

Science in Bondage¹

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UNLIKE THE OTHER MAJOR CULTURAL ACTIVITIES OF MANKIND, science is a relative newcomer, almost an intruder on the human scene. Many so-called primitive peoples have for ages had highly advanced arts of both visual, sonic, kinesthetic, and verbal types, and have been masters of elaborate techniques for arousing human emotions, for creating individual and mass anger, fear, awe, or ecstasy, and for instilling given attitudes of mind, and given systems of beliefs. This is not true of science. In our present-day sense of a systematic search for truth, based on the pooled observations, experiments, reasonings, and counter-criticisms of numberless persons who have tried to free their judgment of any but objective criteria—in this sense, science has been almost nonexistent throughout the long history of *Homo sapiens* until we come to Greece and her outposts. Even there it flickered rather spottily. It is only since the rekindling of this small flame by medieval Arabs, Persians, Moors, Jews, and then Italians, followed by its gradual fanning into a full flare with the rise and dissemination of Western civilization during the past five centuries, that science has acquired a widespread and secure existence—or, at least, one that has *appeared* to be secure.

Nevertheless, there is ample evidence that the *ability* to think scientifically has long been widely diffused among the peoples of the earth. This is clearly shown by the mathematical and astronomical achievements of several ancient peoples, especially the Babylonians, Mayas, Hindus, Chinese, and Egyptians. It is also illustrated by the engineering, the metalworking, and other material techniques developed by some Central Africans and Peruvians, and by the various agricultural methods that arose independently in all the seven great centers of origin of cultivated plants delineated by Vavilov—Ethiopia, China, India, Iraq-Iran, Peru, Mexico, and the southeastern Mediterranean-Caucasus area. And today individuals of all “races” have shown themselves capable of making major contributions to science as we know it. This obvious possession by peoples in general of the potentiality for successfully pursuing science, coupled with the marked restriction of science as such in human history, shows what an extremely delicate cultural plant science is. Let us then inquire into the nature of the highly special soil and climate that its continued growth demands.

¹ Based on an address delivered at the panel on “Science and Totalitarianism” of the Congress for Cultural Freedom, Berlin, Germany, June 27, 1950.

The growth of science (and without growth it withers) does not depend only on a few great discoveries. It depends equally on that slow accretion of multitudinous small steps that furnish the bases for, and the necessary extensions of, those discoveries, and also on the correction of the even more numerous missteps continually being made. It is evident that to carry out all this painstaking work, as well as to provide a body of personnel large enough for the origination of even a few major scientists, a very considerable number of scientific workers is necessary. This means not only a large educated public, but a large economic surplus. In most societies of the past in which a large surplus has existed, however, it has come almost exclusively into the possession of people who made leisure a profession, and whose ideal was “conspicuous consumption,” as Veblen has termed it. The development of science, on the contrary, requires that much of the economic surplus become available for those groups who do the actual work of the world, and who have an ideal of constructive achievement.

The attainment of such a distribution of the products of labor and the existence of such an ideal imply that, in the society in which science develops, a large proportion of the so-called common people has a high standard of living, highly developed techniques, and considerable education. This means, too, that they have an effective voice in the management of their own affairs and participate in decisions affecting the whole community. Along with this comes a sense of their own dignity, as well as a basis for believing that they can still further improve their situation, both materially and culturally. All these factors together form part of the groundwork that is necessary before the “common” man and woman can produce individuals with that controlled initiative and creativeness that characterize scientific activity. Such conditions cannot exist long or securely in any community founded upon slavery, nor in one resting upon the work of oppressed and poverty-stricken masses who live on a bare subsistence level. In other words, a rather high level of democracy is necessary—one that, until recent times, has rarely been found in communities that have evolved beyond a primitive stage of development.

The community that nourishes science must not only be free from the physical oppression of nature and of other men, and have grounds for hope in its own prospects; it must also be relatively free from the despotism of imposed ideas. Its history must have entailed processes of intellectual disequilibrium that led men to doubt the dogmas of their forefathers. Rarest of all—into the breach thus made there must

have entered, in considerable strength, not merely a new and equally rigid set of dogmas, but a spirit of inquiry and objectivity, a wide tolerance for objectively reached but conflicting conclusions of others, a custom of candid criticisms, a distrust of all argument by authority and of all wishful thinking.

