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THE ADVENTURE OF CYBERNETICS IN THE SOVIET UNION
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Reports and Documents

I

A LIFE-TIME IN SOVIET SCIENCE RECONSIDERED

THE *Biennale di Venezia* of 1977 was devoted to *Il Dissenso culturale*. Much attention was directed to dissent among scientists in the communist countries of Eastern Europe. One of the speakers was Professor Arnost Kolman, then 84 years of age. Although of Czech origin, Professor Kolman was at one time professor in the Institute of Mathematics and Mechanics in Moscow and a member of the praesidium of the State Scientific Council of the Soviet Union. He was a member of the Soviet delegation to the Second International Congress of the History of Science and Technology in London in 1931. At that conference, he delivered two papers on "Dynamic and Statistical Regularities in Physics and Biology" and "The Present Crisis in the Mathematical Sciences and General Outlines for their Reconstruction",[1] in which he took the orthodox Leninist-Stalinist view. The vicissitudes of his career and intellectual development are exhibited in the paper which he presented at the *Biennale* and which is reprinted below with slight abridgements and stylistic revision.

E.S.

THE ADVENTURE OF CYBERNETICS IN THE SOVIET UNION

ARNOST KOLMAN

THE idea of the dictatorship of the proletariat as a transitional period from capitalism to socialism which is necessary to suppress the resistance of the former ruling, exploiting classes, but not inevitably by force of arms, was for the first time formulated in detail in 1875 by Marx in his *Critique of the Programme of Gotha*. But already a quarter of a century later Lenin began, at first theoretically and afterwards in practice, to distort this concept in four respects.

Although he did it with the noblest subjective intentions—to free humanity from all kinds of oppression by means of the world revolution—objectively it had fatal consequences. These distortions were: First, the dictatorship of the proletariat was now directed not only against the exploiters, but against all adversaries, according to the slogan, "Who is not with us is against us". Secondly, it was executed by violence even in those cases where it could be avoided. Thirdly, not the working masses, but the Communist Party or more exactly its bureaucratic caste, which became a monopolistic one, carried out this terroristic dictatorship; finally

1 *Science at the Cross Roads: Papers Presented to the International Congress of the History of Science and Technology* (original ed., 1931; new ed., with a foreword by Joseph Needham and introduction by P. G. Wersky [London: Frank Cass, 1971]), pp. 83–94, 215–229.

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the dictator alone did it. Fourthly, it was extended over the entire sphere of culture, over the political, juridical, ethical, religious, philosophical, artistic, aesthetic and even scientific views of men.

The combination of these facts, which under Stalin and his heirs converted the Soviet Union into a totalitarian state, led to a phenomenon unintelligible at first sight. Even as abstract a science as mathematics, which does not affect the world-wide struggle, became an area of violence against scientific intellectuals. Even more this was the case in the social and biological sciences. It was done on the grounds of the right thesis—which was however extremely simplified—that ideology is in some measure a spiritual reflection of the material interest of social groups, and especially of classes.

The world outlook of dialectical and historical materialism, the principles of which are supposed to be founded on the experimental and theoretical results of the concrete sciences, was simply imposed on these sciences. While theologians and some Western philosophers and scientists drew from the results of science reactionary conclusions, we Marxist philosophers did not attempt to interpret the facts materialistically and dialectically; but we simply rejected them. Thus, as in the Middle Ages "philosophia ancilla theologicae", so now our Marxist philosophy became an obedient serving-maid of politics.

The huge majority of Soviet philosophers were and are "pure philosophers", who had and have no knowledge of concrete social and, even less, of natural sciences. But imitating Stalin, they—including myself—meddled in spheres where they were absolutely incompetent. My personal example is very characteristic. In the physico-mathematical disciplines where I had an appropriate grounding, I opposed the movement started by the physicist A. K. Timiriasev, and then by the philosopher Maximov, against the theory of relativity, or as they called it "reactionary Einsteinianism". I fought also for the acknowledgement of quantum theory, the theories of Pauling and Ingold in physical chemistry, for cybernetic and mathematical logic, and against the attempts which would restrict mathematics to its immediate, practical applications, and which denounced abstract inquiries as "idealistic".

But where I was fully incompetent—in psychotechnics, the science of soils, eugenics, and in particular in genetics—I took an active part in the campaigns against these disciplines which were declared pseudo-scientific. As a member of the editorial board of the philosophical magazine *Under the Banner of Marxism,* I, following the instruction of the central committee of the Party, obediently went with the other members of the board for three months into the question of heredity. But how could we, unprepared and prejudiced, understand such a complicated problem in such a short time? Afterwards, in the discussion about "formal genetics" and "Mendelism-Morganism", I wrote three articles on behalf of the "innovative ideas" of Lysenko.

