the influence of external factors on the shaping of parties; the one-party system in African conditions, the creation of a vanguard party of the working people, and so on.

The authors point out that anticolonialism, antiracialism and to a certain extent antifeudalism of the advanced sections of African society were the main social prerequisites for the rise of political parties in Africa and their activity. As for the social basis of parties, it is marked by extreme diversity. The main reasons for the relatively wide social mainstay of parties are the multistructural economy and the consequent incomplete process of class formation. From this follows the non-coincidence, in most cases, of the "party" and the class boundaries. On the whole, as the authors remark, an amorphous structure is typical of political parties. African political organisations which existed prior to independence were sooner mass anti-imperialist, anticolonial, nationalist movements rather than parties in the general sense accepted among Marxists. The political heterogeneity of their composition is a reflection of their general popular (and not class) nature. Of course, there were also class parties, for example, Marxist workers' and bourgeois parties. But they were the minority. The above distinction of African parties has been preserved in some cases up to the present.

The authors also examine ethnic, caste and other factors of the preclass period, which greatly influenced political parties in countries of Tropical Africa. The authors discard the simplified notion that under any circumstance "ethnic parties" played an adverse part in the political destinies of Africa.

In the opinion of Soviet researchers, these parties, just as political-religious sects, were the initial and inevitable stage of political activity in colonial society.

But after winning state independence the preservation of ethnic parties began to hamper the crystallisation of general national unity. In this connection many African political leaders think that it is the struggle against tribalism in political life that imperatively dictates the introduction of a one-party system because a multiparty system in African conditions would tend to preserve the tribal fragmentation of a country's population.

One merit of the book is that the authors strive to group the vast number of African parties, to sum up their theoretical postulates and political activity, and classify them. All the parties of the continent are divided into three main types: revolutionary-democratic; Marxist-Leninist; bourgeois and pro-bourgeois (the latter type includes parties of the European population in the Republic of South Africa and Rhodesia).

The specific social conditions, the distinctions in the shaping of class and national consciousness in African countries, lastly, the needs of socio-economic development and the continued struggle against imperialist influence have largely determined the extensive spread of *parties of the revolutionary-democratic type.* For a long time they remain the basic form of organising the democratic, progressive forces of society. These parties, for all their differences in organisational structure, forms of activity, traditions, and so on, are united by a desire to facilitate non-capitalist development. In independent African countries they head the advance along the non-capitalist path and in the remaining colonial possessions they lead the struggle for national liberation.

At present revolutionary-democratic parties pay particular attention to the struggle for economic independence. All of them have completed in the main the elaboration of their own concept which essentially consists in that the ruling party is considered the leading and organising force of social, cultural and economic progress; the state apparatus is regarded as the main instrument for carrying out the party's policy; planning is looked upon as the principal method of economic, cultural and social development. The rooting of these views in revolutionary-democratic parties has been expressed in the establishment and consolidation of the swiftly growing state sector in the economy and in restricting private capitalist enterprises. These views serve as the basis for the programmes of reforms of a pre-socialist nature launched by revolutionary-democratic parties.

The authors examine in detail the activity of *Marxist-Leninist parties* which most consistently express the interests of the working people—workers, peasants and the working intelligentsia. In the last 30 years the membership of communist parties in Africa has steeply increased. Some of the Marxists are members of ruling revolutionary-democratic parties; others participate in the struggle of revolutionary-democratic parties which are heading the national-liberation movement. In countries with pro-Western regimes Marxists belong to opposition parties. The communist parties in Africa are energetically working to unite all the Left forces.

The book carries considerable material illustrating the multifaceted activity of African communists, their struggle for the consolidation of independent young states, for socio-economic progress, and revealing the objective and at times subjective difficulties the communist movement encounters in this continent.

Bourgeois and pro-bourgeois parties represent a third type of African political parties. In some countries these are parties of the national bourgeoisie. Many of them arose already in the colonial period and played a telling part in the national-liberation movement. In other countries these are parties of the so-called bureaucratic bourgeoisie which is often closely linked with the incipient national bourgeoisie and neo-compradore elements. But the question arises, is it possible to place them among bourgeois parties in the usual meaning of the term? The authors furnish the following answer: "The incompleted process of class formation and the general aims of the struggle which are common for almost all social groups have determined the fact that political parties, even though they are led by representatives of the bourgeoisie and bourgeois intellectuals have arisen and operate as parties of the whole people both for their composition and for the demands they put forward. From this point of view they cannot be considered class organisations or, to put it more precisely, their class nature at the first stage of the liberation struggle is glossed over, it, as it were, is relegated to the background." The authors emphasise that "so far one thing is clear: these are not bourgeois parties in the generally accepted sense of the word". After the winning of state independence the class nature of such parties as "potentially" bourgeois begins to loom more or less distinctly, although their leaders in words often reject capitalism and put to the fore various theories of so-called African socialism. A keen

internal struggle between different groups goes on incessantly in the ranks of these parties, reflecting clashes of different social interests within the bounds of one and the same ruling party, which often is the only one in the country. In this connection, as is shown by the authors, there is every reason for regarding the one-party system in African countries with a capitalist orientation as being of a formal nature.

The development of political parties in Africa is proceeding amidst the deepening of the national-liberation revolution in the continent, and African parties reflect its strong and weak sides. The authors draw the right conclusion that a noticeable imprint in the history of the continent will be left by parties which lead their countries in the fight against imperialism and strive radically to break up the colonial and neo-colonial order, to advance the economy, democratise social life, emancipate spiritually the individual and achieve social progress.

Ya. Etinger,
Cand. Sc. (Hist.)

В. КУТЕЙЩИКОВА. *Мексиканский роман. Формирование. Своеобразие. Современный этап.* М., Изд-во «Наука», 1971, 333 стр.

V. KUTEISHCHIKOVA, *The Mexican Novel. Its Formation. Distinctive Features. Present Stage,* Moscow, Nauka Publishers, 1971, 333 pp.

Marxist literary critics in Latin America, beginning with the outstanding Peruvian José Carlos Mariátegui, have always examined the national literatures of the continent and their specific features in close connection with the historical destinies of the peoples who created them. The "visage" of Latin American literatures, reflecting the consciousness of the peoples which evolved over the centuries, emerges in the complex process of the formation of historically new nations, in the course of the reciprocal influence and interaction of different cultural, ethnic groups, in the interlacement of conflicting internal and external factors.

The monograph under review is a striking instance of the fruitfulness of studying the literatures of the continent in close connection with the historical process of the formation of nations. The author has taken as the starting point of her research literature as an expression of the national consciousness of the Mexican people and as an active factor that helped to shape it. This approach offered wide scope for selecting material and analysing it. The history of the novel—the leading genre in modern literature—is traced in close conjunction with social processes, ideological trends, philosophical thought and different kinds of national arts, thus bearing out the truth of the view voiced by M. Bakhtin, a prominent Soviet literary critic, that literature can be properly understood only in the context of the entire culture of the given epoch. However, the monograph's voluminous historico-cultural material has not "dissolved" the specific features of literary development. The author has avoided tracing the history of literature directly through the prism of socio-political and ideological processes.

The history of the Mexican novel is examined both in the context of the processes of national history and culture and of the development of literature in the continent as a whole, and in the context of West European and Russian Soviet literatures. The author rightly considers that some of her conclusions about the specific features of the literary process in Mexico apply equally to the entire continent. An interesting conclusion is that certain peculiarities of the continent's literary development, such as the violation of the customary order in which artistic methods and aesthetic systems replaced one another. a certain uneveness and speeding up of the development of literary trends, which hampered periodisation, stem from the interaction and counteraction of many of these trends. In the author's opinion this is due to the functional, non-differentiated character of Latin American literatures (that is, their concern not only with literary art, but also with historiography, sociology, publicism, etc.), and to their orientation on European, and, later, on North American models.

The history of the continent's literatures in the 19th century is particularly notable in this respect. Romantic aesthetics, which Latin American writers studied in Europe, gave rise to a very specific kind of literature. The author focuses attention on certain features of Latin American romanticism (its accentuat-

ed "national function", the progressive nature of its content, the emphasis on collective "national individuality", as distinct from the individualism of European romanticism), showing, at the same time, that the proportion of romantic works is anything but considerable compared with Costumbrisme which is often far removed from true literature.

The chapter "Epoch of Revolution" constitutes the monograph's central part where all the threads of the author's analysis converge. The bourgeois-democratic revolution of 1910-1917 was one of the last acts in the dramatic process of the formation of the Mexican nation and its culture. In the crucible of this revolution Mexico's realistic art was born, imbued with a spirit of social criticism, of revolutionary enthusiasm and possessing truly original features. The author shows that its aesthetic independence sprang from the specific character of the revolutionary experience, from the social practice of the young nation. The book successfully copes with one of the main tasks of literary criticism, that of examining the history of the novel in the context of historical and cultural development. The reader learns of philosophical, ideological and aeshetic trends and of their impact on the history of the novel. Of particular interest is the analysis showing the interconnection of the revolutionary novel (in particular the works of Mariano Azuela) and the frescoes of Crozco, Rivera and Siqueiros who created the image of the central hero of the epoch—the fighting people. The strength of Mexican art of the revolutionary epoch is in its affinity with the people's aesthetic and ideological concepts. Interesting, too, are the author's conclusions regarding the close bond between the artistic principles of the novel of the revolution and those of folk art, and, in particular, her observations that the image structure of the novel of those years has many features in common with the folk songs of the corrido genre.

The aesthetics of the novel of the revolution, reflecting the aesthetics of revolutionary reality, of social upheaval, is a discovery of the 20th century, the century of national-liberation movements and revolutions, the century when the Mexican novel entered the stream of world literary development. The author compares the poetics of the novel of that period (Mariano Azuela, Martín Luís Guzmán, José Rubén Romero, Gregorio López y Fuentes and others) with Soviet prose about the revolution and the Civil War (I. Babel, V. Ivanov, A. Vesely, A. Malyshkin, and others), shows both the direct influence exerted by Soviet writers and the historically conditioned affinity of their methods. Such an approach helps to perceive in the background of a "foreign" culture the new features of the literature studied.

The author brings the history of the Mexican novel up to the 1960s, charts some of the possible perspectives of its development, shows that the crises it experienced were sparked by the changes in the life of the country during the period of stabilisation of capitalist relations. The new reality called for new aesthetics in art, renovation of the realistic method, of the entire system of artistic means. The synthetically generalised image was replaced by more refined, analytical methods of reflection; the collective hero, formerly the principal figure of portrayal, was superseded by the individual; a sharp differentiation took place in the individual styles of the country's writers. At the same time, however, provincialism, regionalism (Agustín Yáñez, Juan Rulfo, Carlos Fuentes) was relegated to the past, the writers turning their attention to worldwide intellectual and moral problems. If formerly the Mexican novel (like Latin American literature as a whole) was indebted to world literature whose experience it copied, today the best works created in the continent can rightly be included in the cultural heritage of the world.

V. Ilyin

Наследие Ленина и наука о литературе. Ленинград, Изд-во «Наука», 1969, 396 стр.

The Lenin Heritage and the Science of Literature, Leningrad, Nauka Publishers, 1969, 396 pp.

Soviet scientists have written a number of articles and books devoted to a study of Lenin's views of, and statements on, problems of aesthetics, art and the theory and history of literature. The authors of the new collection strive to show the wealth of instructive material for literary scholars contained in the works of Lenin which at first glance might seem far removed from problems of literature *(What Is To Be Done? Materialism and Empirio-Criticism, Philosophical Notebooks, Imperialism, the Highest Stage of Ca-*

pitalism, "Left-Wing" Communism, an Infantile Disorder, and other writings).

Each article in the collection has its own subject and offers its own solution. But for all that the book leaves the impression of an integral whole both in conception and execution. The binding element is the aim of the authors to give the reader an ample idea of the art of the Marxist analysis, the Leninist principles and methods of scientific research, to determine their importance for the study of literature.

In this context mention should be made first of all of the article by A. Bushmin "Principles of Scientific Analysis in Lenin's *Materialism and Empirio-Criticism*". The author examines the problems and structure of this work, which is rightly considered a model of the application of the dialectical method in scientific congnition. Tracing how the exposure of a particular philosophical trend grows over into an exposure of the insolvency of positivist varieties of idealism, Bushmin emphasises the logic of proof and the partisan evaluation which here, as in all Lenin's works, are a consequence of the objective analysis and are always given on the basis of a strictly scientific examination of the facts.

The problem of partisanship is discussed throughout the article but it is especially brought out in one of the central chapters—"Unity of Objectivity and Partisanship in Marxist Sciences". Entering into a polemic with bourgeois ideologists, who seek to prove that communist partisanship supposedly is incompatible with scientific objectivity, Bushmin shows that time and again these ideologists in a purely philistine way equate the principle of partisanship with selfish considerations, group passions, subjective intentions, and so on, perceiving in Marxism a variety of pragmatism. In reality, however, as Bushmin points out, "Marxist partisanship has nothing in common with pragmatism. While from the standpoint of pragmatism 'everything that leads to success is right and true' from the viewpoint of Marxism 'only that which is right and true leads to success'. Here we have a different understanding of success (aim). In the first case, what is meant is the immediate benefit, individualistic interests of man of bourgeois society; in the second, the lofty interests of progressive historical development."

It is these lofty interests that Lenin always considered first and foremost. That is why his method was marked by scientific objectivity, implacability of its partisan evaluation, profound historism and the desire to examine every question in its independent essence and in all its intricate dialectical connections with other questions.

Lenin raised and solved on a broad historical, sociological and philosophical plane such a primary question of the socialist revolution as the national question. Many of his works are dedicated to this problem and they are in the focus of attention of L. Yershov and A. Khvatov, authors of the article "National Traditions in Soviet Literature (in the Light of the Leninist Doctrine of Socialist Culture)". Speaking of the indissoluble dialectical unity between the national and the international and how the national tradition consolidates those progressive elements which meet the interests of the nation as a whole, the authors show that Lenin approached the national question, just as the problem of national culture, in a historically concrete way, in connection with the developing liberation struggle of the proletariat. In the new historical conditions he further developed the Marxist doctrine, disclosing the dialectics of the living contradictions contained in the concepts "nation" and "national culture". He opposed the bourgeois nationalist concepts of the unity of national culture under imperialism. Lenin pointed out that relying on the democratic and socialist elements, Marxists show them in contrast to the bourgeois culture and the bourgeois nationalism of every nation. "This, however, does not mean that Lenin did not recognise the unity of national culture in its deepest manifestations," the authors point out.

The Leninist interpretation of the national and the international was embodied in cultural development after the October Revolution. In contrast to the apostles of destruction who mounted high-sounding revolutionary phrases but did not understand anything in the laws governing the development of the new culture ("Communist Futurists", proponents of "proletarian culture", "Left Futurists"), he formulated the doctrine of continuity of the finest world and national traditions.

The undoubted merit of many articles in the collection is that their authors, as distinct from some predecessors who at times confined themselves to an empirical study of Lenin's works, strive for theoretical generalisations and conclusions and are able to apply them concretely and fruitfully in literary studies. Here mention should be made of the article by E. Kupreyanova, "Lenin on the Dialectics and the Concept of the Historical and Literary Process". She consistently analyses Lenin's theory of reflection, the relationship of ma-

terialism and dialectics in Marxism and recalls the need to establish the connection of every concept with all others. It would seem that all these are maxims, but they are not always ably applied. In the opinion of the author, such difficulties are encountered by literary scholars in defining specifically such historico-literary concepts as classicism, romanticism and realism. Attention is usually concentrated on bringing out and enumerating some constant, immutable and, consequently, static typological features. They ought to be studied, however, not only in this plane but above all in the aspect of their dialectical connection, transition of one into the other and also into their opposite which negates the old and retains and deepens all its positive content.

The book encompasses a wide range of important problems. It shows how Lenin developed Marxist aesthetical thought; it discusses problems of the crystallisation of socialist realism in the light of the theory of reflection; the influence of Lenin's ideas on studies of Russian literature in other socialist countries. There are also articles of a narrow specialised character. On the whole, the collection is a meaningful and topical book which sheds light on important problems.

V. Grechnev,
Cand. Sc. (Philol.)

Закономерности развития литературных языков народов СССР в советскую эпоху. М., Изд-во «Наука», 1969, 1-й том — 435 стр., 2-й том — 483 стр.

Laws of Development of the Literary Languages of the Peoples of the USSR After the 1917 Revolution, Moscow, Nauka Publishers, 1969, Vol. 1, 435 pp.; Vol. 2, 483 pp.

The first two volumes of the monograph under review are a significant contribution to Soviet linguistics. The first volume shows the main achievements in developing the Iberian-Caucasian and Iranian languages, the second—the achievements in developing the Turkic, Finno-Ugric and Mongolian languages, and the languages of the peoples of the North. It is interesting to note that most of the authors of the articles published in these two volumes are the bearers of the languages which are the subjects of the study.

The volumes under review are the first work which comprehensively treats the important problems of the development of phonetic structure, the lexical and semantic, morphological, syntactic and stylistic systems of literary languages which are of great importance for working out the methods of teaching both the native and the Russian languages in Soviet schools. Each article to one or another degree deals with the problem of bilingualism, the solution of which requires the efforts of a number of adjacent sciences: linguistics, psychology and methodics. The analysis of this problem in each chapter makes it possible to define vitally important aspects of research into different types of bilingualism and multilingualism with due consideration of the basic interests of the peoples inhabiting the USSR.

As is known, the formation of literary languages in the USSR in conditions of free and equal national development was a very intensive process which depended, to a considerable degree, on the scale of social functions performed by each language on the territory of the given republic or region. The authors of the collective work set themselves a very complicated task: to show the processes of development, stabilisation and perfection of contemporary literary languages, and to analyse the changes in their structures which took place after the October Revolution. It was established, in particular, that in their development both old literary languages and those which had no alphabets before the October Revolution possess many common features. Structural changes of languages are a very slow process, it takes place through the gradual accumulation of new elements at all linguistic levels. The most important changes take place, first of all, in the lexical composition of languages. Changes also occur in the phonetic system and grammatical structure. The two reviewed volumes offer a detailed description of these processes both as regards the given groups of languages and the concrete languages.

Each chapter first examines general trends of development of literary languages and then development of some concrete languages. The authors approach linguistic

phenomena as being systemic. They disclose this not only in the changes caused by inter-linguistic factors, but also in lexical and grammatical shifts caused by cultural and historical factors. Another, no less important, merit of the volumes is the fact that the phenomena of different linguistic levels are analysed in their interconnection. Thus, for instance, changes connected with the borrowing of vocabulary and terms lead also to the transformation of the phonetic system of language (the borrowing of some vowels and consonants, violation of uniformity in stress and in the syllabic composition of words, etc.). The development of the lexical composition leads to the transformation in word-building (many productive and non-productive affixes become active, the role and productivity of word-formation increases, some new models of word-building become active, some affixes of word-building are borrowed from other languages, etc.). Of the greatest interest, in our opinion, are those chapters in which systemic transformations in individual languages are traced from the first written memorials till our times. The monograph is based on rich factual material which is systematised by respective methodological concepts determining the logical structure of the volumes.

In conclusion we should like to note that authors' deductions are based on carefully checked fresh data. The volumes under review show that the Soviet experience in creating alphabets for peoples, who did not have written languages, the development of orthography, terminology, the social functions of languages, enhancement of the latter's role in the socio-political, cultural and scientific life of their bearers, can be successfully used in the developing countries.

