

THE DIAMAT AND MODERN SCIENCE

Soviet scientists today must serve two harsh and exacting masters: the official credo of dialectical materialism, and the philosophy of science. How do they do it?

By PAUL S. EPSTEIN

IN STUDYING the position of intellectuals in sovietized countries the situation of scientists must be analyzed separately from that of writers and artists. Indeed, the conditions under which the scientists do their work are materially different from those which apply to other creative workers, and these differences derive from two sources.

In the first place, science, in general—and modern physics, in particular—has developed its own philosophical point of view. Therefore, the scientist finds himself obliged to serve two harsh and exacting masters: the official credo of dialectic materialism, on the one hand, and the philosophy of science, on the other. Thus arises the question to what extent the demands of these two masters are compatible.

In the second place, for the sovietized states, the usefulness of the results of scientific work is not of the same nature as the value of literary and artistic productions. This fact cannot fail to have some influence on the psychic atmospheres in which the two kinds of intellectuals live.

The term *diamat* is an abbreviation for *dialectic materialism*, current among Russian writers. We shall use this word to designate the particular form of dialectic materialism developed by Soviet philosophers, officially adopted by the Soviet government, and taught in the Soviet schools.

The purpose of the following pages is to discuss the conditions which the *diamat*—so understood—creates for scientists and for scientific pursuits.

1. DIALECTICAL MATERIALISM

It often has been said that Marxism is the religion of the Soviets; and by the same token the *diamat* represents the articles of faith of this religion.

Permit me to recall here a very profound remark made by Wilhelm Wundt. Only those articles of faith

are well chosen which are beyond human reason; if they cannot be understood, they are safe from getting in conflict with the advances of knowledge and from being disproved by science.

Judged by this criterion, the *diamat* almost qualifies: it is true that it contains one embarrassingly positive point (to be discussed in section 5 below), which stems from the materialistic world view embodied in it. This is offset, however, by two other points, inherent in the dialectic method, which make it very flexible and almost take it out of the realm of logic:

(1) The *diamat* holds that *internal contradictions are inherent in all things and phenomena of nature*, or in Lenin's words: "In its proper meaning, dialectics is the study of contradictions *within the very essence of things*."

(2) All reality is in constant flux and change, including the workings of the human mind. Knowledge is relative and truth unattainable: what is considered a good approximation to truth today may be found not so good tomorrow.

It would seem that a credo of such vagueness and adaptability should have made its confessors humble and prevented them from commitments on questions of scientific import. This was by no means the case. Beginning with Lenin, the theoreticians of the *diamat* made a number of pronouncements about questions of science which were quite unnecessary, in the sense that they were not inevitable consequences of the fundamental principles of dialectics. Nevertheless, these pronouncements became part and parcel of the official *diamat* policies and created a good deal of friction in the pursuit of science, resulting in disciplinary actions against individual scientists and in the condemnation of whole branches of scientific theory.

The action of the Soviet authorities against Mendelian genetics, which culminated in its complete annihilation, is too widely known to need more than mentioning. We shall restrict ourselves here to studying the conflicts of the *diamat* with the *science of physics*. This will give

us a good picture of dialectics as it actually is, as it is interpreted in everyday practice by its official custodians.

2. PHYSICS AND THE DIAMAT

The task of enumerating the planes of friction between the diamat and physics is greatly facilitated by several Russian papers published during the last three years. One of them is a report under the title "Lenin and Natural Science" read in January 1949 before the USSR Academy of Sciences by its corresponding member A. A. Maximov.

It is obvious that, in a solemn session of the Academy, an author would not be permitted to express his private views if their general trend were not approved by the authorities: it is the official party line that is announced through the mouth of Mr. Maximov. The contents of his report make it clear that the authorities had become aware of the difficulties inherent in some mistaken assertions made by the representatives of the diamat, since the whole paper may be termed *an orderly retreat from untenable positions*.