I see it now; I began to understand it very late, only in 1953, only after I had witnessed the ghastly trial of Slansky, so strong is the pressure of social opinion! I see now that the main cause of my own and my

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colleagues' attitude of those days was that we made a fetish of the Party. As a Catholic believer accepts without criticism all dogmas of the Church and considers the Pope infallible, so for us each denunciation of an employee of the party apparatus was an indisputable law; every word of Stalin was a great scientific revelation. We did not know that all of this—the "putting through the mill" of "false theories" which ended by branding those who made "mistakes" as "people's enemies", and to their persecution, arrest and annihilation—was organised directly or indirectly by Stalin, as a general repetition of the massacres of the peasants, the old party personnel, the leading officers of the Red Army, the Komsomol, the scientific, literary and artistic intellectuals, and the religious and non-Russian national leaders. Unwittingly, I took part in such crimes as the destruction of the famous geneticist Nikolai Vavilov, and in the persecution of Duhinin and others.

It is not right to think that we all were careerists; on the contrary, most persons acted in good faith and this gave their declarations the force of conviction.

In the case of Lysenko, I thought in the beginning that this provincial agronomist without a higher education had been maltreated by the conservative high priests of science. It is probable that he himself, before becoming a protégé of Stalin, did believe sincerely and fanatically in his own soundness, but after he came to power he began to get rid of his adversaries by violence and to falsify the results of his experiments when these did not confirm his erroneous theories.

It would not be right to think that all our criticism was out of place: true, scientific disciplines were sometimes abused for reactionary aims, but instead of removing such tumours with a scalpel, we struck the healthy body with a cudgel and threw it afterwards in the cesspit. Finally, it should be said that, in spite of the pernicious influence of Soviet ideology on science which was in fact retarded thereby in its development, it did not come entirely to a halt. This is attested by the fact that the Soviets opened the cosmic era with the flight of Gagarin.

There are many talented scientists; it is only necessary to allow them the opportunity to give rein to their talents. The Soviet rulers cannot and do not want to understand that, by forcing many of the most gifted scientists to emigrate, they deprive the Soviet land of its strength.

That ideological interference with science weakens the productive forces and the defence potential of the land, nobody ventured to say. It is possible that some among the Soviet leaders did understand it, but the fear of being charged with opposition made them hold their tongues. The generally disdainful attitude of most of the Soviet politicians towards science, especially towards natural science and mathematics, also exercised some influence here. I cannot forget the disparaging tone of Stalin; on seeing me in the lift of the building of the central committee where I worked with a lot of mathematical books, he said: "Oh, mathematics!" But I must also add that some people who then kept silent and so, indirectly supported these criminal campaigns—unlike myself who supported

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them directly—now make themselves out to be unyielding champions of truth.

What were the historical roots of the intrusion of Marxist philosophy into the natural sciences? When Engels wrote in his *Dialectic of Nature* (1873–1883) that the application of mathematics is limited only to the lower forms of motion, and that it is not to be applied to biological, mental and social forms, this was not an ideological interference. His view was founded on the false, narrow, but at that time universally widespread definition of mathematics as the science of quantitative numerical relations. Only Felix Klein in his *Erlanger Programm* (1872) stated explicitly that mathematics deal with all relations which are structurally analogous to the quantitative ones, and so opened the way to its application to all domains of knowledge.

Nonetheless Lenin, in his philosophical work *Materialism and Empirio-criticism* (1909), reproached physicists with the mathematisation of science, writing: " the matter disappeared, only equations remain ". This and the other authoritative and sometimes incompetent opinions of Lenin in the interpretations of science—and Engels under the influence of Hegel's pretentious idealistic dialectics had already fostered a large number of them—set the pattern for us philosophers during the long decades when Marxism became a sacred, indisputable state philosophy. We imitated Lenin's intolerance which seemed to us to be strict adherence to principle, and his bluntness which was criticised by the philosopher Ljubov Axelrod when Lenin's book first appeared. We could not admit that a scientist can err honestly; we—including myself in some of my articles—characterised a scientist's real or imaginary mistakes as " reactionary ", and " counter-revolutionary ", and by this we branded him as an " enemy of the people ".