Ye. Bokarev,
D. Sc. (Philol.),
A. Shabanov,
D. Sc. (Pedagog.),
Kh. Sukunov,
Cand. Sc. (Pedagog.)

Русский язык и советское общество. М., Изд-во «Наука», 1969, 4 тома.

The Russian Language and the Soviet Society, Moscow, Nauka Publishers, 1969. 4 Vols.

What developments have taken place in the Russian language in Soviet times? What influence has been exercised upon it by the new social formation? The monograph in question, produced by the Russian Language Institute of the USSR Academy of Sciences, was intended to provide an initial reply to these questions.

There have been two different approaches to the history of languages—some philologists have sought to explain everything new solely by the impact of social environment. Others, on the contrary, have considered the development of any language system as an "internal" process, a spontaneous movement dependent on the properties of the given linguistic system. Neither of these approaches was able to explain the nature of the changes that have occurred in the Russian language over the last fifty years. It was necessary to combine the study of inner laws governing linguistic developments with the "external" social influences. It is well known that development is a struggle of opposites. This concept alone "furnishes the key to the 'self-movement' of everything existing".[1] The development of a language is likewise determined by inherent opposites. The monograph has made an attempt at revealing some of the most important of them. Mention should be made, for instance, of the "antinomy of the speaker and the listener". Both are interested in the correct understanding of the communicated idea. They have, consequently, a common goal. However, the speaker is concerned with simplifying the utterance, whereas the listener is concerned with simplifying the process of perception. Frequently the two intentions come into conflict. For instance, the speaker finds it convenient to pronounce the words in a negligent and superficial manner (many phonetic trends are explained by the "economy of pronouncing effort"), but for the listener this manner is acceptable only in certain conditions, namely, when he is in close contact and in a posi-

[1] V. I. Lenin, *Collected Works*, Moscow, Vol. 38, p. 360.

tion to ask the speaker to repeat. Consequently, the development of communication is contradictory, since it either benefits the listener or the speaker. The gain of one conflicting party evokes the need to compensate the loss of the other party.

Another opposite is the "antinomy of the linguistic code and the text". The book mentions other internal contradictions as well, which lead to linguistic developments and determine the inner dynamics of a language. Internal contradictions, it appears, are not non-social. On the contrary, they are determined by the social purpose of the language as a most important means of human communication. It is generally accepted that in its very nature language is not a class phenomenon. It does not disappear when classes change, nor does it experience revolutionary upheavals. Its innermost contradictions determine its self-progress in any social conditions. Consequently, they should be set apart from the other factor stimulating its development, that is, from the direct impact of concrete social conditions, which differ depending on the epoch.

The internal and external laws of linguistic development are correlated. It has been noticed, for instance, that at periods of language democratisation, when its social basis is expanded, the "antinomy of the linguistic code and text" is decided in favour of the text, i.e., the vehicles of the given linguistic system (in their new, broader and more democratic composition) display greater willingness towards curtailing codes (even if this entails a lengthening of texts) than towards introducing changes of an opposite character. For instance, such a word combination as "brother-in-law" is substituted by the descriptive "brother of the wife" and "brother of the husband", and so on. There is a general tendency to replace brief indications of remote relationships by descriptive formulae. The texts grow longer but the linguistic code (which in this particular case is a set of lexical units) is shortened: words like "brother-in-law", etc., are doomed to gradual extinction. This is one of the tendencies of contemporary lexicological development. It can be traced from many facts, and in different sections of the lexical system. This is what the authors of the monograph have done. Such processes are a common occurrence in terminology: the influence of scientific language on everyday language is intensified in our epoch in connection with the development of education and the introduction of compulsory secondary education.

The above-mentioned examples give an idea of the methods employed: the inner tendencies of language development (the antinomy of the linguistic code and the text) are studied in connection with the direct social influence which is exercised upon it (the expansion of the social circle of the vehicles of literary language and the influence of science upon the language). The monograph analyses a wide range of problems from this angle. The first volume, which deals with vocabulary, explores the following questions: the ways of stocking up the vocabulary of the Russian literary language in Soviet times, the use of professional vocabulary in literary speech, the adoption of foreign vocabulary, the re-understanding of certain notions in the post-October period and the ensuing modification of the evaluative and stylistic colouring of corresponding words; the correlation of the spontaneous and conscious factors in the formation of terminologies... (I have listed only a small section of the problems covered in the lexical volume of the monograph.)

There is a similar approach to the subject in question in the grammatical volumes of the monograph. The morphological system of the modern Russian literary language is dominated by the tendency towards increasing analytism. The monograph provides a thorough theoretical motivation as to which processes should be regarded as factors conducive to greater analytism in the grammatical system. It was noticed, for example, that intra-linguistic tendency increased, and sometimes underwent qualitative modifications, as a result of social influences exercised upon the language, typical of the new, Soviet epoch. From this point of view the morphological volume discusses such processes as the stability of the morphological system with regard to social influences; the role of social factors in the expansion of aspectual pairs among verbs, the emergence of a new grammatical class of words—the analytical adjectives, the stylistic changes in the morphological system, and so on (we have dealt with only a few of those mentioned in the monograph).

The volumes (and their sections) dealing with word-formation, syntax and phonetics of the literary language are arranged according to the principle of exploring the internal and "external" stimuli affecting the development of language. Changes

occurring in the vernacular in Soviet times have been analysed. Linguistic research carried out proves convincingly that in our epoch the history of language does not imply merely some spontaneous intralinguistic processes. On the contrary, an increasing influence is deliberately exercised by the public in the development of vocabulary, phonetics and, to a smaller extent, grammar. A struggle is going on with everything that clutters up the language and is not evoked by its logical development. This struggle waged by the Soviet public for a full-blooded Russian language preserving its finest cultural traditions, is likewise described in the monograph.

The authors use the results obtained through a mass poll circulated with the help of several thousand specially compiled questionnaires, dealing with phonetics, word-formation and morphology. The returns were processed by computing machines at the Central Statistical Board. The research staff obtained over a million figures socio-linguistically characterising the modern Russian language. Some of the figures were included in the monograph, so that now we can judge the linguistic tendencies of various age, professional and local groups of the Soviet population, and explore linguistic differences found in people belonging to different educational strata, and so on.

Some linguists are rather dubious about the questionnaires. When giving answers many people make mistakes and unconsciously distort the picture of their linguistic habits. In this connection, a special system of questions had been worked out in conjunction with psychologists which checked up upon one another. The people giving replies (unless belonging to a linguistic profession) were unaware that their answers were being compared on the spot. Along with the questionnaires other sources of factual information were used, such as speech recordings, fiction, scientific and publicist writings. This variety of sources is yet another distinctive feature of the monograph which has made a considerable contribution to the socio-linguistic study of the dynamics of the modern Russian language.

M. Panov,
D. Sc. (Philol.)

XVII век в мировом литературном развитии. М., Изд-во «Наука», 1969, 502 стр.

The 17th Century in World Literary Development, Moscow, Nauka Publishers, 1969, 502 pp.

This collective monograph is perhaps the first attempt undertaken by Soviet literary scholars to examine the 17th century as a single process essentially differing from the preceding Renaissance and the subsequent Enlightenment. The authors regard the 17th century as an essential period in the history of West European cultures. Moreover, they analyse the literatures of the East, which despite their national specificity have features which typologically draw them closer to literary development in the West.

Considerable space is given to the historical background of the epoch and its main features, which involves a sharp polemic against the existing one-sided and simplified viewpoints.

The 17th century is considered an important turning-point in world cultural development. Without breaking with the gains of the Renaissance it prepared the way for the Enlightenment. The authors highlight the tremendous influence exerted on the general development of culture in that period by the powerful mass movements even if they did not lead (as was the case, for example, in England) to a radical break-up of the existing social order. This influence of the popular democratic forces also affected the development of realistic literary genres, above all the novel, equally characteristic both of the literatures of Western Europe and the Far East, the evolution of the satire, and so on. Its effect was also felt by many writers who adopted the artistic principles of such leading creative methods of that epoch as Classicism and Baroque. These methods are examined in the book in all their diversity, mutual influence and conflict.

Thus, the authors refuse to consider Mannerism, Baroque and Classicism as creative methods which successively replaced each other, although such a viewpoint is still current in world science. In examining their specific features and evolution, their seclusion, or autonomy is vigorously denied. Moreover, what is stressed is their

inner complexity and the existence not only of specifically national variants but also of different transitional forms (so-called "Classicising Baroque", "Baroque Classicism", and the like).

The tendency towards a realistic reflection of life revealed in the 17th-century literary process is fundamentally important. The book also shows that the artistic gains of Renaissance realism did not disappear in the next epoch; they were developed and enriched and subsequently formed the basis for Enlightenment realism. The rich legacy of 17-century social novel which gave world literature the remarkable books by Mateo Alemán, Agrippa d'Aubigné, Charles Sorel, Francisco Quevedo, Paul Scarron, Hans Grimmelshausen and others, are not dissolved in the creative method of Baroque of Classicism, but neither are they put up in contrast to the works of Pierre Corneille, Molière, Jean la Fontaine or Madame de la Fayette.

The 17th century, an era of social shifts and ferment, of bold artistic quests, thus saw an additional development: a new creative method, realism, was gradually shaping within its framework. Although it was not yet fully singled out from the leading methods of that period, the future belonged to it.

The picture of the 17th century as an integral specific epoch would be incomplete had not the literary process in Western Europe, Russia and the East been shown against a background of, and in comparison with, the general development of the other arts, of culture in general. This wide cultural background is present both in the sections dealing with literature as such and in special articles on the evolution of music and painting in the 17th century.

A. Mikhailov,
Cand. Sc. (Philol.)

SCIENTIFIC LIFE

Research Work of the Institutes of Literature and Language, USSR Academy of Sciences

IZVESTIA AN SSSR, SERIA LITERATURY I YAZYKA (ANNALS OF THE USSR ACADEMY OF SCIENCES, LITERATURE AND LANGUAGE SERIES)

This bimonthly journal issued by the Literature and Language Section, USSR Academy of Sciences, was founded in 1940. Its contributors are eminent Soviet philologists, research associates of academic institutions and faculty members of universities and institutes, and also foreign scholars. Corresponding Member of the USSR Academy of Sciences D. Blagoi, eminent scholar of Russian classical literature who specialises in the study of Pushkin, has been its Editor-in-Chief since 1954. The journal is designated for a wide range of specialists—literary scholars and linguists, university instructors, postgraduates and school teachers.

The journal publishes works on major problems of philology and Marxist-Leninist aesthetics, questions of the partisanship and the class nature of literature, the theory of reflection, the relationship of the world outlook and method, objective and subjective factors of artistic endeavour, poetry and stylistics, the creative originality of the artist and form and content of literary work. Much space is given to the theory of literature, the laws and social role of literature, and the historically determined movement of forms and styles.

Many articles are dedicated to the multinational literature of socialist realism which ushered in a new stage in the artistic development of mankind. They analyse trends and styles and the diversity of genres of socialist art. The journal features articles on such an important subject as "Gorky and Soviet Literature", "Gorky and the Traditions of Russian Classical Literature". There were articles on the world significance of the poetry of Mayakovsky and on the works of the outstanding Soviet writer Alexei Tolstoy. The materials published for the 60th birthday anniversary of Mikhail Sholokhov shed light on some little-known facts of his literary biography, and the distinctive features of his writings were thoroughly studied. Considerable space was given to the study of the work of Konstantin Fedin. The characters of his novels and his style were characterised in a new way by D. Blagoi, B. Brainina and other literary scholars. Important questions of a comparative study of poetry were the subject of several articles devoted to Yesenin's art. Various aspects of the poetry of A. Blok and the writings of L. Leonov, K. Paustovsky and other outstanding Soviet writers were analysed.

A special issue of the jounal for the 50th anniversary of the Great October Socialist Revolution summed up the results of Soviet literary studies and linguistics over half a century. It carried articles about Soviet literature, poetics, the languages of Asian peoples and literatures of Western Europe and America. A special issue dedicated to the Lenin birth centenary presented materials on the history of Russian literature in the light of Lenin's views, his literary style, aesthetical problems of the 20th century, national languages and the national question.

Much space is given to the history of national literatures of Soviet peoples prior to the October revolution: a study of the peculiarities of national literatures, their interac-

tion and mutual influence, stages and typological tendencies of their development. The history of Russian literature (Russian writers represent the biggest group among all the authors of the fraternal Soviet peoples) attracts much attention. In recent years articles were published about the great memorials of mediaeval literature (*The Lay of Igor's Host* and the Georgian epic poem *The Knight in the Panther's Skin*), on the history of the Russian literature of the 18th and 19th centuries and on different aspects of the writings of G. Derzhavin, A. Radishchev, A. Pushkin, K. Batyushkov, F. Tyutchev, N. Gogol, I. Goncharov, I. Turgenev, F. Dostoyevsky, V. Belinsky, A. Herzen, A. Chekhov, I. Bunin and other writers. Summary articles and studies were put out for anniversaries of notable writers. A lively discussion is carried on in the rubric "Rostrum". In 1970, for example, it printed several articles about Griboyedov's famous comedy *Wit Works Woe.*

Studies of different questions related to the history of literatures of Western Europe and America are systematically presented, specifically articles on mediaeval European literature and also literatures of the Rennaissance period. Soviet scientists have made a notable contribution to the study of the works of Dante, Shakespeare, Lope de Vega and other world-renowned writers. There were articles on the history of foreign literature in the 18th and 19th centuries: the writings of Stendahl, Balzac, Hugo and Byron.

A comparative study of the folklore of different peoples, the interconnection of folklore and literature, and the ideological and aesthetical values of folk art are other subjects covered in the journal.

In the sphere of linguistics, the Editors aim to reflect the work done in linguistic institutes of the USSR Academy of Sciences and the Academies of Sciences of the Union Republics. The journal prints materials on questions of general linguistics, lexicology, the structure of modern languages and their functioning.

It will be recalled that Soviet scientists are now successfully elaborating the theory of grammar, classical and structural methods of linguistics, are working on a description of the grammatical structure of languages, and in recent years have paid attention to linguistic semantics. There are articles on questions of phonetic systems and processes in different languages; materials on the structure of the modern Russian language, its phonetics, morphology, syntax, history, stylistics and phraseology; the kinship of languages and language families; problems of the comparative-historical Slavonic linguistics; works on German and Romance linguistics (the late Academician V. Zhirmunsky, head of Soviet Germanists, was a member of the journal's editorial board and systematically contributed his works). Many materials deal with questions of Iranian and Finno-Ugric linguistics, with grammar, toponymics, history of Finno-Ugric languages and their connection with other languages, and also with Iberian languages. New languages of all continents are studied in the USSR and articles are written about rare and little-studied languages and dialects. Considerable attention is paid to problems of applied linguistics (machine translation, automatic summarising). The rubric "Materials and Communications" is given over to materials introduced for the first time in philology and articles dealing with specific questions of literary source studies and linguistics, letters of scientists, and different documents of interest to philologists.

A special rubric prints bibliographical summaries and reviews of the most outstanding works of literary scholars and linguists issued in the USSR and other countries.

The journal takes an active part in activities conducted by the Section of Literature and Language of the USSR Academy of Sciences and its institutes in preparing for different congresses and conferences. Specifically it prints papers of Soviet scientists and reports of the proceedings of these congresses and conferences. It is also a tradition in the journal to feature articles for jubilees of pro-

minent Soviet scientists which represent, as it were, a review of their activities. The journal regularly informs readers about the activities of scientific councils on questions of literature and language and about cooperation of Soviet and foreign scientists.

A. Kuzmin,
Cand. Sc. (Philol.),
Executive Secretary

THE GORKY INSTITUTE OF WORLD LITERATURE, THE JOURNAL **VOPROSY LITERATURY** (PROBLEMS OF LITERATURE) AND **LITERATURNOYE NASLEDSTVO** (LITERARY HERITAGE)

The family of Alexander Pushkin's daughter, Maria, whose image is believed to have been recreated by Leo Tolstoy in Anna Karenina had lived at one time in the house which is so uniquely associated with the history of Russian literature and is now the Gorky Institute of World Literature.

The Institute was founded in 1934 on the initiative of Maxim Gorky, who had long believed that a systematic study should be made of the literature of the peoples of the world, written down the ages. His idea was to make the Institute a scientific centre with research departments, a big specialised library, literary archives, and study-rooms for creative work. The Institute's Gorky Archives, the main depository of the writer's manuscripts and documents, and the Gorky Museum, which has many exhibits on the life, creative work and revolutionary and social activities of the founder of Soviet literature, were set up in 1937. The Institute's first important works were put out in 1939.

Important changes have taken place in the Institute's structure since its foundation, its staff has been enlarged to cope with an extensive research programme. During the 36 years of its existence, it has grown into an important scientific centre. It rightfully holds a leading place among Soviet literary research centres, and is carrying out a broad programme for studying the historical and theoretical experience of world literary development. The Institute puts out many publications which are popular not only in the Soviet Union but also abroad. Many of the books which the Institute compiled have been translated into other languages.

Today the Institute has four main departments: the Theoretical Problems, the Foreign Literatures, Russian Classical Literature and Soviet Literature. These in turn are subdivided into sectors and groups. The Insitute has several sectors which are organisationally independent of the departments. These include: the Complete Works of Maxim Gorky Sector, and the sectors concerned with the study and publication of the Soviet peoples' oral popular poetic art, and with the study of textual criticism. The Institute publishes the widely read *Literaturnoye nasledstvo* (Literary Heritage). Its manuscript department contains chiefly the archives of Soviet writers and literary associations of the 1920s and 1930s.

The Institute's staff of over 300 counts many eminent scholars, among them Corresponding Members of the USSR Academy of Sciences and Doctors and Candidates of Science. It would be no exaggeration to say that the Institute is a real smithy for specialists in multinational Soviet literary criticism. About 60 people, most of whom come from the national republics, annually do postgraduate work in the Institute where to date over 400 Doctors and Candidates of Science have defended their theses. Many of them now head scientific groups, have become well-known literary critics who take an active part in the literary process of today.

The elaboration of theoretical questions holds an important place in the Institute's work. Discussions are regularly held on major problems of literary criticism. Particularly notable were the discussions held in the 1960s on realism in world literature—they substantiated the historical approach to the study of realism in art—and the discussion on the in-

terconnection of national literatures, where the importance of elaborating the Marxist-Leninist conception of the interaction of the art of different peoples was emphasised. Another important event in the Institute's scientific and literary life was the conference "Contemporary Problems of Realism and Modernism", which charted the way for tackling the complex problems of the relation of the realistic forms of art with modernistic trends. The recent conferences "The Great October Socialist Revolution and World Literature", "Lenin and Urgent Problems of Literature" and "The Ideological Struggle and Problems of Modern Culture", dealt with contemporary ideological and artistic life and analysed the non-Marxist ideas in literature. The discussions and conferences were of fundamental importance, for by their methodological orientation they strongly influenced the development of several very important trends in the research activities of Soviet scholars.

The Institute's three-volume *Theory of Literature* is among the major general theoretical works on literary criticism recently put out in the Soviet Union. Its authors did not attempt a normative interpretation of the main problems to be tackled in this sphere, but showed their modification and enrichment in the process of the historical development of literature. The two-volume research work *Problems of the Art Form of Socialist Realism,* which takes issue with the anti-Marxist methods of analysing literary phenomena, will be put out in the near future. It accentuates the need to show the entire wealth of a work of art studied in unity of form and content. At present the Theoretical Problems Department is compiling a three-volume *Theory of Literary Styles,* where the authors seek to trace the causes that produced the formation of styles, to interpret the essence of the transition from one stylistic norm to another, and to show the laws of the stylistic development of Russian classical and Soviet literature.