Western civilization has approached these conditions only by dint of centuries of struggle toward higher material techniques, toward ever-wider and more potent democratic procedures, and better popular education. At the same time, following contact with other cultures, including those represented in the rediscovered literature of the ancients, men were led to question further and further the voice of ancient tradition, as well as that of contemporary authorities. Moreover, travel brought men new knowledge and new problems, as well as fresh opportunities for gain and adventure. In all these ways, then, the stage has been set for the rise of science, but this rise has only been at the cost of constant effort, and contention with both man-made and natural obstacles.

Even yet, the very findings of science that are of the greatest significance for a deeper understanding of ourselves and of the universe are the most apt to arouse concerted opposition from powerfully organized groups representing established ideologies and institutions that the new knowledge would upset; hence, even in Western civilization, persistent vigilance and endeavor are necessary in the defense of the honest search for truth and of the teaching of it. It is one of the greatest strengths of this civilization that, viewed over the course of the centuries, it has made marked progress in this respect and is so constructed that the efforts of enlightened men to push this progress still farther *can* have a considerable measure of success.

In the profound discouragement and paralysis following the wreckage of war, however, some have been misled by the lure of complete despotism, masquerading under the name of "national socialism" or "international communism." Where one of these movements has gained control, it has become clear only too late that modern technology, both material and social, affords the tyrant a far more inescapable, efficient, and personalized grip over his unhappy subjects than any ancient or oriental tyranny. Under such conditions science—indeed, all culture—becomes a trained bear with a ring through his nose. At the tweak of his master's hand he must try to dance, but his virility is gone, he languishes away his life in desperation, and his days are numbered.

An audience in Berlin knows only too well the disillusionment with regard to progress in science and in cultural life in general that followed the accession of Hitler, with its disastrous purges on grounds of race and politics and with its deadening regimentation of ideas. My own branch of science, genetics, was the most perverted and outraged of all, since in its place a tissue of lies was fabricated in support of the dictator's racist psychosis. This would have been used to

justify a state of world slavery in which, had it continued, all fundamental science must at last have perished.

To many an outsider it seems amazing that any persons who have suffered such disillusionment and loss as those who experienced Nazism should be ready to turn again to a dictatorship. But the Soviet dictatorship claims to be the very antithesis of Hitler's, and it presents a very different façade, reflecting the great differences in its earlier aims. It pretends to be a movement of liberation, as indeed it was originally intended to be. In the first flushes of release that followed the demolition of the semifeudalistic tsarist system it did in fact afford the people, not more food, fuel, or clothing, but more voice over their conditions of work, more education, more right to live and think as they wished to, and more hope. With this went a great upsurge of culture, including science.

But gradually, secretly, by hook and by crook, as well as openly at the point of guns, the Communist Party, claiming to represent the common man, took more and more power out of his hands, ostensibly for his own good, until there was no check left on the power of the Party. In each place of work, whether economic or cultural, an inner Party cell is planted to direct and redirect activities. Moreover, by its false accusations, its condemnations and dismissals of individuals, usually based on jealousy, and its glorifications of others who play its game, it holds workers and intellectuals alike in fear and subjection. At the same time, within the Party itself all vestiges of democracy have sedulously been rooted out.

Thus the entire Soviet system has become like a gigantic spiderweb. All its radii—political, military, economic, social, cultural, educational, and scientific—have been brought under the absolute control of the one center and of one omnipotent being who sits grasping all these strands at their junction. In this structure, all directives proceed outward, and peripheral criticism of more central decisions is never allowed. Neither the central group nor its innermost member, however, is characterized by high cultural development, or by an appreciation of the methods or spirit of objective science. Yet their pronouncements on matters of science and culture are hailed as revelations, even as were those of Nero.