We all opposed the application of mathematical methods in biology, medicine, and psychology, because the idea came from abroad and to approve it would have been, according to Lenin, a " worship of foreign countries ". It was in the line of party policy, of which we—myself included—made a fetish, to fight against every influence of " rotten bourgeois ideology ". We argued in this way despite the fact that Marx, according to his son-in-law Lafargue, considered the progress of every science to be defined by its transition from only qualitative to quantitative investigations, and when he himself applied mathematics—even if only in the simplest way—to political economy; in his preparatory works to *Das Kapital,* he wrote that he hoped to deduce the laws of the periodic capitalist crises from the mathematical analysis of the curves of economic indices. In my article, " Is it Possible to Prove or Disprove Mendelism by Mathematical and Statistical Methods? ", which was published in the *Comptes rendus de l'Académie de sciences de l'URSS* in 1940, I stated that " mathematics is like the mill-stones which grind equally good and bad grain ", and that statistics gives only probable and not absolutely safe results. That is true, but it could not—as I then thought—serve as an argument against the application of statistics to genetics, because every inductive theory and method has only a probability-value. My point of

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view, as I always insisted, was fully determined by the party policy in the correctness of which I firmly believed. It is strange that at the same time I fought against a generally esteemed economic statistician, S. G. Strumilin, and his pupils, who denied the possibility of the application of the mathematical statistics with its law of large numbers to the Soviet economy. . . .

I want to sum up and in doing so to underline what Rudolf Bahrol revealed in the brilliant analysis contained in his recent book *Die Alternative*. The deep cause of all the ideological abuse of science in the countries with ostensibly "socialist" economies lies in the fact that when the means of production are not socialised, but belong to the state, the inevitable result is *Subalternität*, a political, bureaucratic, hierarchical subordination, in which no one can know more and better than the ruling caste. Science and culture in general will become free, and will cease to be manipulated against the genuine interests of the human personality, through its exploitation and estrangement, when this subordination of human beings ceases. This will be possible neither in capitalist society, nor in a pseudo-socialist totalitarian society. It will become possible only in the setting of the "free association" required by Marx, in which "the free development of each will be the condition of the free development of all". It can occur only in a system of socialism with a human face and definitively in the communist society in which sale and purchase, which are the roots of all social vices, have ceased to exist. Our struggle for the freedom of science, which should never again be *ancilla politicae* of autocratic rulers, will never be successful unless it is a fundamental constituent of the struggle of all progressive human beings for democracies everywhere in the East and in the West, and for the observance of human rights.

The disruption and distortion of Soviet science is a result not only of the Soviet ideology, but of the whole system of the "democratic centralism". This is in fact a bureaucratic centralism of the crudest form, the deepest roots of which lay in the Asian origin of tsarist despotism; this had been seen by Marx in his *Die Geschichte der Geheimdiplomatie des achtzehnten Jahrhunderts*. Censorship is omnipotent. As I know from my own experience, a scientific work on which many years of hard labour have been spent, and which has been approved for publication by experts and by the scientific council of a research institute of the Academy, may be sent by the publishing house of the Academy —in order to play safe—to the department of science of the central committee of the Communist Party, where an anonymous employee hears about the problems of this work for the first time. It is sufficient for him to telephone his veto—without a considered justification—to the publisher; the work will then never appear.

But this is not all. When the work is set up in type the Glavlit, the state censorship, enters and deletes all that seems to its officials to be "hostile", and "harmful", and especially all that might reveal the scientific and state secrets of the Soviet Union. The mania about secrecy and espionage and the paternal concern to protect scientific workers from

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the demoralising effects of the ideology of the " decaying capitalist world " hampers scientists from obtaining the knowledge they need for research. When I visited the United States in 1962, the cybernetic laboratories of the Massachusetts Institute of Technology and the factory of IBM were opened to me, who came from Prague, from behind the " iron curtain ". At about the same time in Moscow, when I, a member of the cybernetics council of the Academy, wished to visit its computing centre, I was forced to beg every time for a new special permit. Foreign professional literature is censored before Soviet scientists can see it; this is the reason why it is received with lacunae and lateness, and this leads to the fact that sometimes Soviet scientists discover things which have already been discovered abroad. The publication of their works without permission in foreign journals is a grave crime for Soviet scientists and it is severely punished. As a result, an innovator whose ideas are suppressed by his conservative colleagues and superiors in the Soviet Union cannot appeal to an international scientific forum. In violation of the constitution, private scientific correspondence is intercepted, censored and often confiscated. Delegations to international scientific congresses have to be approved by the central committee of the Communist Party and as a result they consist not of genuine scientists, but of administrators who are not able to take part in the discussion of scientific problems; in all such delegations there is an informer who is assigned to it by the KGB.