The Institute is studying the historical experience of world literature on an ever growing scale. Fundamental research works have been compiled on individual national literatures, including the three-volume *History of English Literature,* the four-volume *History of French Literature,* the three-volume *History of Ancient Greek Literature,* the five-volume *History of German Literature,* and the two-volume *History of Roman Literature.* Monographs have been put out on the life and creative work of many renowned foreign writers, including Dante, Rabelais, Byron, Flaubert, Dickens, Andersen Nexö, Lou Siun and others. Also generalised works have been published on important periods of literary development, among them A. Yelistratova's *Legacy of English Romanticism and Modern Times,* D. Oblomiyevsky's *French Classicism* and I. Golenishchev-Kutuzov's *The Italian Renaissance and Slavonic Literature,* and such works by groups of authors as *Literature of the Renaissance and Problems of World Literature, The 17th Century in World Literary Development, Foreign Literature of the 1930s* and *Problems of Education in World Literature.* Books have also been put out on specific subjects and problems of foreign literature—*The Ancient Novel, Modern US Literary Criticism, Polish-Russian Literary Ties, Evolution of the Chinese Novel* and *The 20th Century Brazilian Novel.*

A very important aspect of the Institute's work is the study of the literary process in the socialist countries. After compiling the four-volume work *Writers of the Countries of People's Democracy,* the sector studying these problems put out several research works on the development of socialist realism, including *Experience of the Socialist Countries' Literatures* and *Problems of the Art Forms in the Literature of the Socialist Countries.* Another aspect of its work is the study made of Soviet literature's ties with the literatures of the GDR, Poland, Hungary, Rumania and Czechoslovakia.

Works analysing major development trends in the literatures of Asia, Africa and Latin America are being published. To date the following two works by groups of authors

have appeared: *Urgent Problems of the Study of Africa's Literatures* and *Formation of Latin America's National Literatures.* The first volume of the voluminous research work entitled *Stages of the Interaction of the Literatures of the East and the West* has been completed. In recent years the Institute has been making a profound study of Byzantine and mediaeval literatures. Works dating from the 4th to the 14th centuries have been translated into Russian and published. Many of them were unknown or scarcely known to the Russian reader (they include *Monuments of Mediaeval Latin Literatures from the 4th to the 9th Centuries* and *Byzantine Literature from the 9th to the 14th Centuries*).

All these research works, which deal with various topics and differ in genre, are connected in one way or another with the Institute's main work, the 10-volume *History of World Literature,* which gives a Marxist conception of the development of world literary history from ancient to modern times. The compilation of this important work, which began eight years ago, called for the solution of many theoretical, historical and literary problems on a new level. Leading Soviet literary critics are taking part in its compilation. Work has now been completed on volumes 1-5, 9 and 10. The last volumes discuss urgent problems of modern world literature around which a sharp ideological battle is now being waged. Volumes 1, 9 and 10 were put out as models; they will be published after they are discussed on a countrywide scale and revised. This important work is to be completed within the next five years.

The Institute's plans also give wide coverage to Soviet multinational literature. Monographs have been put out on individual writers: Mikhail Sholokhov, Alexei Tolstoy, Sergei Yesenin, Alexander Blok, and others. Much attention is given to the study of the life and creative work of the Soviet literary classics Maxim Gorky and Vladimir Mayakovsky. Specialists studying Gorky's literary heritage have published works which have won wide recognition, including the four-volume *Annals of Maxim Gorky's Life and Creative Work,* ten books of *Gorky Readings,* numerous publications *The Gorky Archives,* the collection *Gorky and the Present,* and *Gorky and the Literature of the Soviet Peoples.* Eight volumes of the *Complete Works of Maxim Gorky* have already been published, and the rest will be put out in the foreseable future. The works on Vladimir Mayakovsky include V. Pertsov's three-volume monograph on the great revolutionary poet's life and creative work. The Soviet press has highly assessed the first scientific publication of Vladimir Mayakovsky's works in 30 volumes, compiled by the Institute.

The Institute's works devoted to individual genres of Russian Soviet literature are very popular among literary critics, writers, the faculty in higher educational institutions and students. They include the two-volume *Essays on the History of Russian Soviet Journalism,* the three-volume *Russian Soviet Dramaturgy. Main Problems of Development* and the four-volume *History of Russian Soviet Literature.*

Today the Institute heads and coordinates the research work in multinational Soviet literature carried on by the various institutions concerned. In collaboration with republican scholars, it prepared a series of essays on the development of individual national literatures including Azerbaijanian, Armenian, Ukrainian, Byelorussian, Lithuanian, Latvian and Uzbek. After this, the Institute began to compile a six-volume *History of Multinational Literature,* which has now been completed. Volumes 1 and 3 have been published, and the rest will come off the press in 1971 and 1972. This important work examines, for the first time in Soviet literary criticism, the development of all the Soviet literatures as a single process.

The study of Russian classical literature holds an important place in the scientific programme of the Institute which has published several important works in this field, including such well-known books as the two-volume monograph on Pushkin by D. Blagoi, Corresponding Member of the USSR Academy of

Sciences; the four-volume study on Belinsky by V. Nechayeva and also K. Pigarev on Tyutchev, V. Putintsev on Herzen, A. Tseitlin on Goncharov, and N. Gusev's four-volume monograph on Leo Tolstoy. The wealth of historical and literary material in the monographs on individual writers and individual periods, made it possible to tackle more complex tasks, such as the publications of a two-volume *History of Russian Criticism*, and a three-volume *History of Russian Literature*. At present the Institute is focusing attention on making a study of the main laws of Soviet literature's historical development, as is evidenced by the research works which attempt to formulate new concepts of such complicated phenomena as romanticism and realism, and to give an up-to-date picture and assessment of the artistic distinctiveness of entire Russian literary periods. Works are being compiled showing the place of Russian classical literature in the world literary process.

A special group is successfully studying ancient Russian literature. Work has begun on the five-volume *Russian Theatre of the 17th and 18th Centuries*, three volumes of which are already in print. They will be put out in 1972, when the 300th anniversary of the Russian theatre will be celebrated. It is planned to publish jointly with the Institute of Russian Literature (The Pushkin House) a *Library of Russian Ancient and Mediaeval Literature* in 12 volumes.

The Institute coordinates and directs the extensive work being carried out in the Soviet Union in the study of oral popular poetic art. In collaboration with the respective institutes of the Union and Autonomous republics, the Institute held several discussions and conferences, and published several theoretical works which put the study of the epos of the Soviet peoples on a truly scientific basis. The works include the collection *Story of the Narts: Epos of the Caucasian Peoples* and the monographs *Ukrainian Folk Poetry* by B. Kirdan, and *The Yakut Epos "Olonkho"* by I. Pukhov. The book *The Eastern Romance Epos* is the first in the series of publications of the monuments of popular art. The *Uzbek Heroico-Romantic Verses "Rustamhan"* and the *Turkmen Popular Romantic Epos "Hurluk and Hemra"* will soon appear. *The Kazakh Heroic Epos "Koblandy Batyr"* and the *Yakut Epos "Kuulun Kuulustur"* have been prepared for publication. Together with the translation, every volume contains the original text, a study of the epos, and a scientific commentary. The theoretical studies *Textual Criticism of Popular Epos* and *Specific Features of Folklore Genres* have already been sent to press. This series is very timely, especially since some foreign philologists are trying to distort the meaning and nature of the epic stories of the Soviet peoples.

To get a complete picture of the Institute's diverse activities mention should be made of its work in textual criticims. Besides the aforementioned publications of Gorky and Mayakovsky, the Institute is compiling the collected works and letters of Anton Chekhov. Academic publications of A. Herzen's works have been put out in 30 volumes and S. Yesenin's works in five volumes. Besides the publication of various works, the Institute is engaged in theoretically generalising the research in textual criticism, the fruits of which are the *Fundamentals of Textual Criticism* and *Textual Criticism of Soviet Literary Works*.

In conclusion, I should like to note the Institute's growing international ties, which are another important aspect of its work. It has held many conferences and discussions with literary critics from the GDR, Hungary, Poland, Rumania and Czechoslovakia on the urgent problems facing Soviet science, and several joint works have been compiled.

Such are the problems studied by the Institute. At present it is extending its research, linking it more closely with the urgent tasks of developing Marxist social science.

A. Ushakov
Cand. Sc. (Philol.), Scientific Secretary

The journal *Voprosy literatury* (Problems of Literature) is designed not only for men of letters, but also for those who want to learn more about the present state of Soviet multinational literature, about foreign literatures, about the problems of the theory and history of this art.

The journal, whose publication began in April 1957, is the organ of the Writers' Union of the USSR and the Gorky Institute of World Literature, USSR Academy of Sciences. This "parentage", so to say, of the journal naturally determines its nature. As the organ of the Gorky Institute of World Literature, it carries articles written by literary critics, that is, by persons who study literature and analyse the writers' creative work. As the organ of the Writers' Union of the USSR, it carries articles by writers, that is, by those who create literature. This unity of theory and practice may be clearly seen from one of the journal's most popular sections, the "Writer's Skill" which carries articles by literary critics who show the writer's creative workshop, the birth of an image and poetry, and their influence on the reader. The writer tells of his own creative experience, the history of his works, reflects on the "technology" of the writer's profession, shares his thoughts on art.

The public widely responded to the writers' replies to the questionnaires, which are regularly carried by the journal.

Interviews with writers are regularly published in the journal. Many of these have been republished in other press organs in the Soviet Union and abroad. The editorial office frequently holds round-table discussions on important literary problems. The "Writer's Skill" section carries articles by such prominent Soviet writers as K. Fedin, L. Leonov, A. Korneichuk, S. Mikhalkov and S. Narovchatov.

One of the main sections of the journal is "Topical Subjects", which discusses the current problems of multinational Soviet literature, the formation of socialist realism in national literatures, internationalism and national traditions, the contemporary hero, on a wealth of genre and diversity of style, the development of the literatures recently put into writing, and the making of the novel. It also regularly carries articles on the mutual enrichment of the various peoples' literatures and their classical legacy.

The journal attaches great importance to articles on literary criticism in the Union republics, which are published in the section "Literary Science and Criticism" and occasionally in the section "Literary Life". These sections inform the reader of the plans and activities of the republican scientific institutes and publishing houses, carry summaries on conferences and meetings, and the questionnaire "Literary Critics at Work".

The journal has a special foreign literature section, which keeps its readership posted on the most important developments in world literary development. It carries problematic articles based on one or several literatures; monographs about prominent foreign writers and, under the rubric "Foreign Press Review", gives information about literary life and important discussions abroad. Consistently adhering to the principles of realistic art, the journal exposes the reactionary essence of various modernistic schools.

Other sections are the "Theoretical Problems" section, which carries articles on the theory of literature and aesthetics. Forthcoming issues will discuss the new in Marxist-Leninist aesthetics and urgent problems of literary criticism; the "History of Literature" section which examines literature's classical legacy; the "Publications and Reports" section which carries new material from literary archives. Every issue of the journal carries about 15 reviews of books by Soviet and foreign literary critics, and lists of new books. It also has a humour section which carries satirical literary articles, epigrams and parodies.

Besides problems of literature, the journal discusses other branches of art. Thus, a special issue was put out on the creative cooperation and interaction of the arts, which car-

ried articles by literary and art critics, by writers, producers, actors, artists and composers.

Wide-range plans have been drawn up by the journal for the foreseeable future. A section has been introduced where leading writers of socialist realism write about their life and creative work, and about their experience and artistic quests. These are not merely the writers' autobiography, they are the biography of the age. It is planned to publish materials on the road traversed by Soviet literature in the past 50 years and on Gorky and Mayakovsky, articles on the prominent Soviet writers Sholokhov, Aseyev, Marshak, Zoshchenko, Seifullina and others, and also on leading Soviet critics and art critics, Vorovsky and Lunacharsky among them.

The journal's foreign literature section plans to hold a discussion on the most important aspects of the development of the principles of socialist realism in world literature. In 1971 and 1972 material will be published on the new phenomena in the literatures of Bulgaria, Hungary, Poland and other socialist countries, and in the literatures of the United States, Britain, France, Brazil and West Germany. Articles on Seghers, Iwaszkievicz, Hikmet, Böll, Fitzgerald and Camus, and reviews of the works on Hemingway and Čapec, have either already been, or are about to be, published. Problems of the theory and history of literature, of the writer's creative work, and the methods of literary critical analysis, will be discussed. Among other articles scheduled for publication are the "Review of Contemporary Literature on Dostoyevsky's Creative Work" and writer's questionnaire "Nekrasov and Our Time".

The journal will publish in a new way reviews of Soviet verse, prose, dramaturgy and criticism of the 1970s. Formerly, it carried an article by only one critic, and naturally the review was not complete. Today, the journal holds "round-table talks", where critics express their views on the outstanding works of the year. The verbatim reports are then published, thus giving the reader an idea about individual and common views on new books.

Thus, the journal publishes material which is closely connected with the development of the modern science of literature, with the activities of the writers' organisations in the Soviet Union, with the most important problems worrying Soviet intellectuals. In an issue devoted to the 24th Congress of the CPSU, the journal's Editor-in-Chief, Vitaly Ozerov, wrote:

"It is quite understandable why literature and art have an unabating interest in the images of those who personify the mind, honour and conscience of the people. Of course, it is difficult for us to name new works which are ideologically and artistically on the same level as *How the Steel Was Tempered* and *Virgin Soil Upturned.* It is therefore not surprising this article should contain some critical remarks even on works which may be regarded on the credit side of our art. Still in recent years creative work on the image of a Communist has been carried on more persistently and deeply, which is an encouraging sign. Between the 23rd and 24th CPSU Congresses, works appeared which aroused the keen interest of readers, stimulated the development of social thought and were notable for their artistic solutions.

". . .No matter what the artists, who are exacting towards themselves, write about, whether it be about the past, or the present, their attention is invariably centered on those who organise the struggle and the labour of the broad masses. Many of these features of the individual have been correctly noted by our literature, which is ever progressing, penetrating into the spiritual make-up of its heroes and showing the diversity of their lives and the complexity of their interrelations. The readers and the audience too are exacting. They not only want to see in the characters they admire the true features of the Communist of today. There is a persistent demand, addressed to both writers and to film and theatre workers, to show the foremost

people of our country in all their stature and to create true artistic characters of the epoch. It is to be hoped that this will be realised before long."

To show the problems of literature in great detail, to make a careful analysis of what is taking place in literature, to inform the reader of the literature of different countries—such are some of the tasks facing the journal. And Editors aim to make the articles interesting, clear and intelligible, free of false academism and pseudo-scientific profoundness.

E. Osetrov,
Deputy Editor-in-Chief

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Literaturnoye nasledstvo (Literary Heritage) is a scientific documentary research publication first put out in 1931. In 1960 it became the organ of the Gorky Institute of World Literature of the USSR Academy of Sciences. So far 80 voumes (58 books) have been published (until 1949 many books had a double numeration, since 1956 some volumes have been put out in two books).

In the 40 years of its existence *Literaturnoye nasledstvo* has become widely known in the Soviet Union and abroad. Its volumes have carried much valuable material on the history of Russian literature and social thought, which they introduced into scientific use. Without referring to them, one cannot study the most important phenomena and periods of development of Soviet literature. The first volumes contained letters by Karl Marx and Frederick Engels, showing their literary and aesthetic views, the unpublished works by G. Plekhanov and P. Lafargue, and other documents which played an important part in the elaboration of the Marxist-Leninist theory of literature.

The first volumes of *Literaturnoye nasledstvo* were largely miscellanies. They were followed by volumes devoted to prominent Russian writers of the 19th and the beginning of the 20th century—Pushkin, Lermontov, Griboyedov, Belinsky, Herzen, Ogaryov, Chernyshevsky, Dobrolyubov, Nekrasov, Sleptsov, Saltykov-Shchedrin, Turgenev, Leo Tolstoy, Dostoyevsky and Chekhov, and the correspondence between Gorky and Andreyev. Some of these writers figured in separate editions: Herzen and Ogaryov—in six books, Tolstoy—in six books, Belinsky, Nekrasov and Turgenev—in three books each, and so on. Individual volumes were devoted to entire periods in the history of Russian literature (volumes 9 and 10 were on the 18th century) and to ideological and literary trends (the Decembrists, Revolutionary-Democrats and Symbolists). Several volumes, such as *Goethe and Russia, Russian Culture and France,* and *Leo Tolstoy and the Foreign World* treated of the connection between Russian and foreign literatures. Volume 79, recently put out, is devoted to *Literature and Folklore.* It carries the texts of the folk songs written down by Russian writers for the famous P. Kireyevsky's Collection.

Many of the aforementioned volumes promoted the scientific reassessment of phenomena being studied, and mapped out new directions and approaches in investigating one or another problem. The publication of P. Chaadayev's *Philosophical Letters* (Vols. 22-24), which could not be published in his lifetime, opened up new prospects for the historians of Russian culture studying this prominent thinker's world outlook. Volume 61 contains hitherto unknown documents on the revolutionary activities of Herzen and Ogaryov; these documents are epoch-making in the scientific elaboration of the first revolutionary situation in Russia. Volume 71 adds to our information about some writers: thus the two-volume collection of the known works by the writer and democrat of the 1860s and 1870s, V. Sleptsov, has been enlarged to three volumes.

In the past decade, *Literaturnoye nasledstvo* has been attaching increasing importance to the publication and study of materials on the history of Soviet literature. This is the subject-matter of the volumes *Maxim Gorky and Soviet Writers. Unpublished Correspondence* (Vol. 70), *From the Soviet Writers' Creative Legacy* (Vol. 74) and *Soviet Writers at the Fronts of the Great Patriotic War* (Vol. 78). The several hundred letters collected in Volume 70 give a graphic picture of literary life in 1920s-1930s and greatly enriches our knowledge of Gorky as a direct participant and leader of the literary movement of the Soviet epoch. Volume 74 contains the hitherto unknown texts of prominent Soviet writers and founders of Soviet literature (including Gorky, Furmanov, Fadeyev, Alexei Tolstoy, Babel, IIf and Petrov). These texts reveal to the readers the writers' creative workshop, new facets of their talent. Volume 78 shows the writers' heroic varied activities during the Great Patriotic War and Soviet literature's patriotic exploit.

Volume 81, *From the History of the International Union of Revolutionary Writers*, is undoubtedly of great ideological and political importance. It shows the enormous, difficult work carried out in uniting revolutionary and progressive writers in various countries of the East and West in the 1920s and 1930s. The documents collected in this volume (particularly the letters of leading figures in progressive literature, notably Barbusse, Becher, Bredel, Weinert, Hidas, Dreiser, Illés, Renn, Rolland, Upton Sinclair, Feuchtwanger and Stefan Zweig) show the significance of the Great October Socialist Revolution to the world literary process.

The last volume is devoted to the unpublished material of that outstanding figure in socialist culture, Anatoly Lunacharsky, which deals with major policies pursued by the Communist Party and Soviet state in the sphere of art, with important developments in the history of Soviet and foreign literature and the theatre, and urgent problems of the theory and methodology of art criticism.