Maximov employs the usual technique of the Soviet debaters: imputing to their adversaries the very sins of which they are guilty themselves. He sets up straw men in the persons of some mythical bourgeois scientists whom he charges with the mistakes, in reality made by the expounders of the official Soviet line; but he has the grace to admit that a few Russian men of science fell into the trap of uncritically accepting the corrupt bourgeois views. Then he goes on to define the correct materialistic vantage point.

The subjects taken up are: (1) the theory of relativity; (2) the alleged unreality of mathematical physics; (3) the apparent paradoxes of the quantum theory.

Although Maximov seems to know a good deal of science, his equipment is inadequate for a full understanding of theoretical physics. Hence, the job he did was superficial and incomplete, leaving the matter in a state where further strategic retreats of Soviet philosophy are unavoidable.

As far as relativity is concerned, a further step was indeed taken in 1951, in a paper by G. I. Naan which will be considered in the next section. It goes without saying that in the further discussion we shall present the older Soviet point of view, not as Maximov sees it, but as it stands revealed in the writings of Lenin and in other official sources.

3. THE THEORY OF RELATIVITY

In the field of the *theory of relativity* the Soviet philosophers created for themselves two difficulties, both of an entirely verbal nature. The first is inherent in the vagueness of the words "matter" and "material".

These terms are remnants of eighteenth century ideas and do not form part of the formulation of any law of modern science. If used at all in scientific writings, they are catch-alls for ill-defined and varying qualities of nature.

Lenin was not satisfied with the vague definitions given by Marx and Engels but had recourse to the idea of identifying matter with mass; "Matter is that which has mass." In consequence, the observation of physicists, that the mass of an electron decreases as it slows down, troubled Lenin, since it seemed to involve the disappearance of matter, a conception which he was not prepared to admit.

The argument was later taken up by Lunacharski from the point of view of Einstein's law of equivalence of mass and energy. He charged that the bourgeois physicists were trying to remove from science the concepts of mass and matter and to replace them by energy. Hence, the theory of relativity is idealistic and must be condemned as contrary to materialism. Maximov correctly points out that there is actually conservation of mass, because the mass lost by the electron turns up as mass of the radiation emitted in the process of slowing down, so that the Soviet idea of materialism is not threatened by this phenomenon.

The second difficulty also derives from a verbal misunderstanding. It has its root in the rather unfortunate name chosen by Einstein, namely, *theory of relativity*. This leads to all sorts of misapprehensions since it seems to imply that there is nothing absolute. The Soviet theoreticians lay great stress on the absolute (if unattainable) truth and on the immutable laws of dialectics. Hence, the denial of all absolute values, which was imputed to relativity, was a stumbling block for the Marxist philosophers and a serious contributing cause of its condemnation.

In reality, the theory of relativity makes no such claims, and its importance does not lie in pointing out the variable aspects of most phenomena in dependence on the frame of reference: indeed, this variability was *obvious long before Einstein*.

The great achievement of the theory lay in the diametrically opposite direction, in the disclosure of the immutable invariants of nature lying behind its relative aspects.

As early as 1908 this was pointed out by Minkowski, who proposed to discard the name "theory of relativity" and to replace it by the term "theory of the absolute space-time." Maximov's background is insufficient to understand that the difficulty is self-created and imaginary; he believes in its existence and proposes several makeshifts to get around it. Quite unnecessarily, he suggests that the mathematical formulas of the theory of relativity must be accepted, but no philosophical conclusions should be drawn from them.

The most recent Soviet point of view is contained in the 1951 paper by G. I. Naan already mentioned: "On the Question of the Principle of Relativity in

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Physics." With the most impudent perversion of truth, Naan makes a complete about-face and falsely claims that the bourgeois scientists of the West regard the theory of relativity as conflicting with materialism and, "acting with their usual rascally tricks," advance it as an argument against Marxism, while in reality there is no conflict. Section 4 of the paper is entitled "On the errors of A. A. Maximov and of others" and takes that author to task for not going far enough and not accepting the whole of relativity in its mathematical and philosophical aspects.

Thus a campaign of thirty years' duration against the theory of relativity—which had caused numerous scientists much inconvenience, and a few, serious mental and physical suffering—turned out to have been much ado about nothing.