The most powerful means of subjugating Soviet science to politics and of depriving it of the freedom of development is " planning ". Of course, this can have its important and positive sides. It would eliminate unhealthy competition and duplication, and it would allow for the concentration of all human and material resources on the most important problems. Under totalitarianism all this turns into its opposite. In higher education, there prevails a system of selection which rejects many talented undergraduates, especially Jews, because of their political views, religious beliefs or philosophical convictions and nationality. In the research institutes similar criteria are applied to the recruitment and promotion of members of staff. The subjects of scientific work are directed from the top in such a way that first preference is given to themes which are expected to have a military or immediate practical application, or which will serve the prestige of the country and its rulers. To them are assigned enormous sums and their workers are given privileged conditions of existence. On the other hand, those scientists who are occupied in investigating abstract problems which might in the future turn out to be very important—as has been the case repeatedly in the history of science—are treated slightingly and are even declared to be saboteurs.

All these factors together create an atmosphere which is very unfavourable to creative scientific work. It is a truism to say that without liberty creative work in science, as in art, is generally impossible. Slavish labour, labour executed as a task, forced labour carried out by officials—and in totalitarian states the majority of scientists act as government officials—only rarely creates original values. It is true that there are exceptions. Sometimes even in solitary confinement—as I know it from my own

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experience—in order to divert himself from painful reflections a man concentrates his mind on scientific creation, and it is not always sterile. . . .

The dictatorship in science, which Lenin unwittingly started and which Stalin brought to a point where it became a mass crime, was continued after Stalin's death; it is continued now by his heirs. A colourful illustration shows the development of cybernetics in the Soviet Union in which I was involved. Allow me to tell here briefly about it.

In the summer of 1953, half a year after I was released from the Lubjanka and rehabilitated, I spent my holiday in a little village on the Black Sea. One evening as I was taking a walk I heard the tapping of a typewriter which came from a cottage where an old and good acquaintance of mine, Professor Kolbanovsky, lived. He said that he was writing an article about cybernetics, which was a pseudo-science, an American " misinformation ". From his manuscript, I learnt for the first time about the existence of this new science—which investigates the processes of control in technical automata, in living bodies and in society —and its name and creator, Norbert Wiener. Then I said: " Victor, you are a pure philosopher without any knowledge of mathematics and of foreign languages. You have not read a single line of cybernetics. How can you judge it? How can you think that American businessmen would spend millions on faked electronic computers? "

Because of the fact that before my arrest in 1948 I had published in Prague, where I was working, a book about mathematical logic in which I stated that logical operations will perhaps be performed in the future by mechanisms, I was favourably disposed to cybernetics. I advised the author not to publish his polemic. But he did not heed me and it appeared in the leading Soviet philosophical monthly magazine. He signed it with a pseudonym: " Materialist ".

So a broad campaign against cybernetics broke out. In addition to philosophers, some mathematicians and engineers also took part in it. Although it was not as cruel as the ideological campaign under Stalin, it lasted until 1958.

I wished to become acquainted with cybernetics, but in the greatest Soviet library, the Lenin Library in Moscow, Wiener's fundamental work was among the *libri prohibiti*, with all the works of Einstein and many others. The librarians would not allow me to read it. So I sent a letter of protest to one of the secretaries of the central committee of the Communist Party and to my surprise all these writings were made accessible to me.

In November 1954 the executive of the institute of social sciences of the Party invited me to lecture to their professors and postgraduates on the philosophical problems of the natural sciences. I accepted the invitation and lectured about cybernetics but not, as they expected, against it. On the contrary, I attacked " Materialist's " article. This caused consternation. They all pounced on me as a " mechanist ", and as an " admirer of bourgeois fashion ". The discussion continued for two weeks. Only one of those in attendance, a young postgraduate, did not fear to join me.

I attempted to have my lecture published in the monthly *Voprosi*

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filozofi, but the editorial board twice rejected it unanimously as " anti-Marxist ". Only after my repeated appeals to the central committee, and after a well-known mathematician, Sobolev, who was a member of the Academy of Science and a member of the Communist Party, also spoke in favour of cybernetics, did my article finally appear.