Literaturnoye nasledstvo is thus based on publications of hitherto unknown or little known literary texts and documents, such as unpublished works, their different versions and rough copies, writers' diaries and notebooks, autobiographical notes and reminiscences. The epistolary legacy of literary figures is widely represented. Moreover, unlike collected works, not only the letters written by the writers are given, but also the letters they received, and often the correspondence of both sides.

Looking for the necessary material before it is published in the books of *Literaturnoye nasledstvo* involves painstaking research in the state archives, museums, private libraries and foreign collections. Many volumes have been compiled in close collaboration with various research institutions and public organisations, including the Institute of Marxism-Leninism of the CC CPSU, the Tolstoy Museum, the Gorky Archives and the Writers' Union of the USSR. Several interesting publications are based on material from foreign collections, including numerous documents on the life and activities of A. Herzen and N. Ogaryov, which were scattered in different countries and cities (Prague, Sofia, Paris, etc.), Ivan Turgenev's manuscripts kept in France, and Maxim Gorky's letters to Leonid Andreyev kept in the United States.

The material published in *Literaturnoye nasledstvo* is based on extensive work in textual criticism. This work has been highly assessed by the well-known Soviet writer, Kornei Chukovsky, who wrote in his article "From Dillettantism to Science": "The Editors of these wonderful collections... are by no means archivists who blindly register all documents without first checking them. Before they present a recently found text to the reader, they... check it most scrupulously with all the related memoir-archive sources. The reader is thus guaranteed the maximum accuracy of every published text." [1]

[1] K. Chukovsky, *Peoples and Books*, Moscow, 1960, p. 370 (in Russian).

All the publications of *Literaturnoye nasledstvo* carry detailed commentaries which, as a rule, are of a scientific research nature. These commentaries, worked out over the years, acquaint the reader with many hitherto unknown facts and archive documents, and make amendments in the outdated or inaccurate conclusions contained in earlier scientific literature.

Every volume has research articles about a given writer, his place in the history of literature, his creative ties with other writers, and so on. The monographs on individual writers often carry voluminous selections from the unpublished letters and of contemporaries, and also reviews which are based on a careful study of various newspapers and journals and which give a picture of the importance of a writer's creative work in different countries, Russian and world press comments on a writer's death, anniversaries, and so on.

The volumes also carry various bibliographies, reviews of archive material on a given subject, and other information indispensable to researchers.

Every volume is usually the fruit of the efforts of a large group of researchers—prominent literary critics, historians, archivists, writers, critics, and cultural workers, including their colleagues from abroad. Also young specialists, particularly from among archive workers have been enlisted in this work which, in a way, has been a schooling for them in research, textual criticism, and so on. The volumes put out to date were compiled in collaboration with about 30 scientists and literary critics from 11 countries, including Bulgaria, Hungary, the GDR, Poland, Rumania, Czechoslovakia, Britain, the United States and France.

Every volume of *Literaturnoye nasledstvo* contains some 150 illustrations. Although the collection has not strictly confined itself to the reproduction of unpublished works, illustrations of forgotten or hitherto unknown material predominate. Many of the illustrations are now widely published in the USSR and abroad. The collection has very many iconographic illustrations, portraits and photographs of writers and public figures, their kith and kin, friends and associates. Of great interest are the 115 portraits, published for the first time, of the Decembrists and their wives. They were drawn by Nikolai Bestuzhev when he was in penal servitude (Vol. 60, Book II).

In keeping with the specifics of the publication, the collection contains many facsimiles of writers' manuscripts, rare publications of their works, and so on, richly reflects the pictorial and graphic legacy of several writers, including A. Pushkin, M. Lermontov, T. Shevchenko, I. Turgenev, L. Andreyev, V. Mayakovsky and E. Bagritsky. The pictures and photographs of the places associated with the writers' lives are of memorial interest. The collection also contains many illustrations of literary works, scenes from theatre productions and films. Others of the many illustrations in the collection include cartoons and caricatures, which graphically show the socio-ideological struggle in Russian literature and journalism in various historical periods.

At present, work is being completed on new volumes, whose publication, it is hoped, will be an important event in the history of literature and public life. They are *Lenin and Lunacharsky. Correspondence, Reports and Documents* (Vol. 80), *The Unpublished Dostoyevsky* (Vol. 83, which will be put out to mark the 150th anniversary of the writer's birth), and *Ivan Bunin* (Vol. 84). The editorial staff is also working on the following volumes: *Russian Culture and Britain, At Tolstoy's. Makovitsky's Yasnaya Polyana Notes, From the History of Soviet Literature of the 1920s and 1930s,* and *Russian Literature and the Foreign Slavic World* (which is being compiled with the participation of researchers from West Slavic and South Slavic countries.)

V. Shcherbina,
D. Sc. (Philol.), Editor-in-Chief

THE INSTITUTE OF RUSSIAN LITERATURE AND THE JOURNAL RUSSKAYA LITERATURA

The Institute of Russian Literature in Leningrad, one of the leading research institutions of our country in the realm of literary studies, is known as Pushkin House. Established in 1930 on the basis of the then Pushkin House, a museum-type depository and centre of sources studies into the Pushkin heritage, [1] the Institute has, over the last 40 years, been successfully conducting both research and collecting work, preserving, replenishing and spreading knowledge of the wealth of the treasures of our national culture stored in its manuscript and museum collections.

The leading role in the present-day structure of the Institute is played by six sectors specialising in ancient Russian literature, modern Russian literature, Soviet literature, the links between Russian and foreign literature, folk poetical art and theoretical studies. It is from here that the fundamental writings of the Institute have emerged, many of them being the joint efforts of several scientific collectives engaged in studying various epochs or various aspects of the history of Russian literature.

Established in 1933 and now guided by Academician D. Likhachev, the Sector of Ancient Russian Literature is the major centre in the country in this particular field. It conducts planned studies into 11th-17th century literature, its range of subjects, apart from theoretical and historico-literary research, including writings on bibliography, textology and source studies, most of which are published in the series entitled *Transactions of the Department of Ancient Russian Literature,* which is well known both in our country and abroad. Initiated in 1934, the series had brought out its 25th volume by mid-1970. Since 1963, the various volumes of the *Transactions* have dealt with the following themes: *Russian Literature of the 11th-17th Centuries and the Other Slav Literatures* (XIX), *Newly Discovered and Unpublished Works of Ancient Russian Literature* (XXI), *The Interplay Between Literature and Pictorial Art in Ancient Russia* (XXII), etc. On the basis of extensive preliminary historico-literary studies conducted over several decades, the Sector has in recent years completed fundamental summarising works, among which primary mention should be made of two collective monographs: *The Sources of Russian Belles Lettres* (1970) and *The History of Genres in Russian Literature of the 10th-17th Centuries* (now being printed).

Important in the Sector's activities is the bringing to light of monuments of ancient Russian literature, which then appear either in the abovementioned *Transactions,* or in separate publications. Among these mention might be made of *Stories of the Origins of Moscow* (1964), *The Tale of the Ruin of the Russian Land* (1965), *The Story of the Merchant Basarg* (1969), to name but a few. At present the following are being prepared for publication: *The Tale of the City Babylon, The Story of Peter and Febronius,* and *The Chronicle of Constantine Manasses,* etc. Textological studies and their ensuing publication by the sector have been linked with extensive field work for over 30 years under the guidance of V. Malyshev, D. Sc. (Philol.), the prominent Soviet scholar. In the postwar years the work done by V. Malyshev and his numerous pupils has produced a collection of ancient Russian manuscripts and books now numbering over 5,000 publications, the newest and one of the richest of its kind in the Soviet Union. [2]

[1] A history of Pushkin House, description of its research work and bibliography of works, put out by it are contained in the book: *Pushkin House—Fifty Years,* Moscow-Leningrad, 1956.

[2] The collection of Pushkin House contains mainly ancient Russian manuscripts and books of the Northern and North-Western parts of our country. For a summarised review of the above see, V. Malyshev, *Ancient Russian Manuscripts of Pushkin House,* Moscow-Leningrad, 1965.

Studies in later Russian literature—between the 18th and the 19th centuries—are the province of the Sector of Modern Russian Literature, now headed by N. Prutskov, D. Sc. (Philol.). In structure this is the most complex of the Institute's sectors, including a group for the study of Russian 18th-century literature, organised in 1934 and now guided by G. Makogonenko, D. Sc. (Philol.), a group studying the Pushkin heritage under B. Meilakh, D.Sc. (Philol.), and a Textology Group.

Of these, the first is the country's only centre for the study of Russian 18th-century literature. It coordinates the work of a large number of experts in this field from Leningrad and other cities. It brings out a regular publication under the title of *The 18th Century*, the 8th issue of which *Derzhavin and Karamzin in the Literary Development of the 18th and Early 19th Centuries* came out in 1970 under the editorship of the late P. Berkov, Corresponding Member of the USSR Academy of Sciences. At present the group are working on chapters on 18th-century literature for *History of Russian Literature*, and are also completing two collective works, one dedicated to the great Russian fabulist Ivan Krylov, and the other to basic problems of literary developments during the period of Peter the Great.

In recent years, the group studying the Pushkin heritage have brought out a collective work *Pushkin. Problems and Results of Research* (1966), Volumes 5 (1967) and 6 (1969) in the series *Pushkin. Research and Materials*, in 1969, work was completed on a scientific publication of the poet's correspondence, the greater part of the work being carried out by B. and L. Modzalevskys in 1926-1935; work has continued on a bibliography of Pushkin studies, the next issue of which, covering 1918-1936, is now being printed. At present, the group are working on a two-volume collective publication *Pushkin's Verses*, which provides a comprehensive analysis of outstanding lyrical verses by the great Russian poet, and are also completing preparation of the next issue of their serial publication dealing with the problem *Pushkin and World Literature*.

Already in the prewar years, publication of the classics of Russian literature was one of the main areas of the House's scientific activities. The Institute's staff prepared for publication at various times the collected works and correspondence of Radishchev, Pushkin, Lermontov, Gogol, Belinsky, and Uspensky. In 1968, the textology group completed publication, of the first *Complete Works and Letters of Turgenev* (Editor-in-Chief, Academician M. Alexeyev) and began work on the *Complete Works and Letters of Dostoyevsky* (Editor-in-Chief, Corresponding Member of the USSR Academy of Sciences V. Bazanov, Director of the Institute of Russian Literature). Volume 1 is to appear for the 150th anniversary of the birth of the great writer.

The main efforts of the Sector of Modern Russian Literature are concentrated on research into Russian literature of the 19th and early 20th centuries. Prominent among these are studies into the various genres of Russian literature: *A History of Russian Literary Criticism* (two volumes, 1958), a two-volume *History of Russian Novel* (1962-1964), and another two-volume *History of the Russian Poetry* (1968-1969). In recent years, a number of collective writings have been either published or prepared for publication: *The Ideas of Socialism in Russian Classical Literature* (1969), *Russian Realism in the Early 20th Century* (now being printed) and monographs on the writings, inter alia, of Pushkin, Lermontov, Dostoyevsky, Turgenev, Tolstoy and Blok. At present this Sector is the organising centre and main contributor to an eight-volume *History of Russian Literature* now being compiled at the institute.

Pushkin House is also conducting major bibliographical work on 18th-20th-century literature. In 1962 a bibliographical index of 19th-century literature was published, followed in 1963 by another index on late 19th-century and early 20th-century literature, and, in 1968, a similar publication pertaining

to the 18th century. The first two indexes were compiled under the editorship of K. Muratova, D. Sc. (Philol.) and the third under the guidance of P. Berkov, Corresponding Member of the USSR Academy of Sciences. A series of specialised bibliographical indexes was recently brought out, each dealing systematically with literature on a particular writer: Pushkin, Goncharov, Turgenev, Saltykov-Shchedrin and others.

A special Sector is engaged in studies on Soviet literature. During the last 20 years it has been headed by V. Kovalev, D. Sc. (Philol.). The staff of this Sector have compiled such summarising works as: *Artistic Trends in Present-day Soviet Literature. The Times, the Sources of Inspiration, Questions of Style.* (1965); *Soviet Literature and a New Type of Citizen* (1967); *Problems of Psychologism in Soviet Literature* (1970), and *Ideas Harboured Abroad Concerning Soviet Literature* (now being printed).

An important place also belongs to surveys of various aspects of the present-day literary process and the writings of Soviet authors of our day. Among such writings is a collection *The Writings of Leonid Leonov,* brought out for the writer's 70th birthday and containing studies by Soviet and foreign scholars, as well as numerous materials, publications and bibliographical indexes. Similar in composition is the collection now being prepared for publication on the occasion of the 75th birthday of the well-known Soviet poet Nikolai Tikhonov. Scholars associated with the Sector are completing a book of research into the history of the Russian tale, and are starting work on a collective monograph on postwar Soviet poetry, its traditions and innovations.

A Sector engaged in studying the links between Russian and foreign literatures was established at Pushkin House in 1958 on the initiative of Academician M. Alexeyev, who has been guiding it since its inception. The sector has been working on a series of studies on the history of the international links of Russian literature, its publications to date including the collections *The Epoch of Enlightenment* (1967), and *From Classicism to Romanticism* (1970); now being printed is *Early Romantic Trends,* while work is continuing on studies into the international links of 19th-century Russian literature. A tangible contribution to Soviet literary scholarship has been made by the collective monograph *Shakespeare and Russian Culture* (1965) compiled at Pushkin House, a work which has won extensive recognition from Soviet and foreign scholars. Mention might also be made of other work conducted by the Sector: *The International Links of Russian Literature* (1963) and *Russian-European Literary Links* (1966), as well as a monograph by A. Yegunov *Homer in 18th-19th-century Russian Translations* (1963) and another by K. Rovda *Czechs and Russians in Their Literary Interrelations* (1969).

Problems of folk oral poetical creativity come within the purview of the Folklore Sector at Pushkin House, headed by F. Priima, D. Sc. (Philol.). At present this collective is studying a problem of some complexity, till now insufficiently studied—that of the interrelation between literature and folklore. The first volume in this series, devoted to the period between the 11th and the 17th centuries, appeared in 1970. The Sector brings out a series under the general title *Russian Folklore* to which folklorists from many centres of learning in the USSR are contributors. To date, 11 volumes of this non-periodical publication have appeared, and another two are being printed. Also published by the Sector is a series entitled *Monuments of Russian Folklore* dealing entirely with the publication of folklore texts. This series has included *Russian Folk Songs of the Volga Area* (1959), *Historical Songs of the 13th-16th Centuries* (1960), *Russian Folk-tales Recorded and Published in the First Half of the 19th Century* (1961), *Russian Folklore During the Great Patriotic War* (1964), *Ditties Recorded in Soviet Times* (1965), and *Riddles* (1968). A number of publications of Russian historical songs of the 18th and 19th centuries are soon to appear.

Besides its extensive activities in collecting, registering and preserving folk oral poetry, the Sector also draws up bibliographies of folklore literature.[3] The Sector sends annual expeditions to various parts of the country to conduct extensive exploration for and recording of folklore material, which is then subjected to research and kept in archives and on tape recordings.

The most recently created Sector is that of theoretical research (headed by A. Bushmin, Corresponding Member of the USSR Academy of Sciences). Prior to its establishment in 1969, research into the theory of literature and the methodology of literary studies was conducted within the framework of the other sectors without any unifying centre. Until 1969, the following publications were brought out: the collection *Problems of the Methodology of Literary Studies* (1966); the collective monograph *Soviet Literary Studies over Fifty Years* (1968), and a monograph by A. Bushmin *Methodological Problems of Literary Studies* (1969). Related to these in the nature of the problem studied are following publications of Pushkin House for the Centenary of the Birth of V. I. Lenin: *The Lenin Heritage and the Science of Literature* (1969), and *The Lenin Heritage and the Study of Folklore* (1970). Research of a theoretical and methodological nature is now concentrated in this sector, which is completing work on a collective monograph *The National Character of Russian Literature* and is continuing work on a number of collective efforts under the general headings *The Historico-Literary Process. Problems and Study Methods,* and *Progress in Belles Lettres.* A monograph by A. Bushmin *On Continuity in Literature* is shortly to appear.

Apart from the sectors mentioned above, there are three ancillary departments at Pushkin House: Manuscripts, the Museum of Literature, and the Library. The first of these is one of the largest depositories of literary manuscripts in the country, containing autographs of the works of Russian writers, public and political figures, and their correspondence. The total collection is in excess of 500,000 units, including almost all the extant autographs of Alexander Pushkin, as well as the poet's private library of 3,700 volumes, fifty of them with his autographs. There is a considerable part of the manuscript heritage of Lermontov, Krylov, Koltsov, Ryleyev, Dobrolyubov, Saltykov-Shchedrin, Nekrasov, Goncharov and Blok as well as many other authors. Also kept here are the archives of well-known Russian journals such as *Vestnik Evropy* (European Herald), *Russkoe bogatstvo* (Russian Wealth), *Russkoe slovo* (Russian Language), *Russkaya starina* (Russian Antiquities), *Severny vestnik* (The Northern Herald), *Sovremennik* (The Contemporary), and others. Among important and constantly expanding manuscript funds are those of Soviet writers, such as Gladkov, Lavrenev, Libedinsky and Novikov-Priboi. This storehouse of manuscripts is made extensive use of both by Soviet and foreign scholars.

The Museum of Literature has a rich collection of iconographical, memorial, historical, and other materials connected with the life and work of outstanding representatives of 18th-20th century Russian literature. The total number of exhibits at the museum is in the neighbourhood of 400,000[4], with special halls devoted to Turgenev, Goncharov, Leo Tolstoy, Lermontov, Dostoyevsky, Gogol, and Gorky.

The Library at Pushkin House is a major collection of books on the history of Russian and foreign literature, a stock of books totalling over 500,000 volumes including the private libraries of a number of writers such as

[3] Bibliographical indexes of literature on Russian folklore between 1917 and 1965, drawn up by M. Melts and published by the Library of the USSR Academy of Sciences in three volumes (1961, 1966 and 1967).

[4] In 1951-1962 the Museum of Literature brought out *Descriptions of Materials of Pushkin House*, bearing upon Lermontov, Gogol, Goncharov, Tolstoy, Turgenev, A. Ostrovsky, Dostoyevsky and the revolutionary democrats.

A. Ostrovsky and A. Blok. Within the framework of the library are Pushkin, Lermontov and Gorky departments, each with a complete stock of literature in its special field. Extensive research and information work is carried on here, which is reflected in the publications both of the Library of the USSR Academy of Sciences, and Pushkin House.

As we have tried to show in this brief survey, the Institute of Russian Literature is at present conducting research on a broad and varied plan. Its highly skilled personnel, wealth of material on the history of literature, and the long-standing traditions of the Russian school of literary studies gives Pushkin House every right to be considered one of the world's leading research centres on the study of Russian literature.

V. Baskakov,
Cand. Sc. (Philol.),
Scientific Secretary of the Institute

Since 1958 the Institute of Russian Literature, USSR Academy of Sciences has been bringing out *Russkaya literatura* (Russian Literature), a quarterly dedicated to the history of literature. During the first decade the journal was edited by V. Bazanov; since 1968 V. Timofeyeva, D. Sc. (Philol.) has been the Editor-in-Chief.