For the security of a tyranny so unparalleled in its thoroughness it was important for all expression of thought to be brought under the complete domination of the Party. For this purpose Party organs were established for the control of all instruments of propaganda, education, and communication—the schools, press, film, radio, organizations of scientific, professional, trade union, and social character, sports, celebrations, and public assemblages. As a second check, a vast secret intelligence system was set up parallel to all this, and espionage was inordinately expanded and intensified. To render the spying still more effective, a new concept of morality was inculcated, making it a man's first duty, above all personal ties, to report

any signs of dissatisfaction with the Party or with its leader that might be shown even by the closest friend or relative. On top of all this were superimposed the great mass arrests and "trials," which gained such momentum in the thirties. These not only provided a mobile labor force of 10-20 million out-and-out slaves, but reduced the remaining population to abject submission in all intellectual, as well as physical, spheres of life. Thereafter, conformity must be complete, in deeds, in words, and even in facial expressions. Could any setting be less propitious for the encouragement of that adventurous thinking in new directions that must characterize fundamental science?

As an apologetic for all Soviet policies and doctrines, whether in science or elsewhere, recourse was had to the heterogeneous collection of notions on matters of science and philosophy, largely borrowed from Hegel, which Marx and Engels had long ago put together under the title of "dialectical materialism." Although it embodied some important advances over earlier views, its artificial schemes do not correspond with the operations of nature as we have now come to know them. Moreover, so far as natural science is concerned, this view is especially at fault in maintaining that all reactions in nature are basically a struggle between "opposites." This is a transparent attempt to make natural processes resemble that antiquated concept of social processes according to which the class struggle is always the prime mover in human progress. In this way, conflict and hate are made to lie at the bottom of all good.

Today dialectical materialism is no longer even an earnest attempt to interpret natural and social changes. It has been frozen into a medieval scholasticism. On the one hand, it is reduced to mystical and unintelligible slogans that are taught by rote to hundreds of millions in place of the credos of the church. On the other hand, since the mode of application of these doctrines for the reaching of specific conclusions is seldom clear and may lead to the most divergent results, official interpreters have been trained to twist the doctrines so as to provide "philosophical" justifications, as wanted, for any opinions, policies, or programs that happen to be favored by the central power. Thus, dialectical materialism has become a club, where-with dissident opinions are condemned as undialectical or unmaterialistic and therefore anticommunistic, and persons holding such views become branded as traitors and enemies of the people. And if it still remains too obvious that the condemned views are founded on facts and logic, as has been the case with genetics, then there is another club in reserve. The views are labeled objective, in quotation marks, instead of partisan, class views, and it is proclaimed that the "most important principle in any science is the party principle."²

Whereas in some branches of science all these conditions have simply worked to undermine the spirit

² From an editorial in *Pravda*, August 27, 1948.

of the scientists, and to retard and deflect them in their work by the action of numerous, individually minor restrictions and disturbances, in other branches there have been systematically organized frontal attacks, controlled by the center, upon the main scientific principles and the main personnel. In the case of genetics, I happen to know much of the history of these attacks at firsthand and will draw upon it to illustrate the fate to which science in bondage is likely to fall victim.

Genetics, the science of heredity, variation, and evolution, had attracted a considerable body of able young Russian scientific workers shortly after the Russian revolution. This new science had itself been revolutionary in its discoveries by establishing the existence of units of living matter, called the genes, far smaller and more fundamental than the cell itself. These genes serve to carry the biological heritage from one generation to another, according to an amazingly precise set of principles. And these same genes, when they undergo changes, or mutations, give rise to the potentiality of biological evolution that Darwin had seen at a distance, as it were. It was found, quite definitely, that changes in the genes are usually caused by accidental molecular events, like those occurring on application of heat or of x-rays. Such changes do not correspond with the alterations that exercise, nutrition, or other environmental conditions induce in the body that carries the genes. In other words, Lamarck's old doctrine of the inheritance of acquired characters, which antedated Darwin's theory of evolution by the natural selection of accidental changes, was proved erroneous.

Realizing the significance of this fundamental subject for an understanding of the nature and history of living things, and of the future possibilities of mankind, as well as for the improvement of agriculture so needed by the USSR, Russian scientists soon forged their way into the front rank in this field. They became conspicuous among those who helped make it the most exact and well documented of all the biological sciences—the field most nearly comparable, both in the precision of its methods and in the reliability of its conclusions, with the sciences of physics and chemistry.

Beginning in 1936, however, a series of attacks upon genetics was instituted. These ranged from deliberate misrepresentations and vilifications in the press to forced "confessions" of error and guilt from some of the leading geneticists, followed by their disappearance and the closing of their laboratories. These men, as some of them whom I knew well explained to me, made their false "confessions" out of loyalty to the Party that ordered them to do so. That did not save them, however.