4. IDEALISTIC USES OF MATHEMATICS

The problem of the so-called "idealistic uses of mathematics" by physicists also goes back to Lenin. As in the case of the notion of matter, the root of the difficulty lies in the persistence of some ancient ideas, long discarded by modern science. As seen by the early physicists, the aim of theoretical analysis consisted in the "explanation" of all natural phenomena in terms of movements and collisions of particles. However, this point of view broke down with the discovery of the properties of the electromagnetic field in the nineteenth century. Since the attempts to press them into the old mold were unsuccessful, it was proposed by Heinrich Hertz to take the equations given by Maxwell as the ultimate description of the electromagnetic phenomena, instead of trying to reduce them to mechanisms.

This approach (later extended to other fields of modern exact science) was troubling to Lenin. Inasmuch as these equations were set up by man, he argued, the electromagnetic field itself becomes a creation of the human mind and not a reality of nature. The theory is, therefore, idealistic and contrary to the materialistic world view. This is the original example of the so-called *idealistic uses of mathematics*, since then they were discovered by the priests of the diamat in the writings of many scientists.

With respect to this problem, Maximov's mediating position is correct and adequate. As he points out, the equations in question were derived from numerous observations; therefore, they represent the results of objective experiments fully as much as do the laws of mechanics.

Undoubtedly, Maximov's views had the endorsement, at least, of a part of the diamat authorities, but this does not mean that the subject of unrealistic theories was disposed of once and for all. It means only that the

abundant use of high powered mathematics may be justifiable *in some instances* and that every case must be decided on its own merits. Thus the Soviet scientists are always at the mercy of the interpreters of the diamat.

More than a year after the reading of Maximov's report, serious charges were preferred against some of the leading organic chemists of Russia (1950). The accusations came from a committee especially set up by the USSR Academy of Sciences for the purpose of purging Soviet chemistry of all reactionary ideas borrowed from bourgeois science. Conspicuous among the charges was the idealistic use of mathematics.

5. THE QUANTUM THEORY

The areas of collision treated in the two preceding sections were due either to misconceptions or to arbitrary interpretations of dialectics. The only genuine conflict between science and Marxism exists in the field of the quantum theory. It is the more important because it is concerned with the only unequivocal assertion of Lenin's materialism incorporated into the official diamat.

In its ontological aspect the philosophy of Lenin is a primitive dualism: Complete reality is attributed to the *outer* (material) *world*, which is quite independent of its observers and would exist in the same form in their absence. In this respect, the saying of Engels is accepted: "The materialist world outlook is simply the conception of nature as it is, without any reservations." The second world, the *inner world* of the observer consisting of his sensations and perceptions, is produced by the stimuli of the outer world and constitutes its "reflection," that is, an approximate reproduction, which is at best close, but never ideally exact.

It should be pointed out that taking for granted that the things of the outer world always exist in the same form in which they are observed, is a metaphysical assumption, in the sense that Lenin had no objective way of knowing whether it was true and, certainly, no scientific foundation for it.

Since Lenin's time modern science—through its advances in the field of the quantum theory—has developed a world picture in some respects different from his, which may be termed a *modified dualism*. Of course, the physicist has to start from what is directly accessible to him, namely, from the *world of the observer*. He thinks of it, not in terms of sensations and perceptions, but as the physical world of the totality of his observations, secured by his measuring and recording instruments. The mathematical formalism developed for the best description of the accumulated data, however, contains the recognition of an *outer world* beyond the observer.

One part of this formalism consists in the mathematical means of describing the inferred outer world as long as it is unobserved; another part—of a different

mathematical structure—refers to the erratic disturbances which arise in the world of the observer through his unavoidable interference with nature, in the pursuit of his business of securing measurements.

This interference involves the well known interruptions of causality characteristic of the quantum theory, the so-called paradoxes of the principle of indeterminacy, which take place at the points of interaction between the outer world and the instrumental paraphernalia of the observer. We call this dualism *modified* because it is unlike the primitive realism of the diamat: the world of the observer is not a replica, or "reflection," of the unobserved outer world but is different from it because of the modifications introduced by the process of measurement. Indeed, the descriptions of the unobserved outer world is *causal* and that of the world of the observer *acausal*.