The journal deals with a range of problems of the development of Russian literature from its inception down to our days, its links with folklore, and with the literature of other countries, the Slavic in the first place, and with questions of theory. Of course, the journal is mainly concerned with the 19th century, which gave our country Pushkin and Lermontov, Turgenev and Dostoyevsky, Leo Tolstoy and Chekhov, authors who not only in considerable degree exerted a shaping influence on generations of Russian society but left an impress on the development of artistic thought beyond the borders of Russia. A good deal of attention is also devoted to the inception and development of Soviet literature. Considerable space is also devoted by the journal to the writings of Maxim Gorky (besides regular publications of articles and materials on his works, a special jubilee issue dedicated to Maxim Gorky was published in 1968), Yesenin, Mayakovsky, Sholokhov, and Leonov. Although questions of ancient and 18th-century Russian literature get comparatively little space in the journal, important items are to be met on its pages. One might mention the scientific polemic on the question of the authenticity of *The Lay of Igor's Host* (1965-1967), valuable material bearing on the creation of Radishchev's *Journey from St. Petersburg to Moscow*, and others.

Apart from the first section of the journal, which features research articles, the regular sections include: "Publications and Reports", "Textology and Attribution", "Notes and Specifications", "Surveys and Reviews", and "News Briefs". Two new departments were recently instituted—"Polemics" and "From the Manuscript Department of Pushkin House".

The range of themes since the inception of this publication is an extensive one, including general problems of the development of Russian literature, its national character and links with the revolutionary movement; problems of the development of individual genres or the struggle in the field of ideology and art at various periods. There have also been articles dealing with the relations between writers, the influence they have exerted on one another, as well as research into the techniques of prosody.

The "Publications and Reports" section features a wide range of materials (hitherto unknown letters, articles and works by Russian writers, as well as documents that throw light on various aspects of their literary careers, censors reports and so on). It is envisaged that publication of archive materials, in

the first place from the wealth of manuscripts at Pushkin House, is to be considerably extended in the near future. The "Surveys and Reviews" section constantly examines works on literary studies brought out in our country and abroad. Reviews of events in the world of scholarship, articles devoted to leading experts on Russian literature, shorter items and polemics are usually featured in each issue.

The authors include a number of leading scholars such as Academicians M. Alexeyev and D. Likhachev; Corresponding Members of the USSR Academy of Sciences A. Bushmin and L. Timofeyev, as well as younger researchers, scholars from all parts of the Soviet Union, foreign experts in Russian studies (in France, Czechoslovakia, Poland, Bulgaria, the GDR, Italy, Rumania and the USA).

The publication of contributions by foreign researchers is only part of the work conducted by the journal to keep scholars abreast of the state of Russian literary studies in various countries. Besides, the jounral regularly publishes reviews of writings on Russian literature brought out in other countries, as well as materials describing the impact exerted by various classics of our literature.

N. Kondratyev,
Executive Secretary of the Editorial Board

THE INSTITUTE OF THE RUSSIAN LANGUAGE AND THE JOURNAL RUSSKAYA RECH (THE RUSSIAN LANGUAGE)

The Institute of the Russian Language is a recognised centre of linguistic studies in the Russian language. When the Institute became a separate entity at the end of the Great Patriotic War (it had formerly been part of the Institute of Language and Thought, USSR Academy of Sciences), its director was Academician S. Obnorsky, an outstanding Russian linguist. For many years Academician V. Vinogradov stood at the head of the Institute.

During the 25 years of its existence, the Institute's staff have prepared and brought out hundreds of publications of which special mention should be made of the two-volume *Grammar of the Russian Language* (1952-1954; second edition 1960), the 17-volume *Dictionary of Modern Literary Russian* (1950-1965), which was awarded a Lenin Prize in 1970, and a four-volume *Dictionary of the Russian Language* (1957-1961). All these publications have won a worldwide reputation.

Hundreds of thousands of people make daily use of the one-volume *Dictionary of the Russian Language* compiled by S. Ozhegov. Other valuable books of reference brought out in large editions are: *A Spelling Dictionary of the Russian Language* (a revised and supplemented edition is shortly to appear) and a special pronouncing dictionary *Russian Literary Stress and Pronounciation* (a new edition of which is also being prepared).

Among the researches published in recent decades mention might be made, in the first place, of the following multi-volume collective works: *The Russian Language and Soviet Society, Notes on the History of the Russian Literary Language of the 19th Century* (1964), and *A Comparative Historical Syntax of the East-Slavic Languages* (1968).

When the Institute of the Russian language was mapping out its plan of research work for the next five years (1971-1975), special attention was paid to bringing the plan in line with problems of topical interest and to meeting, as far as possible and within the framework of our field, the spiritual needs of Soviet society.

Lexicographical work on the Russian language is one of the most important branches of our research work. As an ideal, we must try to evolve a complete description of the

vocabulary of the Russian language, beginning with ancient written monuments down to the vocabulary of our days in all its varieties. Our public stand in need of general-purpose dictionaries as well as dictionaries dealing with synonyms, set expressions, ideological matters, dialects, as well as the history and etymology of the Russian language. Prior to the October Revolution, there was a long-standing tradition at the Academy of Sciences in respect of work on general-purpose dictionaries, although a number of important targets were never achieved. Soviet scientists have been consistent in carrying on the finest aspects of this tradition and have devoted much effort to a study of the national vocabulary.

Work is under way at the Institute's Dictionary Sector on a new academic dictionary of the Russian language which is designed to fully reflect the rich vocabulary of the Russian language of today. What is demanded of those taking part in this work is strict consistency in their normative appraisals of the facts of the language, and thoroughness in the semantic and stylistic definition of words. The Institute has also started work on a second, corrected and supplemented edition of the well-known four-volume *Dictionary of the Russian Language.* The non-specialist reader will soon get a one-volume dictionary of Russian synonyms, compiled on the basis of the two-volume dictionary of synonyms which contains about 5,000 synonym groups (the largest dictionary of this type in the history of Russian studies).

At present the publication is being prepared of a multi-volume *Dictionary of Russian Sub-dialects,* which will provide many times more information on local speech than the celebrated Dahl *Dictionary* (1863-1866). This edition will lay a firm foundation for work on many problems of the historical lexicology and etymology of Russian and other Slavic languages.

In preparation is a multi-volume *Dictionary of 11th-14th Centuries Old Russian,* as is a more popular six-volume dictionary covering the 11th to 17th centuries. Compilation has begun of a dictionary of 18th-century Russian. When these fundamental editions have been completed, we shall have a series of dictionaries covering the entire history of our native language in all its basic varieties (the written language and alphabetic sub-dialects). It is common knowledge that the roots of the Russian vocabulary go back to very ancient times. These sources will be covered by *An Etymological Dictionary of the Slavic Languages* in ten issues, to be brought out by the sector of etymology and onomastics.

Fundamental in the Institute's studies of the grammatical structure of present-day literary Russian has been an academic *Grammar of the Russian Language.* The term "academic grammar" is usually applied to a scientific description of the entire corpus of the grammar rules of a modern language, including all exceptions to those rules, and explanations of such exceptions. This kind of work, with its simplicity and its appeal to a wide readership, should not include any hypothetical decisions or arguments, but should contain only precise and tested recommendations based on models quoted from classical literature. The existing Academic *Grammar of the Russian Language* which dates back to 1952-1954 is far from meeting such requirements. Besides, the advances in linguistics and the changes in language (particularly in the distribution of what is known as norms and what lies beyond such norms) require that publication of an academic grammar should be repeated at least once in twenty or thirty years, providing a kind of standard for Russian language textbooks and manuals designed for higher and other schools. This kind of grammar is a most important document in the life of a language. Work along these lines is currently being conducted by the Sector of Grammar and the History of the Russian Literary Language, which was also responsible for the *Grammar of the Modern Russian Literary Language,* published by the

Institue in 1970. This work is of an experimental nature pursuing theoretical aims: the search for new methods of describing language material, various stages of grammatical abstractions, and the like.

Soviet scholars not only engage in studies in their particular fields but also play an active part in disseminating scientific knowledge among the masses. This applies to linguists as well which is why it is their responsibility to compile manuals and text-books designed for extensive use in school practice. The time has long been ripe to enrich the teaching of Russian at schools with scientific achievements in the sphere of Russian studies, so as to narrow the gap between theory and practical teaching. In this connection, a group of Institute staff members are working on an experimental text-book of the Russian language for the 4th to 7th forms at secondary schools, a work in which a scientific treatment of the material is to go hand in hand with understandability. The spread of scientific knowledge of the Russian language among students at higher and secondary schools will also be fostered by a linguistic dictionary now being prepared at our Institute, with its wealth of definitions of linguistic terms. This book will be an aid both to teachers and pupils in the senior forms.

In view of the mounting role of the Russian language as a means of communication between nations, the Institute has planned publication of a book entitled *The Russian Language in the World of Today*, which is designed to show the place held by Russian among other languages in the inter-state intercourse, and some of its most characteristic features. Also taking part in this work is the Scientific and Methodological Centre for Russian Studies at the State University of Moscow. In view of the enhanced interest in Russian in all countries and continents, we attach great importance to encouraging, in other countries, a knowledge of the fundamentals of the Russian language: the ability to read and understand simple texts and to speak on essential every-day topics. In this connection, a group of staff workers are preparing a manual entitled *The Fundamentals of the Russian Language*, designed first and foremost for those who have just begun to study our language. Prominent in this book will be a vocabulary of words important and common in speech, with brief definitions and examples of their use. Knowledge of this vocabulary will permit an understanding of ordinary, every-day Russian speech. Appended to this vocabulary will be a brief grammar outline. We hope that the book will help foreigners to learn Russian.

The study of present-day colloquial speech is acquiring special significance. In the past, linguists focused their attention on studying the written forms of the literary language, so that its spoken variety, so full of syntactical and other specific features, was mainly unexplored, though it is a commonplace that we speak and listen far more than we read and write. Following the completion, in 1970, of a collective monograph *Russian Colloquial Speech*, work along these lines is to continue. Also planned is a mass poll intended to register language usage in different strata of the population, and to study the obsolescent and the developing language, which is important both to theory and practice, with a view to recommendations in the use of speech norms. The Institute's Sector of Speech Culture is preparing a number of manuals dealing with urgent problems of spelling, pronunciation, style, and correct Russian speech.

Our language scholars are focusing their attention on a range of problems of social linguistics—research into the links between social processes and the life of language, and the influence of social development on changes in language. After publication of *The Russian Language and Soviet Society*, work has been completed at the Institute on the theme "The Russian Language according to Data Provided by Mass Polls". The long-term plan of the Sector of Present-day Rus-

sian envisages work on such themes as "Problems and Methods of Experimental Socio-Linguistics" and "The Language of Workers". Also being prepared is a cycle of works dealing with language styles in present-day literature.

The extensive practical work under way in our country to improve the terminology of the various branches of industry has confronted scholars with the problem of analysing terminological problems in the light of general linguistics. Several researches already prepared at the Institute or in course of preparation pursue these aims.

Special problems confront the personnel of the Sector of Structural Linguistics (the elaboration of models of applicable grammar, methods in semantic research, and the language of semantic description), and the laboratory of experimental phonetics, where the physical properties of speech sounds are analysed with the aid of instrumental methods.

Much has yet to be done by the Sector of the History of Russian and Dialectology, where work has begun on two volumes of *An Historical Grammar of the Russian Language: Morphology and Synthax.* Also participating in this work will be staff members of the Sector of Comparative Historical Studies into the East-Slavic Languages. The aim here is to summarise the vast material accumulated by Soviet and foreign scholars, and to give a systematic description of changes in the grammatic structure of the Russian language and its distant precursor—Old Russian. The Sector of Dialectology has been working on a multi-volume atlas of Russian dialects. The contents of the various volumes deal with the dialectal phenomena in certain territorial zones of the European part of the Soviet Union. This work is approaching completion. The dialectologists working at the Institute will soon begin preparations for an overall atlas of the Russian language. There is no need to explain the scientific and cultural significance of dialect atlases, which comprise material of primary importance to the history of the Russian language and the history of the people that has created that language. These works are of importance not only to linguists but also to historians, archaeologists and ethnographers.

The Institute is also a centre of scientific and organisational work of major international significance, for almost all the European socialist countries are participating in its work of creating a pan-Slavic linguistic atlas. The collection of material in accordance with the Atlas's programme is to be completed within the next few years, and cartographical work will then begin.

Important work is carried out by the Sector of Linguistic Source Studies and the Study of Language Monuments. In recent years highly important historical and linguistic monuments have been published: the celebrated *Izbornik Svyatoslava, 1076* (Selections by Svyatoslav) (1965) and the no less known *Sinaisky Paterik* (The Lives of the Sinai Fathers) of the 11th and 12th centuries (1967), as well as business and everyday texts dating back to the 17th and early 18th centuries. These books are being used not only by linguists but also by students of history and literature. A unique monument—the *Uspensky Sbornik of the 12th Century*—is being prepared for publication. Work on such editions is to continue.

Apart from the already mentioned major works conducted by staff members of the various sectors, quite a number of interesting studies of a more specialised nature are being prepared, dealing with various aspects of the functioning of Russian or with the history of its formation. Examples are: the research by D. Shmelyov, *The Russian Language in Its Functional Varieties (Statement of the Question)* and S. Kotkov's *Moscow Speech in the Epoch of the Establishment of the Russian National Language (Sketches).*

Many generations of linguists have contributed to the longstanding tradition of the study of the Russian language in the Soviet

Union. That is why the compilation of comparatively complete bibliographies is a task whose accomplishment will help the present-day linguist find his bearings in the ocean of available information. An extensive bibliographical reference system covering the years 1825 to 1965 has in the main been created. At present, work is being conducted to fill the bibliographical gap between 1881 and 1917 and to continue compilation of bibliographies for recent years.

As will be seen from this brief review, the range of the work done by the Institute of the Russian Language is quite complex and extensive. At the same time, the advances in linguistic science are confronting experts in Russian language studies with new tasks that await accomplishment.

F. Filin,
Corresponding Member of the USSR Academy of Sciences,
Director of the Institute,
G. Belozertsev,
Cand. Sc. (Philol.),
Scientific Secretary of the Institute

Russkaya rech (The Russian Language)—this scientific journal, an organ of the Institute of the Russian Language, USSR Academy of Sciences, which is devoted to problems of the Russian language, is addressed to a broad readership. Founded in 1967, the journal comes out six times a year, and is illustrated with etchings and drawings. Its Editor-in-Chief is V. Borkovsky, Corresponding Member of the USSR Academy of Sciences and State Prize winner.

A fairly good idea of the line pursued by the journal will be provided by mention of its permanent sections: "The Language of Literature", "The Writer Has the Floor", "Good Speech", "The Language of the Press", "Terminology", "The History of Writing", "From the History of Words and Set Expressions", "Introduction to Linguistics", and "Consultations". Also featured are the biographies of linguists, articles on the languages of the Soviet peoples, and reports on new books on Russian studies.

During its relatively short period of existence, the journal has featured numerous contributions by such Soviet men of letters as Kornei Chukovsky, Nikolai Tikhonov, Mikhail Isakovsky, and Victor Bokov. It was on the pages of this journal that Academician Victor Vinogradov published his report "The Russian Language in the World of Today", which he delivered in Paris in 1967 at the constituent conference of the International Association of Teachers of the Russian Language and Literature, as well as his notes on the history of words and argotic expressions current in Russia, an extensive article on the language of the fabulist Ivan Krylov, and other materials.

Among the numerous articles that present considerable interest from the scientific point of view, special mention should be made of those which determine the character of our publication.

An article by F. Filin entitled "At the Sources of the Russian Language" deals with the general problem of the ancestral home of the Slavic peoples. In the author's opinion, the precursors of the ancient Slavic tribes lived between the middle reaches of the Dnieper and the Western Bug in the first millennium B. C. This hypothesis, which is widely accepted in Soviet Slavic studies, is dealt with in detail, not only in Filin's writings but also in those of other researchers. In this particular instance F. Filin published additional material on general problems of the history of the Slavic languages. In his capacity of Director of the Institute, he describes the publications and plans of research work envisaged in the Academy of Sciences in the field of the Russian language.

V. Borkovsky, who, together with a large group of scholars, was last year awarded a State Prize for deciphering Novgorod official documents recorded on birch bark and

then publishing their findings, has written in a style designed for the general reader on the significance of these outstanding memorials of ancient Russian documents and the language used in them. It is noteworthy that our journal has devoted considerable space to the history of the Russian language as a whole, to important ancient documents, the history of words and set expressions, and former and current contacts between Russian and other languages of the world. In 1970 alone, the journal carried the following important articles: one by V. Anichenko on Francisco (George) Skorin, the first Byelorussian printer; another on *Kniga Bolshomu Chertezhu* (Book on the Grand Design), the first description of the geography of 17th-century Muscovy by A. Barandeyev; an article by V. Sergeyev on inscriptions on ancient Russian icons; an article by L. Senina on 17th-century private correspondence in Russia; an article by S. Skvortsova on the first children's magazine in Russia, and an article by V. Terekhova on manuscript medical treatises of the 17th and 18th centuries.

During 1970, new facts on the origin and history of the term "Golden Horde" were reported in studies by G. Bogatova; N. Baskakov, a leading Soviet Turcologist, published notes on the origins of such ancient Russian surnames pertaining to the nobility as Yusupov, Arakcheyev, Bibikov, Korobin, Chirikov, Polivanov, and Merlin; M. Sniraliev, member of the Azerbaijan Academy of Sciences, published an article on the Turkic languages of the Soviet Union and a number of other articles on Turkic expressions in Russian.

Besides articles of a theoretical nature, the journal features material on outstanding facts in the scientific activities of Soviet linguists. Thus, the award of a Lenin Prize to a group of Soviet lexicographers who compiled a 17-volume *Dictionary of Present-day Russian* provided the occasion for publication of material on the history of lexicography in our country, on a number of academic dictionaries of the Russian language, work on a card index of the vocabulary of the Russian language of the Soviet Union, and on plans for the compilation of a new academic dictionary.

As is common knowledge, the works of V. I. Lenin and his colleagues in the Communist Party played a highly significant part in the history of Russian publicist writing. Consequently, the journal regularly publishes material on general and particular problems of the study of the language and style of Russian revolutionary publicist writing. On the occasion of the centenary of the birth of V. I. Lenin, the journal published a series of articles, in the course of 1969 and 1970, on the Leninist national policy, and Lenin's views on language, among them, "Lenin and Good Speech" by L. Skvortsov; "The Leninist National Policy in Language Advancement" by M. Isayev, to name but two instances. It goes without saying that materials on the language and style of Russian classical and contemporary literature are prominently featured in our journal. Thus, in the course of 1970, we published series of articles on the language of Ivan Bunin and Alexander Fet, the style of the Russian historical novel, and as well as writings on the language of Kondratii Ryleyev, Alexander Herzen, Nikolai Nekrasov, Ivan Turgenev, Leo Tolstoy, Maxim Gorky, Sergei Yesenin, Mikhail Prishvin, Vladimir Mayakovsky and Mikhail Sholokhov.

Besides informing a wide readership of the achievements of the Soviet science of language, the journal has also set itself the task of active propaganda and explanation of the norms of spoken and written literary Russian, the rules of Russian grammar, word usage, and pronunciation. Articles are frequently published on the norms of stage speech and radio announcing.

Under the heading of "Good Speech", we feature materials on correct stress and pronunciation, and articles on the proper use of words and expressions. R. Budagov, Corresponding Member of the USSR Academy

of Sciencies and a leading authority on Russian composition, writes on the specific features of the language of science, and V. Veselov on the style of official correspondence.