In the meantime I fought for the acknowledgement of cybernetics, lectured about it, and wrote a popular book about it. I also edited the translation of Wiener's book *The Human Use of Human Beings*, to which I wrote a preface. Later, in 1960, in collaboration with the director of the Prague Endocrinological Institute, Professor Silling, I proposed a programme of cybernetic diagnosis, with the help of which a large-scale investigation was carried out and through which two new diseases were discovered.

In the end, in 1958, the Academy of Science organised a scientific council of cybernetics, headed by an academician, Axel Berg, a former electro-engineer and tsarist admiral, of Swedish origin. I was included in this body. But the Soviet Union was already a full decade behind the United States in this field and, with its bureaucracy and its ideological attitudes towards science, it could not make up the lost time in the development of automation and cybernetics.

Of course, the Soviets are able to build large cybernetic systems designed for special military or astronautic aims, because in this case they are created under specially privileged conditions; high salaries, exclusive food supplies, prizes, access to health resorts, and decorations are given to the team of scientists, engineers and workers engaged on them. The mass production of Soviet computers is however on a low level. They are clumsy and flimsy, insecure and expensive. The automation of production, transport, trade and service advances very slowly. It encounters resistance from the heads of the enterprises, because it would need a radical and long-lasting reorganisation of the whole technology, during which the prescribed plans would not be fulfilled and no bonuses would be obtained. There is also a shortage of specialists capable of preparing the necessary programming for the computers. As a result, cybernetics apparatus stands unused.

But naturally, the most fierce opposition of Soviet ideologists to cybernetics persists with regard to the possibilities of application to human society. In 1965, at an all-union conference on the methodological problems of cybernetics, I set forth in my report the conditions which would have to be met before one could turn over to a cybernetic machine the control and the planning of the development of society. I said that in a scientifically governed society power over man would be replaced by power over things. This could not happen without a simultaneous realisation of two fundamental, necessary and sufficient conditions, the realisation of which would entail a radical change of the relationships among men. These conditions are: first, the socialisation —and not their acquisition by the state—of the major means of production, with the participation of workers in their management and the cessation of the exploitation of man by man; and second, an absolute democracy in the management of society together with the strict

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observance of all human rights and civil freedoms and the abolition of the material, social and political privileges of the rulers. Only under these conditions would society become a dynamic complex and open to a cybernetic system with ideal self-regulation. . . . A colleague, Spirkiw, a doctor of philosophy accused me of being "anti-Soviet", and I had serious troubles because of this. . . .

I must return to the autumn of 1969, to the time of a symposium on cybernetics in Naples, which took place in the Accademia navale. I participated in it with a Czechoslovak delegation and there I met Wiener. During the intervals of the conference we walked together along the shore and Wiener shared with me his anxieties lest cybernetics be turned against man. He remembered a legend from sixteenth-century Prague about the magician Rabbi Loew ben Betzalel and his *golem*—a clay robot who began to destroy everything. He also talked about the djinn—the evil spirit which according to the *Thousand and One Nights,* was released by a fisherman from a sealed bottle and then threatened to exterminate mankind.

But it is not cybernetics and science in itself, or the social system, which constitutes a dreadful threat. Here the fatal contradiction of our age displays itself: the colossal power of man in mastering nature and his wretched inability to rule rationally his own society.

Those weapons of mass destruction which science has already created are enough to annihilate all life on earth and the military are preparing others even more terrible. Therefore it is the most important, the most urgent task of our time, to the solution of which every man of good will ought to contribute—to make another world war impossible. Hence it is necessary that no rulers contemplate a forcible division of the world or an annexation of foreign territories.

It is possible to believe that they will do such things, as long as they violate the human rights of their own citizens. That is why if we wish to protect the life of our children and grandchildren we must fight for true democracy and liberty, for human rights in every country, however remote it is from ourselves. We must put this struggle above all immediate considerations, higher than marketing, party politics, today's gains of trade and profits. I do not even say that it is our moral duty. It is simply in the interests of every one of us.

Whoever does not see this is blind. I appeal to him. Understand, at last, before it is too late! . . . Scientists, writers and artists have power. Force your governments to demand from the oppressors who oppress their own people, to prove at home the peacefulness which they are constantly proclaiming. They should be economically, scientifically, technologically and culturally boycotted if they do not cease the oppression of their own people.

Aggressors take into consideration only force. They assess as weakness every concession by their opponents. Only when totalitarianism is finished everywhere will a general and complete disarmament be possible. Only then will cybernetics, atomic energy, laser, space exploration, genetics, microbiology, molecular biology, be used solely for constructive ends. . . .

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