This is only one of the possible ways of bringing out the conflict between the point of view of modern science and primitive dualism; there are many other ways of stating it. It is true that the contradictions manifest themselves only in the narrow area of atomic and subatomic phenomena; but they are of a profound philosophical importance and have acquired practical significance since the utilization of atomic energy became a reality.

The position taken by the Soviet authorities in this conflict is reminiscent of the controversy between Galileo and the Vatican. The Roman Curia was ready to grant him the *imprimatur* on condition that he treated the revolutions of the earth as an astronomical theory and not as a fact. Similarly, the Soviet state permits the use of the quantum theory—including the principle of indeterminacy—as an instrument of scientific research in technical publications, but militates against its philosophical consequences.

It must be pointed out that the fear of the diamat philosophers to recognize the interaction of observer and observed is based on a misconception. What they are afraid of is the idea that the phenomena of nature are, in part, created or influenced by the human mind. This would be, in fact, *idealism*; and according to Lenin, "philosophical idealism is a road to clerical obscurantism" and, further, "religion is the opiate of the people."

But the world picture of the quantum theory is not, in any sense, idealistic; both the outer world and the world of the observer are physical worlds, and the reactions on the outer world which the theory postulates are caused by the *instruments* of the observer and not by his way of thinking.

It is easy to understand that the Russian authorities are reluctant to change the slightest letter of their creed, but it should not be hard to find a formula preserving its spirit and making the necessary concessions to sci-

ence. In the long run this adjustment will have to be made, and it will be far more painful than the small strategic retreats announced by Maximov and Naan.

In the meantime, the Russian censors do not yet understand the situation; they see the ghost of idealism in quite innocent passages.

6. GOLDEN AGE OF SOVIET SCIENTISTS

In returning to the question of the situation of scientists in the Soviet countries, it is best to use the historical approach. Right after the communistic state was established and the diamat was proclaimed as its official credo, science became a very attractive field for able and ambitious young Russians, since it was the only type of intellectual activity unaffected by politics.

Writers and artists were expected to put their talents at the service of the state, and to engage in direct or indirect propaganda for the communistic way of life. On the contrary, science was indispensable for the Soviets' industrial future on its own merits, and the scientists played a role useful to the state in their legitimate pursuits as researchers and teachers. Compared with other Soviet citizens, their lot was indeed a happy one: they enjoyed a high social and economic standing and—apart from a few exceptional cases—they were unhampered by political interference in their work.

This accounts for the growth of the achievement and prestige of Russian science in the period between 1920 and 1936, which may be considered the Golden Age of the Soviet scientists. As private citizens they could accept the diamat or treat it with skepticism but, on the whole, they were free of conscientious scruples in their profession because the scientific philosophy, described in the preceding section, had not yet crystallized.

Even in this period the sky was not altogether cloudless. The authorities were pressing for practical results and were, at first, reluctant to support pure science; but at length they were persuaded that applications are contingent upon thorough basic research. A few philosophically inclined members of the Soviet hierarchy made nuisances of themselves by stirring up in their writings the spurious issue of idealism in physics, discussed in sections 3 and 4.

I am aware of several disciplinary actions against individual scientists on that score which should not be passed over lightly. The totalitarian state is so powerful and implacable that even those accused, who are ultimately exonerated, go through a period of acute mental anguish at the possible prospect of losing career and livelihood and ending up in a concentration camp. Yet, for two reasons, it seems unnecessary to enumerate these cases.

In the first place, they were not part of a concerted campaign of regimentation but the sporadic actions of individual high bureaucrats—either sincere but unwise zealots or jealous troublemakers.

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In the second place, the grounds for the accusations lay usually in activities outside the laboratory, such as philosophically colored popular writings and oral utterances.

For the larger part of the period in question this was true even for the field of Mendelian genetics, whose results ran afoul of a particularly deep-seated complex of proletarian inferiority feelings. Although Mendelism had been early attacked by a few Soviet writers, the work of its exponents proceeded without interference until 1932. Sporadic actions against individual geneticists started only after that date, and a large scale persecution, including the dissolutions of the Medico-Genetical Institute, followed in 1936.