The journal also publishes informatory material on new words, short vocabulary lists, and replies to questions from readers regarding the Russian language.

The journal is addressed to all those who love the Russian language, to those who use words and speech as working tools and also to such that take an interest in linguistics. It enjoys a well deserved popularity in our country and abroad: in the past four years the number of subscribers has doubled, reaching 85,000 in 1971.

V. Deryagin,
Cand. Sc. (Philol.),
Executive Secretary to the Editorial Board

THE INSTITUTE OF LINGUISTIC STUDIES AND THE JOURNAL VOPROSY YAZYKOZNANIYA (PROBLEMS OF LINGUISTICS)

The Institute of Linguistic Studies of the USSR Academy of Sciences was founded in 1921, the year when the Petrograd Institute of Japhethodological Studies was set up. Since then it has undergone several changes. It received the present name in 1958. The Institute is in Moscow, and is headed by V. Yartseva, Corresponding Member, USSR Academy of Sciences. It has a branch in Leningrad. At first the Institute's main trends in research were:

a) study of the languages of the peoples of the Soviet Union and their history (save for the Russian language, which was naturally studied by the Institute of the Russian Language), and cognate foreign languages;

b) study of Romanic and Germanic languages;

c) elaboration of questions of general and applied linguistics.

The Institute's structure was established (for Moscow) in conformity with these tasks. It set up sectors and groups according to the genealogical principle of the division of languages, and groups for general and applied linguistics. Improvements were made in the structure as the Institute began to study a growing number of problems. In 1960, for instance, the group for applied linguistics was turned into the Sector for Structural and Applied Linguistics, since the structural and mathematical methods of research in linguistics are the theoretical basis for the elaboration of applied linguistic problems of cybernetics.

In 1962 the group for general linguistics was turned into the Sector for General Linguistics, whose task was to make a detailed study of the many urgent questions of theoretical linguistics, including the correlation of the descriptive, comparative-historical and comparative-typological linguistics, the correlation of the traditional and new methods of linguistic studies, the various aspects of semiotics, structural linguistics and linguistic typology, the laws of the development of national languages in the epoch of the full-scale construction of communism. These questions were also dealt with by the problem group studying the laws of the development of the literary languages of the peoples of the USSR in the Soviet epoch, which was set up at the time.

In 1965 the Institute began to study the African languages, setting up a special group for African languages (which was formed, in the main, in 1966). In June 1970 Assistant Professor N. Okhotina, the head of the group, delivered a report to the Bureau of the Literature and Language Section of the USSR Academy of Sciences on the state and prospects for the development of the research in African languages at the Institute, and proposed to set up a Sector for African Languages.

In April 1968, a group for socio-linguistics was set up so as organisationally to consolidate socio-linguistic research on the basis of the problem group for the laws of the development of the literary languages of the peoples of the USSR in the Soviet epoch. In 1969 the group was turned into a sector for socio-linguistics.

The Institute took the initiative in developing research in psycho-linguistics, and set up a problem group for psycho-linguistics to coordinate the Soviet scientists' work in the field. In 1967 and 1968 the group held two coordinating symposiums, and published their materials. In October 1969 it received the status of a special structural subdivision of the Institute, having become the group for psycho-linguistics and the theory of communication.

Thus, the range of problems dealt with by the Institute gradually expanded. Fundamental theoretical research was stepped up, and work was carried out along new lines. The Institute's field of studies became clearly defined, and its structure improved in keeping with the new tasks.

Besides the sectors for general linguistics and socio-linguistics mentioned earlier, the Institute now has sectors for structural and applied linguistics, for Germanic languages, Romanic languages, Iranian languages, Caucasian languages, Turkic languages and Finno-Ugric languages, groups for Mongolian languages and African languages, an editorial group and, as we have seen, a group for psycho-linguistics and the theory of communication.

The Institute has a branch in Leningrad which, from 1962, has been headed by the Institute's Deputy Director and Corresponding Member of the USSR Academy of Sciences, A. Desnitskaya. It has sectors for Indo-European languages, Altaic languages, Paleo-Asiatic languages and Samoyedic languages, and a group for structural and typologic linguistics.

If there are problems that must be worked out by various specialists, the Institute sets up temporary or permanent problem groups consisting of workers from various sectors and, if need be, of specialists from other scientific and higher educational establishments in the country. Today the Institute has problem groups for language and society headed by A. Desnitskaya, statistics of speech headed by R. Piotrovsky, D. Sc. (Philol.), structural and probabilistic analysis of language and speech headed by N. Andreyev, D. Sc. (Philol.), and onomastics headed by V. Nikonov.

The Institute leads other Soviet establishments in the wide range of the general linguistic problems which it is studying and in the profound elaboration of the important methodological problems of the theory and history of language, its social functions and laws of development. Theoretical work is being carried out on the basis of concrete research. The Institute has good linguistic specialists, including one Academician, four Corresponding Members of the USSR Academy of Sciences, 42 Doctors of philological sciences and 84 Candidates of philological sciences.

The Institute is putting out publications which clearly show its scientific activities. In recent years it put out such major works by groups of authors as *Theoretical Problems of Soviet Linguistics, Inquiries into the General Theory of Grammar, General Linguistics* (Vol. I), *Fifty Years of Soviet Linguistics, Leninism and the Theoretical Problems of Linguistics* (put out to mark the centenary of Lenin's birth), *Comparative Grammar of the Germanic Languages* (in four volumes), and *Contrastive-Comparative Grammar of the Romanic Languages* (serial publication).

Important research has been carried out into many languages of the Soviet peoples and the following works by groups of authors have been compiled and published: *Languages of the Peoples of the Soviet Union* (in five volumes) and *Laws of the Development of the Literary Languages of the Peoples of the USSR in the Soviet Epoch* (in

four volumes, the last two volumes are at the printer's). Moreover, the following monographs by individual authors have been put out: *Grammar of the Nanaian Language* (in two volumes), *Grammar of the Chukchi Language, Grammar of the Asian Eskimo Language* (in two volumes), *Nivkh Language* (in two volumes) and *Historical Syntax of the English Language*. Various dictionaries have also been compiled, and some of them have already been put out, including *Ancient Turkic Dictionary, Comparative Dictionary of the Tungus-Manchu Languages, Etymological Dictionary of the Kartvel Languages, Etymological Dictionary of the Adighe (Circassian) Languages* (Vol. I), *Etymological Dictionary of the Turkic Languages* (Vol. I), *Historico-Etymological Dictionary of the Ossetian Language* (Vol. II), *Concise Etymological Dictionary of the Komi Language, Nenets-Russian Dictionary, Eskimoan-Russian Dictionary, Chukchi-Russian Dictionary* and *Dialect Dictionary of the Mansi Language*.

The Institute puts out, on average, from 20 to 25 works by groups of authors and individual monographs annually. Moreover, the workers at the Institute contribute from 200 to 250 articles to various Soviet and foreign publications every year. The annual plans for scientific research envisage the elaboration of about 65 to 70 themes by one or more authors.

Today the Institute and its Leningrad branch are carrying on scientific work mainly along the following lines:

—study of the general questions of the theory and methodology of linguistics, the social nature of language, the interrelations of language and thinking, the psychological and physiological mechanisms of speech (psycholinguistics), and the methods of linguistic research;

—elaboration of the problems of social linguistics and the theory of mass communication, study of the role of social factors in linguistic development, the linguistic policy and national relations today, and the processes of the functioning of the Russian language as a means of international communication;

—typologic, genetic and areal study of the languages of the peoples of the Soviet Union and cognate foreign languages. Investigation of the formation of languages in their literary and colloquial forms;

—study of the structure of the Romanic, Germanic and other Indo-European languages and the African languages, and the history of their development;

—study of the processes of the formation of language unions and the nature of the territorial-linguistic communities;

—study of the lexicology, lexicography, alphabets and orthographies of the national languages of the Soviet Union;

—elaboration of the problems of structural and applied linguistics and the questions of applying mathematical methods in linguistics.

The Institute is the main scientific establishment which studies the problems of general linguistics and the languages of the peoples of the Soviet Union and other countries; it coordinates the scientific establishments' activities in this field on a country-wide scale. Moreover, it renders scientific-consultative assistance to local scientific and higher educational establishments, and organises all-Union and regional conferences and symposiums on the most pressing problems.

The Institute is attaching great importance to the training of specialists for its own needs and for scientific and higher educational establishments in the Union and Autonomous republics. The scale of this work may be gathered from the fact that, since 1950, 570 people attended postgraduate course and 40 Doctors defended their theses. Today 55 postgraduates are studying at the Institute; many of them came from the Union and Autonomous republics, and from socialist countries. Every year about five persons stand for a Doctor's degree, and about 10 to 12 persons for a Candidate's degree at the Institute's Scientific Council in Mos-

cow. About the same number of persons stand for a Candidate's degree at the Scientific Council of the Institute's Leningrad branch, which in 1968 received the right to admit persons to stand for the degree of Doctor of Philological Sciences.

Yu. Eliseyev,
Cand. Sc. (Philol.),
Deputy Director of the Institute

The journal *Voprosy yazykoznaniya* (Problems of Linguistics) started publication in 1952 as the organ of the Institute of Linguistics of the USSR Academy of Sciences. Until 1969, its Editor-in-Chief was Academician V. Vinogradov. Its present Editor-in-Chief is F. Filin, Corresponding Member of the USSR Academy of Sciences and Lenin Prize laureate.

The journal's aim is to elucidate and discuss, in good time, the main general theoretical problems of linguistics and allied sciences (prosody, applied linguistics, linguistic geography, onomastics, psycho-linguistics, and so on), and the creative achievements and hypotheses of the philologists in the Soviet Union and other countries. It carries reports on the hitherto unknown features of the structure of the various languages of the world, makes a critical analysis of the various trends in linguistics, and reviews linguistic literature put out in the Soviet Union and other countries. Readers may consult it for various urgent problems of linguistics. Moreover, the journal promotes ties between Soviet science and the secondary school, and informs the reader about new finds, deciphered manuscripts and scientific life. It has the following sections: 1. articles; 2. discussions; 3. materials and reports; 4. applied and mathematical linguistics; 5. review of the history of linguistics; 6. review of foreign journals; 7. consultations; 8. criticism and bibliography (reviews); 9. news items. It comes out six times a year, and has a circulation of over 7,000 copies.

The journal's material has been on a high theoretical level ever since it was put out. It therefore enjoys great international prestige, and has long since become indispensable to linguists. Today all important linguistic works make references to it, and many of its articles have been republished abroad in English, German and French. Its contributors include such prominent linguists as Academicians L. Bulakhovsky, G. Tsereteli, V. Vinogradov, V. Zhirmunsky and V. Shishmarev, and Corresponding Members of the USSR Academy of Sciences F. Filin, B. Serebrennikov and V. Yartseva.

The journal published such classical theoretical works by V. Vinogradov as "On the Theory of Poetic Speech" and "Poetics and Its Relation to Linguistics and the Theory of Literature", and E. Makayev's article "Comparative, Contrastive and Typologic Grammar".

The "Discussions" section has dealt with structural linguistics and such important linguistic problems as synchrony, diachrony, Armenian consonantism and Russian orthography. It also carried interesting articles on language universals and typology by B. Uspensky, Yu. Rozhdestvensky and others, and articles on the substantiation of a structural approach to vocabulary and semantics (Yu. Apresyan's articles on the interpretation of the lexical system of language by means of syntax and M. Makovsky's substantiation of the theory of lexical attraction; N. Tolstoy's articles on the typology of the Slavonic vocabulary are of great interest). The "Materials and Reports" section carried problem articles by V. Orlova on the classification of Russian dialects, V. Zhirmunsky on the potentiation in German dialects, Ya. Krupatkin and M. Steblin-Kamensky on the phonology of the German languages, and material on the deciphered birch-bark documents of Novgorod, and Carian and Etruscan inscriptions.

The "Applied and Mathematical Linguist-

ics" section carried many articles on linguistical statistics, linguistic probability, machine translation, and so on. The journal has often carried material, published for the first time, by such prominent scientists as A. Shakhmatov, Ye. Polivanov and L. Shcherba. The "News Items" section regularly deals with conferences, meetings and congresses in the Soviet Union and other countries.

The journal will continue to deal with the problems of Soviet and world linguistics, and will make its contribution to the development of progressive linguistic theory and practice and the exchange of scientific experience between peoples.

M. Makovsky,
D. Sc. (Philol.)

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THE 28th INTERNATIONAL CONGRESS OF ORIENTALISTS

The 28th International Congress of Orientalists took place in Canberra (Australia) from January 6 to 12, 1971. Over 1,100 scientists representing 32 countries participated in its work. The 13-men Soviet delegation, led by Academician Ye. Zhukov, Vice-President of the International Union of Orientalists, included representatives of the scientific centres of Moscow, Leningrad, Baku and Tbilisi.

The Congress's proceedings were conducted in 55 working groups arranged according to 6 regional programmes (West Asia, South Asia, South-East Asia, China, Korea, Japan, Central and North Asia), and 14 seminars and symposiums. The Congress participants submitted 595 reports devoted mainly to the problems of the contemporary socio-economic and political development of the Eastern countries. Considering the venue of the Congress it is only natural that its participants paid exceptionally great attention to the problems of the Far East and South-East Asia.

A major programme of the Congress was devoted to China, 120 reports being read on this subject. Almost half of them touched on the problems of contemporary China, its socio-economic, political and ideological evolution. Questions were discussed connected with the social basis of the CPR's political leadership, the role played by the army, the "cultural revolution" and its consequences, production structures in agriculture, etc.

A feature of most of the reports submitted by the Western orientalists was the desire to approach the present events in China, and in particular, assessment of the essence of the "cultural revolution", from objectivist positions. On the other hand, many reporters attempted to consider the complex specific processes in China as possible "models" for other developing states. It was from this point of view that such problems as the role of the army in society, the social basis of political leadership, etc., were analysed. Quite a number of reports were devoted to the position of the Chinese communities in South-East Asia.

The working groups dealing with various problems of China were the best attended; many bourgeois sinologists openly admitted that their interest in present-day developments in China was dictated by the practical and political interests of Western governments and business circles.

The Japan working group also attracted many participants. Acute political issues were raised. A number of the Japanese and also Western reporters tried to prove that before the Second World War it was the Japanese military who held sway in the government and determined the country's foreign policy proceeding exclusively from their caste interests. In other words, an attempt was made to remove responsibility from the Japanese monopolies which actually masterminded the country's foreign policy gambles. But it is common knowledge that the monopolies had a direct hand in the preparation and launching of the Second World War,

and that the Japanese military acted as a vehicle of their interests. That is why the latters bear equal responsibility with the military for the war adventures of Japanese imperialism in Asia.

Soviet representatives took an active part in the proceedings of the Japanese working group. After the report by the Soviet scholar I. Latyshev, a discussion arose in connection with Japan's unjustified claims on the Kuril Islands. In his replies Latyshev showed that these claims had neither a historical nor a legal basis. He underscored the cardinal difference between the legal demands voiced by the Japanese and world public to return US-occupied Okinawa to Japan, which is an ancient Japanese land populated by the Japanese, and the claims of Japanese official circles on Soviet territory, which ran counter to international law.

The Soviet scholars and also their colleagues from the GDR took an active part in the work of the Western Asia groups. Their reports aroused the greatest interest.

In all, 10 reports were read by Soviet delegates, in addition to a number of reports and other materials that was distributed at the Congress. The reports by the Soviet delegates covered general theoretical and methodological problems ("National Independence and Social Progress", "Typology of National Movements", etc.), and researches of a regional nature ("The Main Socio-Economic Results of Industrialisation in the Korean Peoples' Democratic Republic", "Demographical Situation in the Arab East", etc.). All the reports were very well received and evoked lively discussion.

The fact that delegations from socialist countries attended the Congress improved the general atmosphere there; it prevented the Congress's rostrum being used for political attacks, and prejudiced speeches. At the insistence of the Soviet delegation several reports by US bourgeois scholars which twisted facts and were clearly of a provocative character, were cancelled.

It is gratifying to note that reports of that kind were few at the Congress. Most of the scientific papers by Western orientalists were of a high professional level. Many of them showed a good knowledge of Eastern languages and original sources. The Congress showed that interest in present-day problems has sharply grown in Western orientology and that certain success has been achieved in this field. In this respect the Canberra Congress reflected, to a certain extent, the increasingly evident turn, that first began after the Second World War, from the traditional subjects of orientology (textology, cultural memorials, the ancient past, philology), to urgent problems of our time. It is closely connected with the radical changes in the history of the peoples of Asia and Africa, with the collapse of the colonial system and the emergence of a great number of new independent national states.

One can only regret the fact that the Afro-Asian countries were not widely represented at the Congress, with the exception of India, which sent an 88-men delegation. The reports delivered by the Indian scholars showed once again that nowadays orientology is inconceivable without the great contribution being made by the Eastern orientalists.

It was decided in Canberra that the next, 29th International Congress of Orientalists will be held in Paris in 1973, which coincides with the centenary of the First Congress, also held in Paris in 1873.

In conclusion we should like to specially mention the useful work done by the Australian Preparatory Committee and its Chairman, the eminent Indologist, Prof. A. L. Basham. The Australian scholars did much to create a favourable atmosphere for the Congress, which undoubtedly contributed to the high level of scientific discussion and to establishing businesslike contacts between orientalists of different countries.

V. Ivanov,
G. Kim, *D. Sc. (Hist.)*

ALL-UNION SCIENTIFIC CONFERENCE ON "LENINISM AND LATIN AMERICA"

From April 8 to 10, 1971 Moscow was the venue of the All-Union Conference "Leninism and Latin America", sponsored by the Institute of Latin America of the USSR Academy of Sciences, and the Union of Soviet Societies of Friendship and Cultural Relations with Foreign Countries. It was attended by Soviet scientists, and Latin Americanists from the GDR, Poland, Rumania, Czechoslovakia. Also present were guests to the 24th Congress of the CPSU from the Communist parties of Venezuela, Panama, Colombia, Costa Rica and Honduras.

The conference examined, in the light of the Leninist teaching and Leninist practice, a range of problems bearing on the continent's economic and political life, its history, ideology and culture. It discussed: the development of the anti-imperialist movement in the period of the general crisis of capitalism; spread of Leninist ideas and formation of Communist parties; theory and practice of Leninism in the contemporary revolutionary and liberation movement; the ideological struggle at the present stage and unity of the revolutionary forces; the Leninist teaching on imperialism; neocolonialism in the light of the Leninist teaching; socio-economic development; the Leninist foreign policy principles in the Soviet Union's relations with the countries of Latin America; classes and the class structure of Latin American society; the agrarian question; and lastly the formation and development of national cultures. The conference also discussed questions connected with the Cuban revolution and the building of socialism in Cuba.

The conference was opened by Academician Ye. Zhukov who touched upon the problems of the present stage of the liberation movement in the continent, described the principal directions in which Latin American studies are being conducted.

The plenary session was opened by Professor V. Volsky, D. Sc. (Econ.), Director of the Institute of Latin America. He said that the conference was conceived as a report on the research work accomplished by Soviet Latin Americanists, their ability to apply Leninism in their studies of Latin American reality. Prof. Volsky stressed the importance of the Marxist-Leninist methodology for making a correct analysis of the socio-political and economic phenomena and processes under way in the continent.

I. Sheremetyev, Cand. Sc. (Econ.) a research worker of ILA, delivered a report "The Leninist Teaching on Imperialism and Latin America".

The Leninist teaching on imperialism, he said, is the theoretical and methodological basis for a creative study of the problems and laws of socio-economic development of the Latin American countries. The Leninist precepts about the main ways and means of liberating the peoples of the economically backward countries from the imperialist yoke, from the exploitation of the monopolies and finance capital, fully retain their validity. Lenin considered unity of action of the national-liberation forces and the proletariat of the developed countries in the struggle against the imperialist bourgeoisie a guarantee of the success of the struggle of the peoples of the colonial countries against imperialism.

The dependent and subordinate position of the Latin American countries in the world capitalist system is the main, "purely economic" reason that impels the bourgeois states of the continent to "clash" from time to time with the imperialist powers and their monopolies. But there are also political motives. These are the mounting struggle of the masses for their vital interests, the actions of progressive opinion in defence of national sovereignty, and for economic independence. Of no small importance is also the growth of nationalist aspirations among a certain section of the ruling classes.

"The Leninist Teaching on Classes and the Dynamics of the Social Structure of La-

tin American Societies", was the subject of a report by B. Koval, D. Sc. (Hist.), research worker of ILA. He said that the Marxist-Leninist teaching on classes and the class struggle is the scientific basis for examining the social structure of society at all stages of its development. The task facing Marxist scholars today is to make a comprehensive study of the dynamics of the social structures of Latin American societies on the basis of the teaching on classes, their development and struggle in our time.

B. Gvozdarev, D. Sc. (Law), ILA research worker, made a report "Lenin on the Colonial Policy of the Imperialist Powers and Contemporary US Neocolonialism in Latin America".

The present policy of the USA is fraught with grave danger for the destinies of the Latin American peoples. This policy once again irrefutably proves that the struggle against the neocolonialist aspirations of Yankee imperialism is the common concern of all patriotic forces of the continent; at the same time, it raises before us the task of establishing in the respective countries of the continent a broad anti-imperialist coalition that would counter the neocolonialism of the United States and secure for the Latin American peoples national revival and genuine social progress.

S. Semyonov, ILA research worker, devoted his report to the role of the subjective factor in the revolutionary processes in the continent.

The difference in the objective economic content of the revolutionary processes under way in the different Latin American countries, on the one hand, and the specific alignment of class forces, on the other, calls for a differentiated approach in examining the subjective factor conformably to the specific national features of each country. The common, regional feature that unities the entire continent is the revolutionary working class, headed by the Communist parties.

Professor A. Shulgovsky, D. Sc. (Hist.), ILA research worker, took as his subject "Leninism and Ideological Problems of the Revolutionary, Anti-Imperialist Movement in Latin America".

Increasing sections of the population are joining the revolutionary, anti-imperialist processes developing in the continent, he said. Radical, anti-imperialist trends are under way also in such social institutions as the Catholic Church, the Armed Forces, which one would think were the stable bulwark of the exploiter system.

The development of the revolutionary processes in the Latin American countries is accompanied by intensification of the ideological struggle. The opponents of Marxism-Leninism, both from the Right and from the "Left", declare in one voice that the revolutionary Marxist theory cannot be applied to Latin American conditions, that this theory is "European" in character. The Rights are advancing all kinds of theories and concepts about a "united industrial society", "national integration". The "Left" critics of Marxism, for their part, are laying claim to having evolved a "special" Latin American revolutionary theory, a single conception of the Third World.

The strength of Leninist ideas, their effectiveness, concluded the speaker, lies in the fact that they are hostile to ossified schemes and dogmas, that they open up before the revolutionary forces of different countries and continents truly boundless vistas for creatively elaborating the strategy and tactics of revolutionary struggle, which pave the way to socialism.

The conference heard with great interest the reports and speeches by its foreign participants and guests: T. Varela, A. Guido (Colombia); F. Hrbata, V. Nálevka (Czechoslovakia); M. Kossok, A. Dessau (GDR), J. Prokopczuk (Poland). In particular, T. Varela, member of the Central Committee of the Communist party of Colombia, told of the processes of concentration and centralisation under way in the Colombian economy, of the fusion of banking and industrial capital, the formation of finance corporation, connect-

ed with international finance organisations. He also dwelt on the process of pauperisation of the working masses, the growth of anti-imperialist sentiments in the country.

The conference "Leninism and Latin America" showed the maturity, profundity of the research work of Soviet Latin Americanists and scholars of the other socialist countries, greatly contributed to broadening knowledge of the continent.

B. Granin.

THE NEW PRESIDIUM OF THE USSR ACADEMY OF SCIENCES

On May 25-28, at its general meeting in Moscow the USSR Academy of Sciences elected the leading bodies of the Academy.

Mstislav Keldysh has been re-elected President of the USSR Academy of Sciences. Academicians M. Millionshchikov, V. Kotelnikov, A. Belozersky, A. Vinogradov, P. Fedoseyev and M. Lavrentyev have been elected Vice-Presidents.

G. Skryabin, Corresponding Member of the USSR Academy of Sciences, is Acting Chief Academic Secretary of Academy's Presidium.

The following Academic Secretaries of the Academy's various sections have been elected to the Presidium: Academicians N. Bogolyubov, L. Artsimovitch, M. Markov, M. Styrikovich, B. Petrov, A. Nesmeyanov, N. Zhavoronkov, A. Bayev, Ye. Kreps, Ya. Peive, V. Smirnov, L. Brekhovskikh, V. Khvostov, F. Konstantinov, N. Fedorenko, M. Khrapchenko, Chairman of the Presidium of the Ural Scientific Centre of the USSR Academy of Sciences, Academician S. Vonsovsky, First Deputy Chairman of the Siberian branch of the Academy, Academician A. Trofimuk, Chairman of the Far Eastern Scientific Centre of the Academy, Corresponding Member A. Kapitsa. Academicians A. Alexandrov, V. Ambartsumyan, N. Basov, P. Kapitsa, N. Melnikov, N. Muskhelishvili, B. Paton, I. Petrovsky, N. Pilyugin, P. Pospelov, A. Prokhorov, A. Rumyantsev, N. Semyonov and V. Tuchkevich have also been elected members of the Presidium.

BIBLIOGRAPHY

REVIEWS OF FOREIGN PUBLICATIONS ON SOCIAL SCIENCES IN SOVIET SCIENTIFIC JOURNALS (FEBRUARY-APRIL, 1971)

History. Auxiliary Historical Sciences

Летопис на дружбата. Т. I. *Социалистическата революция в България и дружбата със Съветския Съюз.* София, 1969, 596 с.

Рец.: Дороченков А. — *История СССР.* М., 1971, № 2, стр. 210—212.

Ујединена омладина српска. Зборник радова. Нови Сад, 1968, 621 с.

Рец.: В. Ф. — *Советское славяноведение.* М., 1971, № 2, стр. 88—90.

Arismendi R. *Lenin, la revolución y América Latina.* Montevideo, Ediciones Pueblos Unidos, 1970, 483 p.

Рец.: Тихменев В. — *Коммунист.* М., 1971, № 3, стр. 114—119.

Bazylow L. *Historia Rosji.* Wroclaw-Kraków, 1969, 518 s.

Рец.: Белявский М. — *История СССР.* М., 1971, № 2, стр. 203—209.

Bednareck H. *Die Gewerkschaftspolitik der KPD, 1935-1939.* Berlin, Verlag Tribüne, 1969, 304 s.

Рец.: Ерин М. — *Новая и новейшая история.* М., 1971, № 2, стр. 206—207.

Bernand A. *Alexandrie la Grande.* Paris, Arthaud, 1966, 382 p.

Рец.: Шургая И. — *Вестник древней истории.* М., 1971, № 1, стр. 124—129.

Bronowski Fr. *Idea gminowladztwa w polskiej historiografii (Geneza i formowanie się syntezy republikańskiej J. Lelewela).* Łódź, 1969, 158 s.

Рец.: Попков Б. — *Советское славяноведение.* М., 1971, № 2, стр. 92—93.

Der Bund der Kommunisten. Dokumente und Materialien. B. I., 1836-1849. Berlin, Dietz Verlag, 1970, 1196 S.

Рец.: 1. Рудяк В. — *Вопросы истории КПСС.* М., 1971, № 2, стр. 123—126; 2. Поспелова В. — *Вопросы истории.* М., 1971, № 2, стр. 182—184.

Catalano F. *L'economia italiana di guerra. 1935-1943.* Milano, Instituto Nazionale per la storia del movimento di liberazione, 1969, 144 p.

Рец.: Богорад В. — *Новая и новейшая история.* М., 1971, № 1, стр. 189—190.

Ciachir N. *România in sud-estul Europei (1848-1886).* Bucureşti, Editura politica, 1968, 237 p.

Рец.: Чертан Е. — *Балканский исторический сборник.* Кишинев, 1970, № 2, стр. 352—361.

Dolanský J. *Neznámý jihoslovanský pramen Rukopisů královédvorského.* Praha, Academia, 1968, 222 s.

Рец.: Мыльников А. — *Советское славяноведение.* М., 1971, № 2, стр. 94—95.

Grimsted P. K. *The Foreign Ministers of Alexander I (Political attitudes and the Conduct of Russian Diplomacy 1801-1825).* Berkeley and Los Angeles University of California Press, 1969, 367 pp.

Рец.: 1. Георгиев В., Киняпина Н. — *Вопросы истории.* М., 1971, № 3, стр. 191—193; 2. Станиславская А. — *Новая и новейшая история.* М., 1971, № 1, стр. 185—187.

Iliffe J. *Tanganyika under German Rule.* Cambridge, 1969, 235 pp.

Рец.: Рустамов С. — *Новая и новейшая история.* М., 1971, № 2, стр. 214—215.

Kammenhuber A. *Die Arier im Vorderen Orient.* Heidelberg, 1968, 295 s.

Рец.: Гиоргадзе Г. — *Вестник древней истории.* М., 1971, № 1, стр. 120—123.

Komuniści. *Wspomnienia o Komunistycznej partii Polski.* Warszawa, 1969, 654 s.

Рец.: Перцигер И. — *Советское славяноведение.* М., 1971, № 2, стр. 93—94.

Kühnl R. *Deutschland zwischen Demokratie und Faschismus. Zur Problematik der bürgerlichen Gesellschaft seit 1918.* München, Karl Hanser Verlag, 1969, 187 s.

Рец.: Борозняк А. — *Новая и новейшая история.* М., 1971, № 1, стр. 187—189.

Latin American History. Select Problems: Indentity, Integration and Nationhood. New York, Harcourt, Brace & World Inc., 1969, 482 pp.

Рец.: Созина С. — *Новая и новейшая история.* М., 1971, № 2, стр. 217—219.

Luxemburg R. *Gesammelte Werke.* B. I. (1893 bis 1905) in Zwei Halbbänder. Berlin, Dietz Verlag, 1970, 835 S., 667 S.

Рец.: Изволенская Н. — *Коммунист.* М., 1971, № 4, стр. 124—127.

Mithraism in Ostia. Mystery Religion and Christianity in the Ancient Port of Rome. Garrett Theological Studies, No. 1, Northwestern University Press, 1967.

Рец.: Кошеленко Г. — *Вестник древней истории.* М., 1971, № 1, стр. 129—134.

Moravcsik Gy. *Byzantium and the Magyars.* Budapest, Akadémiai kiado, 1970. 148 pp.

Рец.: Литаврин Г. — *Вопросы истории.* М., 1971, № 3, стр. 194—196.

Müller K.-J. *Das Heer und Hitler. Armee und nationalsozialistisches Regime, 1933-1940.* Stuttgart, Deutsche Verlags — Anstalt, 1969, 711 S.

Рец.: Случ С. — *Новая и новейшая история.* М., 1971, № 2, стр. 211—214.

Nougayrol J. *Textes suméro — accadiens des Archives privées d'Ugarit;* Virolleaud Ch. *Les nouveaux textes mythologiques et liturgiques de Ras Shamra (XXIV-e campagne, 1961).* „Ugaritica" V. Paris, 1968, p. 1-446, p. 545-606.

Рец.: Гельцер М. — *Вестник древней истории.* М., 1971, № 1, стр. 106—120.

Peremans W., Van't Dack E., Mooren L., Swinnen W. *La cour, les relations internationales et les possesions extérieurs, la vie culturelle N 14479-17250.* Prosopographia Ptolemaica VI. „Studia Hellenistica", 17. Louvain, 1968, LV, 297 p.

Рец.: Пикус Н. — *Вестник древней истории.* М., 1971, № 1, стр. 134—137.

Radosh R. *American Labor and United States Foreign Policy. The Cold War in the Unions from Gompers to Lovestone.* New York, Random House, 1969, 463 pp.

Рец.: Кравченко И. — *Новая и новейшая история.* М., 1971, № 1, стр. 191—192.

Śladkowski W. *Kolonizacja niemiecka w południowo — wschodniej części Królestwa Polskiego w latach 1815-1915.* Lublin, 1969, 285 s.

Рец.: Копруковняк А. — *Советское славяноведение.* М., 1971, № 2, стр. 90—92.

Viitala H. M. *Raunanoppositiō. Tutkimus poliittisesta oppositiosta. Suomessa vuosina 1940-1944.* Helsinki, Kansankulttuuri, 1969, 221 s.

Рец.: Вайну Х. — *Новая и новейшая история.* М., 1971, № 2, стр. 208—209.

Wójcik Zb. *Między traktatem andruszowskim a wojną turecką. (Stosunki polsko-rosyjskie. 1667-1672).* Warszawa, 1968.

Рец.: Флоря Б. — *Советское славяноведение.* М., 1971, № 2, стр. 85—88.

Wyczański A. *Studia nad konsumpcją żywności w Polsce w XVI i pierwszej połowie XVII w.* Warszawa. 1969, 224 s.

Рец.: Мавродин В., Якубский В. — *Вестник Ленинградского университета.* Л., 1971, № 2. История, язык, литература, вып. 2, стр. 144—146.

Z dziejów stosunków polsko-radzieckich. Studia i materiały. T. I-VII, 1965-1970.

Рец.: Куманецкий Е. — *Советское славяноведение.* М., 1971, № 1, стр. 102—106.

Problems of Today. International Relations

Adenauer K. *Erinnerungen. 1959-1963. Fragmente.* Stuttgart, Deutsche Verlags — Anstalt, 1968, 375 S.

Рец.: Степанов А. — *Новая и новейшая история.* М., 1971, № 1, стр. 192—197.

Alvarez Rios B. *Cuba: revolucion e imperialismo.* Editorial de ciencias sociales del Institute del libro, La Habana, 1969, 480 p.

Рец.: Греков А. — *Латинская Америка.* М., 1971, № 2, стр. 191—193.

America' 70. ¿Servidumbre o independencia en la Presente Decada? Santiago de Chile, Ediciones Nueva Universidad, 1970, 252 p.

Рец.: Ткаченко В. — *Международная жизнь.* М., 1971, № 3, стр. 123—125.

Ataöv T. *Amerika, NATO ve Türkiye.* Ankara, Aydinlik yayinevi, 1969, 295 s.

Рец.: Поцхверия Б. — *Вопросы истории.* М., 1971, № 3, стр. 189—191.

Baring A. *Aussenpolitik in Adenauers Kanzlerdemokratie. Bonns Beitrag zur Europäischen Verteidigungsgemeinschaft.* München und Wien, R. Oldenburg Verlag, 1969, 492 S.

Рец.: Степанов А. — *Новая и новейшая история.* М., 1971, № 1, стр. 192—197.

Beer S. *Modern British Politics. A Study of Parties and Pressure Groups.* London, Faber and Faber, 1969, XII, 432, XIV pp.

Рец.: Рыжиков В. — *Новая и новейшая история.* М., 1971, № 2, стр. 215—217.

Birnbaum K. E. *Peace in Europe. East-West Relations 1966-1968 and the Prospects*

for a European Settlement. London-Oxford-New-York, Oxford University Press, 1970, XI, 159 pp.

Рец.: Юрин Н. — *Международная жизнь.* М., 1971, № 4, стр. 133—135.

Brown E. *Reagan and Reality.* New York, Praeger Publishers, New York, 1970, XII, 235 pp.

Рец.: Олещук Ю. — *США — экономика, политика, идеология.* М., 1971, № 5, стр. 84—87.

De Yaco A. *Colonnelli e resistenza in Grecia.* Roma, Editori riuniti, 1970, 252 p.

Рец.: Монье В.—*Международная жизнь.* М., 1971, № 3, стр. 126—127.

Dye Th. R., Zeigler G. H. *The Irony of Democracy: an Uncommon Introduction to American Politics.* Belmont, Wadsworth Publishing Company, 1970, XIX, 348 pp.

Рец.: Савельев В. — *США — экономика, политика, идеология.* М., 1971, № 5, стр. 88.

Estudios politicos-económicós-filosóficos-culturales. N 54. Montevideo, 1970.

Рец.: Беляев В. — *Латинская Америка.* М., 1971, № 2, стр. 174—178.

Gorce P. M. de la. *La France contre les empires.* Paris, B.. Grasset, 1969, 363 p.

Рец.: Черкасов П. — *Новая и новейшая история.* М., 1971, № 2, стр. 209—211.

La Grecia dei colonnelli. Bari, Laterza, 1970, 276 p.

Рец.: Монье В. — *Международная жизнь.* М., 1971, № 3, стр. 126—127.

Hugo G. *Britain in Tomorrow's World. Principles of Foreign Policy.* London, Chatto and Windus, 1969, 265 pp.

Рец.: Рыжиков В. — *Новая и новейшая история.* М., 1971, № 2, стр. 215—217.

Kahn H. *The Emerging Japanese Superstate. Challenge and Response.* Englewood Cliffs, Prentice-Hall Inc., 1970, 274 pp.

Рец.: Шведков Ю. — *США — экономика, политика, идеология.* М., 1971, № 1, стр. 85—87.

Kohler F. D. *Understanding the Russians. A Citizen's Primer.* New York, Harper and Row, 1970, 441 pp.

Рец.: Яковлев Н. — *США — экономика, политика, идеология.* М., 1971, № 3, стр. 89—92.

Levinson J., Onis J. de. *The Alliance That Lost Its Way. A Critical Report on the Alliance for Progress.* Chicago, Quadrangle Books, 1970, 384 pp.

Рец.: Пахомов Н. — *Международная жизнь.* М., 1971, № 4, стр. 127—130.

Lowi Th. J. *The End of Liberalism. Ideology, Policy, and the Crisis of Public Authority.* New York, 1969, XIV, 314 pp.

Рец.: Никифорова Л. — *Вопросы философии.* М., 1971, № 3, стр. 174—176.

Lucas J. G. *Agnew: Profile in Conflict.* New York, 1970, 160 pp.

Рец.: Вельтов Н. — *США — экономика, политика, идеология.* М., 1971, № 1, стр. 72—74.

Maldonado Denis M. *Puerto Rico. Una interpretación histórico social.* México, Siglo XXI Editores SA, 1969, 225 p.

Рец.: Пояркова Н. — *Латинская Америка.* М., 1971, № 1, стр. 178—182.

McGaffin W., Knoll E. *Scandal in the Pentagon. A Challenge to Democracy.* Greenwich (Conn.), Fawcett Publications Inc., 1969, 192 pp.

Рец.: Леонидов В. — *Международная жизнь.* М., 1971, № 2, стр. 122—125.