Soviet scientists today

I skip over the periods of the great purge and of the world war, as an abnormal and uncharacteristic time, and I turn directly to the present post-war era. In describing the situation of the scientific intellectuals I have in mind the USSR only. If the conditions in the satellite countries are different, this is probably due to a time lag: before long they will be brought in conformity with those in Russia.

The social and economic standing of scientists remains high and is not now appreciably different from that of the preceding period; but the mental climate in which they work underwent a considerable change due to their coming to grips with the diamat. While their former relations with dialectics may be described as a distant bowing acquaintance, two circumstances are now intruding it upon the intimacy of their professional lives.

In the first place, science is now in possession of its own epistemology, and the scientists are no longer philosophically innocent and neutral. The consequences of the quantum phenomena were fully developed and appreciated during the 1930's. Now even the rank and file understands them to be much subtler than is envisaged in Lenin's naive dualism.

In the second place, the government embarked on an ill-advised policy of rigidly enforcing the Marxist line, in science as well as in all other cultural activities. By a resolution of the Central Committee of the Communist party (1949) the scientists themselves were mobilized for the police work: every branch of science was directed to organize a committee "for the struggle against reactionary ideas of bourgeois origin."

A penetrating analysis of the relations of writers and artists to the diamat was given by Czeslaw Milosz in a 1951 book, *Situation of the Intellectual in the Popular Democracies*. Milosz divides them into two groups: those who serve Marxism without believing in it, succumbing to the inescapable necessities of their existence, and those who become sincere converts in order

to achieve true self-expression by patching up the rift between their writings and their convictions.

The second way—the way of being true to their own selves by adjusting their beliefs to the party line—is closed to the scientists. They cannot accept the diamat epistemology, nor do they have a high opinion of dialectics as a research method. Hegel, Engels and Lenin claimed that it is only necessary to study "the contradictions within the very essence of things," in order to arrive at the truth about them.

The scientist will admit that in the rare cases when two independent scientific results seem to stand in sharp contradiction, the resolution of this contradiction always involves an important advance of science. However, the most thorough knowledge of the diamat does not equip the researcher for effecting the resolution. Finding it is always a difficult step, depending on the emergence of new scientific points of view, which often take a very long time to crystallize.

Indeed, one of the favorite examples, adduced by Soviet writers as illustrating the applications of dialectics to science, sounds almost like a derision of its methodological value. It refers to the inconsistencies in the axiomatic foundations of geometry which led to the discovery of its non-Euclidean branch. These difficulties were felt in antiquity, but they were not resolved until more than two thousand years later, through the new points of view supplied by Bolyai and Lobatchewsky.

The way of duplicity

The only adjustment left open to the scientists is the way of duplicity: giving lip service to the diamat and keeping silent about their reservations. Whatever the subject, all their writings, meant for a wider audience, follow the same formula: quotations from Stalin and Lenin in the introduction and conclusion, and a sneering denunciation of the corrupt western scientific practices at a convenient place in the middle. We have seen that the field of genuine conflict between science and dialectics is fairly narrow, being restricted to the quantum theory, i. e. to molecular, atomic and subatomic phenomena; therefore, one might have thought that most of the specialized subjects lie outside it. But arbitrary and spurious interpretations of both the diamat and science widen the danger zone to such an extent that it is almost universal. Especially, since policing committees were set up within the scientific organizations themselves, the most technical passages of the most advanced investigations are not immune from the accusation of containing "non-Marxian ideology."

The critical activities of the various committees, created by order of the Communist Party, have resulted so far in a report, rendered by the committee on organic chemistry, and an editorial in the journal *Kultura i Zhizn*, dealing with geography. These criticisms brand

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as "ideologically faulty and reactionary" certain trends and theoretical conceptions of current research and list by name the specialists guilty of their uses—among them, some men of the first rank.