Minuzzo N. *Quando arrivano i colonelli.* Milano, Bompiani, 1970, 252 p.

Рец.: Монье В. — *Международная жизнь.* М., 1971, № 3, стр. 126—127.

Moreno J. A. *Barrios in Arms. Revolution in Santo-Domingo.* University of Pittsburgh Press, 1970, 226 pp.

Рец.: Аншкина Е. — *Латинская Америка.* М., 1971, № 2, стр. 193—195.

Myrdal G. *The Challenge of World Poverty. A World Anti-Poverty Program in Outline.* New York, Pantheon Books, 1970, XVIII, 518 pp.

Рец.: Герасимов Г. — *Мировая экономика и международные отношения.* М., 1971, № 2, стр. 138—142.

Newman P. C. *A Nation Divided: Canada and the Coming of Pierre Trudeau.* New York, A. Knopf, 1969, XV, 496, XIX pp.

Рец.: Кочегарова Н. — *Новая и новейшая история.* М., 1971, № 2, стр. 219—221.

Nielsen W. A. *The Great Powers and Africa.* New York-Washington-London, Praeger Publishers, 1969.

Рец.: Тамарин В. — *США — экономика, политика, идеология.* М., 1971, № 5, стр. 82—84.

Parenti M. *The Anti-Communist Impulse.* New York, Random House, 1969, XI, 333 pp.

Рец.: Прокошев В., Сетунский Н. — *Мировая экономика и международные отношения.* М., 1971, № 3, стр. 131—136.

Ransom H. H. *The Intelligence Establishment.* Cambridge, Harvard University Press, 1970, XVI, 390 pp.

Рец.: Владимиров В. — *США — экономика, политика, идеология.* М., 1971, № 2, стр. 84—88.

Stanley T. W. *A Conference on European Security? Problems, Prospects, and Pitfalls.* Washington, The Atlantic Council of the United States, 1970, 100 pp.

Рец.: Львова Э. — *Мировая экономика и международные отношения.* М., 1971, № 4, стр. 147—148.

Stanley T. W., Whitt D. M. *Detente Diplomacy: United States and European Security in the 1970's.* New York, University Press of Cambridge, Mass., The Dunellen Company Inc., 1970, 170 pp.

Рец. Громыко Анат., Пастернак Э. — *США — экономика, политика, идеология.* М., 1971, № 1, стр. 76—78.

Stoessinger J. G. *The Might of Nations. World Politics of our Time.* New York, Random House, 1969, 455 pp.

Рец.: Сергеева Н. — *США — экономика, политика, идеология.* М., 1971, № 1, стр. 74—76.

Tournoux J.-R. *Le mois de mai du Général. Livre blanc des événements.* Paris, Plon, 1969, 528 p.

Рец.: Комин Н. — *Мировая экономика и международные отношения.* М., 1971, № 3, стр. 140—142.

Villanueva V. *¿Nueva mentalidad militar en el Perù?* Buenos Aires, Ediciones Replanteo, 1969, 282 p.

Рец.: Гавриков Ю. — *Новая и новейшая история.* М., 1971, № 1, стр. 183—184.

Wells H. *The Modernization of Puerto Rico.* Cambridge, Harvard University Press, 1969, 440 pp.

Рец.: Пояркова Н. — *Латинская Америка.* М., 1971, № 1, стр. 178—182.

Yasky S. *Lisandro de la Torre de Cerca. Los momentos culminantes de su vida pùblica.* Buenos Aires, Editorial Metropolis, 1969, 164 p.

Рец.: Волкова М. — *Латинская Америка.* М., 1971, № 1, стр. 175—177.

Archaeology

Brezillon M. N. *La dénomination des objects de pierre taillée. Matériaux pour un vocabulaire des préhistoriens de langue française.* Paris, 1968, 411 p., 227 fig.

Рец.: Праслов Н. — *Советская археология.* М., 1971, № 1, стр. 270—272.

Investigations at Tal-i-Iblis. Editor J. Caldwell. Illinois State Museum. Preliminary Report. N° 9. Illinois, 1967.

Рец.: Сарианиди В., Панарин С. — *Советская археология.* М., 1971, № 1, стр. 274—280.

Kalicz N. *Die Frühbronzezeit in Nordost-Ungarn. Abriss der Geschichte des 19.-16. Jahrhunderts v.u.z.* Budapest, 1968, 202 S., — 130 Tafeln.

Рец.: Клейн Л. — *Советская археология.* М., 1971, № 1, стр. 286—291.

Taute W. *Die Stielspitzen-Gruppen in nördlichen Mitteleuropa. Ein Beitrag zur Kenntnis der späten Altsteinreit.* Köln, 1968.

Рец.: Кольцов Л. — *Советская археология.* М., 1971, № 1, стр. 272—274.

Ethnography

Кулишић Ш., Петровић П. Ж., Пантелић Н. *Српски митолошки речник.* Београд, 1970, 317 с.

Рец.: Токарев С. — *Советская этнография.* М., 1971, № 2, стр. 174—175.

Florescu F. B., Petrescu P., Stahl P. H. *Arta populară de pe valea Bistriţei.* Bucureşti, 1969, 250 p.

Рец.: Зеленчук В. — *Советская этнография.* М., 1971, № 1, стр. 169—170.

Earhart H. B. *Japanese Religion: Unity and Diversity.* Belmont, California, 1969, 127 pp.

Рец.: Комаровский Г. — *Советская этнография.* М., 1971, № 1, стр. 171—174.

Earhart H. B. *The New Religions of Japan. A Bibliography of Western Language Materials.* Tokyo, 1970, 227 pp.

Рец.: Комаровский Г. — *Советская этнография.* М., 1971, № 1, стр. 171—174.

Earhart H. B. *A Religious Study of the Mount Haguro, Sect of Shugendo.* Tokyo, 1970, 230 pp.

Рец.: Комаровский Г. — *Советская этнография.* М., 1971, № 1, стр. 171—174.

Powne M. *Ethiopian Music. An Introduction. A Survey of Ecclesiastical and Secular Ethiopian Music and Instruments.* London-New York-Toronto, 1968, 153 pp.

Рец.: Чернецов С. — *Советская этнография.* М., 1971, № 2, стр. 177—178.

Siebert E., Forman W. *Indianerkunst der Amerikanischen Nordwestküste.* Praha, 1967.

Рец.: Разумовская Р. — *Советская этнография.* М., 1971, № 1, стр. 174.

Viehwirtschaft und Hirtenkultur. Ethnographische Studien. Herausgegeben von Laszlo Földes. Budapest, 1969, 900 S.

Рец.: Марков Г. — *Советская этнография.* М., 1971, № 2, стр. 161—164.

Philosophy. Sociology

Рачков Р. *Общественото мнение.* Издателство на Българската комунистическа партия, София, 1969, 179 с.

Рец.: Уледов А. — *Научные доклады высшей школы. Философские науки.* М., 1971, № 1, стр. 161—163.

Bunge M. *Scientific Research. U. I. The Search for System. V. II. The Search for Truth.* Berlin-Heidelberg-New York, Springer-Verlag, 1967, 536 pp., 374 pp.

Рец.: Рузавин Г. — *Вопросы философии.* М., 1971, № 1, стр. 169—173.

Contemporary Philosophy. A Survey. II. Philosophy of Science. Ed. by R. Klibansky. Firenze, La Nuova Italia, Editrice, 1968, 521 pp.

Рец.: Зуев К., Раджабов У. — *Вопросы философии.* М., 1971, № 2, стр. 172—175.

D'Hondt J. *Hegel en son temps (Berlin. 1818-1831).* Paris, Editions Sociales, 1968, 302 p.

Рец.: Садовский Н. — *Вопросы философии.* М., 1971, № 3, стр. 181—182.

Garai L. *Személyi ségdinamika és társadalmi lét.* Budapest, Aakadémiai Kiado, 1969, 231 l.

Рец.: Петери В. — *Вопросы философии.* М., 1971, № 3, стр. 183—185.

Ladd E. C. *Ideology in America.* Ithaca, Cornell University Press, 1969, XIII, 378 pp.

Рец.: Скнба В. — *Мировая экономика и международные отношения.* М., 1971, № 2, стр. 142—144.

Piaget J. *Le structuralisme.* Paris, Presses Universitaires de France, 1968, 127 p.

Рец.: 1. Фурман Д. — *Вестник Московского университета. Философия.* 1971, № 1, стр. 78—85; 2. Сахарова Т. — *Вопросы философии.* М., 1971, № 2, стр. 176—178.

Synthese. An International Journal for Epistemology, Methodology and Philosophy of Science. Dordrecht, 1966-1969.

Рец.: Легостаева А. — *Вопросы философии.* М., 1971, № 3, стр. 177—180.

Touraine A. *La société post-industrielle.* Paris, Editions Denoël, 1969, 315 p.

Рец.: Коломийцев В. — *Международная жизнь.* М., 1971, № 2, стр. 125—127.

Economy

Бонев С. *Планиране и икономически лостове.* София, 1968, 324 с.

Рец.: Кулигин П. — *Научные доклады высшей школы. Экономические науки.* М., 1971, № 1, стр. 112—114.

Barber R. J. *The American Corporation. Its Power, its Money, its Politics.* New York, E. P. Dutton and Co., Inc., 1970, 310 pp.

Рец.: Сутулин А. — *США — экономика, политика, идеология.* М., 1971, № 5, стр. 79—82.

Gaument E. *Le mythe américain.* Paris, Editions Sociales, 1970, 272 p.

Рец.: Павленко А. — *США — экономика, политика, идеология.* М., 1971, № 4, стр. 90—92.

Hunter L. C., Robertson D. J. *Economics of Wages and Labour.* London, Macmillan, 1969, 544 pp.

Рец.: Пронин С. — *Мировая экономика и международные отношения.* М., 1971, № 2, стр. 144—146.

Lecht L. A. *Manpower for National Goals in the 1970's.* New York, Frederick A. Praeger Publishers, 1969, 183 pp.

Рец.: Алексеев В. — *США — экономика, политика, идеология.* М., 1971, № 3, стр. 99.

McQuire E. P., Bailey E. L. *Sources of Corporate Growth.* New York, National Industrial Conference Board, 1970, 28 pp.

Рец.: Зелтынь А. — *США — экономика, политика, идеология.* М., 1971, № 4, стр. 95—96.

Theil H. *Economics and Information Theory.* Amsterdam, 1967.

Рец.: Пирогов Г., Зигангирова Н. — *Экономика и математические методы.* М., 1971, т. 7, вып. 1, стр. 156—158.

Turner L. *Invisible Empires. Multinational Companies and the Modern World.* London, Hamish Hamilton, 1970, 228 pp.

Рец.: Доронин И. — *Международная жизнь.* М., 1971, № 3, стр. 120—122.

Law

Гиндев П. *Демокрация, свобода, отговорност.* София, Наука и изкуство, 1969, 206 с.

Рец.: Пагюлин В. — *Советское государство и право.* М., 1971, № 2, стр. 152—153.

Трудове по международно право. Т. I. Софня, 1967, 250 с.

Рец.: Галенская Л., Кириллова Т. — В кн.: *Советский ежегодник международного права,* 1969. М., 1970, стр. 420—423.

Arzinger R. *Das Selbstbestimmungsrecht im allgemeinen Völkerrecht der Gegenwart.* Berlin, 1966, 466 S.

Рец.: Ефремов Ю., Игнатенко Г. — В кн.: *Советский ежегодник международного права,* 1969. М., 1970, стр. 417—418.

Bierzanek R. *Zasady pravne pokojewego wspolisnienia i ich kodyfikacja.* Warszawa, 1968, 269 s.

Рец.: Берестень Л. — В кн.: *Советский ежегодник международного права, 1969.* М., 1970, стр. 423—424.

Bolintineanu A., Popescu D. *Mijloacele juridice prim care statele devin la tratate.* Bucureşti, 1967, 247 s.

Рец.: Талалаев А. — В кн.: *Советский ежегодник международного права, 1969.* М., 1970, стр. 419—420.

Cavan R. Sh., Cavan G. T. *Delinquency and Crime: Cross-Cultural Perspectives.* Philadelphia-New York, G. B. Lippincott Company, 1968, 244 pp.

Рец.: Злобин Г. — *США — экономика, политика, идеология.* М., 1971, № 3, стр. 93—95.

Chandernagor A. *Un parlement, pour quoi faire?* Paris, 1967, 186 p.

Рец.: Серебренников В. *Известия высших учебных заведений. Правоведение.* Л., 1971, № 1, стр. 129—130.

Rybicki S. *Administracyjnoprawne zagadmienia gospodarki planowej.* Warszawa, Panstwowe wydawnietwo naukowe, 1968, 330 s.

Рец.: Лунев А., Пертцик В., Казанник А. — *Советское государство и право.* М., 1971, № 1, стр. 159—160.

Starosciak E. *Prawo administracyjne.* Warszawa, 1969, 603 s.

Рец. Махненко А., Бачило И. — *Советское государство и право.* М., 1971, № 4, стр. 147—149.

Linguistics

Gossen C. Th. *Französische Skriptastudien. Untersuchungen zu den nord-französischen Urkundensprachen des Mittelalters.* Graz-Vien-Köln, H. Böhlaus Nachf., 1967, 368 S.

Рец.: Бородина М., Мильман Н. — *Вопросы языкознания.* М., 1971, № 2, стр. 147—149.

Hrabe V., Adamec P. *Transformační syntax současné ruštiny. I.* Praha, 1969.

Рец.: Попова З. — *Научные доклады высшей школы. Филологические науки.* М., 1971, № 2, стр. 111—113.

Istoria limbii române. V. 1-2. Bucureşti, Editura Academiei R.S.R., V. 1. 1965, V. 2. 1969.

Рец.: Репина Т. — *Научные доклады высшей школы. Филологические науки.* М., 1971, № 2, стр. 113—116.

Kubik M. *Transformacionnyj sintaksis russkogo jazyka.* Praha, 1970.

Рец.: Попова З. — *Научные доклады высшей школы. Филологические науки.* М., 1971, № 2, стр. 111—113.

Lenneberg E. H. *Biological Foundations of Language.* New York-London-Sydney, 1967, XVI, 489 pp.

Рец.: Звегинцев В. — *Вопросы языкознания.* М., 1971, № 1, стр. 124—131.

Maciejewski J. *Słownik chełmińsko-dobrzyński.* (Siemoń, Dulsk). Toruń, 1969, 308 s.

Рец.: Никончук Н. — *Советское славяноведение.* М., 1971, № 2, стр. 99—102.

Marcus S. *Poetica matematică* Bucureşti Editura Academiei R.S.R., 1970, 400 p.

Рец.: Ревзин И. — *Вопросы языкознания.* М., 1971, № 1, стр. 132—138.

Mok Q. J. M. *Contribution à l'étude des catégories morphologiques du genre et du nombre dans le français parlé actuel.* The Hague-Paris, Mouton, 1968, 155 p.

Рец.: Щетинкин В. — *Вопросы языкознания.* М., 1971, № 2, стр. 144—146.

Roceric-Alexandrescu A. *Fonostatistica limbii române.* Editura Academiei R.S.R., 1968, 173 p.

Рец.: Потапова Р. — *Известия АН СССР. Серия литературы и языка.* М., 1971, т. 30, вып. 1, стр. 84—87.

Schlerath B. *Awesta Wörterbuch. Vorarbeiten.* B. 1-2. Wiesbaden, 1968, B. 1. XXXII, 264 S., B. 2. 200 S.

Рец.: Герценберг Л. — *Вопросы языкознания.* М., 1971, № 2, стр. 142—144.

Veyrenc Ch.-J. *Grammaire du Russe.* Paris, Presses Univ. de France, 1968, 125 p.

Рец.: Степанов Ю. — *Известия АН СССР. Серия литературы и языка.* М., 1971, т. 30, вып. 1, стр. 83—84.

Weiher E. *Die Dialektik des Johannes von Damaskus in kirchenslavischer Übersetzung.* Wiesbaden, 1969, XLVIII, 312 S., 12 Tafeln.

Рец.: Бегунов Ю. — *Советское славяноведение.* М., 1971, № 1, стр. 118—120.

Whiteley W. *Swahili. The Rise of a National Language.* London, 1969, 159 pp.

Рец.: Кирьянов В. — *Советская этнография.* М., 1971, № 1, стр. 175.

Literary Criticism

Попиванов И. *Христо Ясенов.* София. Наука и изкуство, 1968, 170 с.

Рец.: Опульский А. — *Вопросы литературы.* М., 1971, № 4, стр. 213—215.

Dima Al. *Principii de literatură comparată.* Bucureşti, Ed. pt. Literatură, 1969, 267 p.

Рец.: Николеску Т. — *Вопросы литературы.* М., 1971, № 3, стр. 239—241.

Lam A. *Polska awangarda poetycka. Programy lat 1917-1923.* T. 1-2. Kraków, Wydawnictwo literackie, 1969, T. 1 245 s., T. 2 460 s.

Рец.: Британишский В. — *Вопросы литературы.* М., 1971, № 4, стр. 202—208.

Leibowitz H. A. *Hart Crane. An Introduction to the Poetry.* New York, Columbia Univ. Press, 1968, 308 pp.

Рец.: Кириченко О. — *Вопросы литературы.* М., 1971, № 1, стр. 223—224.

Lewis R. W. *The Poetry of Hart Crane. A Critical Study.* New York, Princeton Univ. Press, 1967, 197 pp.

Рец.: Кириченко О. — *Вопросы литературы.* М., 1971, № 1, стр. 223—224.

Moser Ch. A. *Pisemsky. A Provincial Realist.* Harvard University Press, 1969, VIII, 268 pp.

Рец.: Грузинская Н., Могилянский А. — *Русская литература.* Л., 1971, № 1, стр. 216—218.

Münchow U. *Deutscher Naturalismus.* Berlin, Akademie-Verlag, 1968, 165 S.

Рец.: Мандель Е. — *Вопросы литературы.* М., 1971, № 4, стр. 215—219.

Stępień M. *Zagadnienia literackie w publicystyce polonii radzieckiej. 1918-1939.* Wrocław-Warszawa-Kraków, 1968, 190 s.

Рец.: Агапкина Т. — *Советское славяноведение.* М., 1971, № 1, стр. 112—114.

Studien zur Geschichte der russischen Literatur des 18. Jahrhunderts. Berlin, Akademie-Verlag, 1968, 492 S.

Рец.: Татаринцев А. — *Советское славяноведение.* М., 1971, № 1, стр. 114—117.

Ziętarska J. *Sztuka przekładu w poglądach literackich Polskiego Oświecenia, t. 10).* Wrocław-Warszawa-Kraków, 1969, 324 s.

Рец.: Ревзин И. — *Советское славяноведение.* М., 1971, № 2, стр. 97—99.

Arts

Кирил Цонев. Път в изкуството. Т. 1—2. Съставител и редактор С. Стоянов. София, 1969.

Рец.: Львова Е. — *Советское славяноведение.* М., 1971, № 2, стр. 95—97.

Francès R. *Psychologie de l'ésthétique.* Paris, Presses universitaire de France, 1968, 204 p.

Рец.: Афасижев М. — *Искусство.* М., 1971, № 4, стр. 69—71.

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«ОБЩЕСТВЕННЫЕ НАУКИ» № 4 (6) 1971 г.
на английском языке

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Issued jointly by the "Social Sciences Today" Editorial Board and Novosti Press Agency Publishing House