In particular, the accusations against the organic chemists are those of "idealistic uses of theory" and of "subverting the clear materialistic concepts, due to Russian scientists, by the faulty ideas of decaying capitalistic science."

In this year's public annual session of the USSR Academy of Sciences the accused scientists were put on the carpet for the purpose of "criticism and self-criticism." As in a revival meeting, they were expected publicly to confess their sins, smiting their breasts and repeating: "Mea culpa, mea culpa." According to the report in *Pravda*, not all of them submitted to the ordeal with the required docility, so that their cases are not yet closed.

How was the audience affected by this spectacle—by the sight of eminent men being forced to humiliate themselves, after a lifetime of devoted and successful service to science? Were the onlooking scientists captivated in favor of the diamat? Could they see in its champions anything but foolish doctrinaires or malicious intriguers? Indeed, the accusations were so arbitrary and unreasonable that only men completely unfamiliar with the mathematical methods of science could have advanced them in good faith.

A disturbing warning

It was a disturbing warning to all listeners: from now on they must watch carefully every word and expression they write, or they may find themselves in the same predicament. Inevitably, the worry and apprehension must make the process of publication distasteful to them, and must react back on their will to work. Their enthusiasm for research will be dampened if bringing out its results is connected with so much trouble.

It is true that most Russian scientists would find it difficult to reduce the quantity of their output. To a large extent, modern science has become a cooperative undertaking of many men, so that the planning of a research program of a national scale is very helpful in coordinating the work and eliminating duplication and waste of effort.

For a long time, national planning has been in the hands of the council of the USSR Academy of Sciences, which assigned definite research responsibilities to individual laboratories and scientists. It seems, however, that the government is now treating these assignments on the same footing as the quota assignments to industrial plants. In this year's meeting of the Academy many laboratory directors were publicly reprimanded for not fulfilling their quotas.

Apparently, the standing of a scientist is judged by

the number of papers he publishes. The danger of this policy lies in the obvious fact that the authorities can prescribe the number and length of the publications but cannot control their quality. If the quantity of output must be maintained, the general flagging of scientific enthusiasm will, necessarily, lead to a lowering of research standards. It seems that this process is already well under way: during the last year several of my friends remarked to me on the deteriorating quality of Russian papers in the field of physics.

Even greater hazards await those scientists who tackle the difficult but necessary task of making the results of modern science accessible to a wider public. They are not allowed to use the expedient of the researcher—to present the underlying theories as mathematical devices and to refrain from discussing their possible bearing on philosophy. Instead, they are willy-nilly dragged into philosophical controversy.

A case in point is the recent book on *The Basic Conceptions of Modern Physics* by the academician A. F. Ioffe, the venerable builder of Russian physical research, the teacher of most men now prominent in his field. The review of this book in the official *Voprosy Filosofii* was written by a certain Omelianovsky who sermonizes the illustrious author like a schoolboy, reproaching him for keeping aloof from philosophy:

"A Marxist book . . . should rest on the foundation of the most recent achievements of historic materialism" . . . "The reader will look in vain for . . . an exposure of the idealistic falsifications of modern theory in the conceptions of bourgeois scientists, or for a criticism of idealistic rudiments in the scientific work of Soviet physicists."

As a comic relief comes his charge that Ioffe failed to explain the Soviet point of view on the theory of relativity, meaning the point of view which was announced only this year (see section 3) and which stood under condemnation at the time the book was written. In short, the review does everything possible to discourage the popularization of science.

A vulnerable group

What general picture of the situation of Russian scientists emerges from all these considerations? It is safe to say that the scientists form a group critical of the official Marxist philosophy and, in turn, distrusted by the authorities—therefore, a group vulnerable to Western propaganda.

The behavior of the Soviet rulers toward them is strangely contradictory: on one hand, large sums of money are spent on research, and a high social standing is accorded to the researchers; on the other, their productivity is crippled by arbitrary interference and by petty annoyances. Undoubtedly, this curious manner of acting finds its explanation in an ambivalent mental attitude. The Russian authorities need the scientists but, at the same time, they are afraid of men who, because of their training, are able to see through the hollowness of the Stalinist claims.