About the same time, because no real scientist could be found to attack genetics, this assignment was delegated to a half-educated and paranoid young demagogue named Lysenko, who had done some work in raising plants, but who was in fact ignorant of sci-

entific principles and incapable of understanding them. Lysenko's reputation was systematically inflated before the public eye, and he was provided with a sophisticated interpreter of dialectical materialism, a cynical weaver of words named Present, so that Lysenko's crudities might be disguised and served up to the public as profundities. After Lysenko and Present had been given some preliminary practice in decrying genetics and in influencing farmers, and had been furnished with a band of mercenaries from the farms, who posed as scientists also but were still more ignorant, a kind of public gladiatorial combat between Lysenkoists and geneticists was arranged by the Party in December 1936. Although it was apparent to the hundreds of scientists in the audience that the contest was one between science and bigotry—and they showed this by the distribution of their applause—nevertheless, the politically appointed moderators of the meeting, in summing up the debate, censured the geneticists, and in the public press it was made to appear as if the latter had come out poor seconds.

Having been thus castigated and weakened, the geneticists were thereafter subjected to a continuous sniping process and to two more staged tournaments, one in 1939 and the last in August 1948. By the latter date all the noted names of Russian genetics had disappeared; the great Vavilov had perished in a labor camp in Siberia, and many others whose memory I hold dear had lost their lives in unexplained ways. Thus only a feeble remnant of comparative weaklings in the science was left to defend or compromise it. The show of 1948 was settled when, after the last word for genetics had been said, Lysenko made the smug announcement that the Communist Party had approved his position in advance and had declared the geneticists wrong. According to *Pravda's* accusation, they had been "objective," they had forgotten "the party principle" in science. But, of course, the Party in its greater wisdom concerning matters of science was able to override them.

Following this exhibition of barbarism there were, of course, recantations and apologies, and the Academies of Sciences, of Medicine, and of Agriculture all sent thanks to Stalin for his personal guidance in bringing this great reform about. At the same time, the laboratories of genetics were closed, their remaining workers were somehow disposed of, courses on genetics were abolished, and all books on the subject were banned. This was only the beginning, however. The principles of genetics are essential to all modern biology, so it was necessary to extirpate them from all curricula and publications dealing with biological subjects. Texts had to be rewritten, and staffs of colleges and of scientific publishing houses had to be purged. In various other lines of biology, medicine, and agriculture, world-famous scientists were dismissed or disgraced merely because, although they were not specialists in genetics themselves, they had refused to renounce its principles.³

³ For details of the Communist Party's attack on the sci-

The same campaign was soon after carried into all satellite countries, where geneticists have been terrorized or forced into other lines of activity. The death of my old friend Kostov, well-known geneticist and Minister of Agriculture in Bulgaria, occurring during a genetics purge, was announced in 1949. Throughout China a comparable liquidation of scientists in this field has taken place. As for the Soviet zone of Germany, the situation will surely be understood by those in Berlin who have followed the controversy on the subject in the local press.

For a long time it has been evident that genetics has been distasteful to the very center—that is, to Stalin himself. We might speculate at length on the reasons and still we could not be sure, for the interpretation would turn chiefly on matters of personality. (What a reflection on the doctrine of the economic determination of history, under a totalitarian system!) Whatever its causes, we can be sure of the consequences of destroying a basic field of science. As all science is becoming more closely interdependent, it must inevitably have vitiating effects in many other theoretical fields. At the same time, practical progress in agriculture and animal husbandry will be greatly retarded. In fact, many previous achievements—such as Vavilov's invaluable world collections of cultivated plants, the basis for the construction of improved combinations—have already been lost.

It is especially to be noted that, in the sphere of the bearing of biology on theories of the nature and potentialities of man, the Communists have lost the scientific basis for answering the pernicious racist doctrines of the Nazis. They have thrown overboard

ence of genetics, the reader may be referred to the following books: P. S. Hudson and R. H. Richens' *The New Genetics in the Soviet Union* (1946); Julian Huxley's *Heredity East and West* (1949); J. Langdon-Davies' *Russia Puts the Clock Back* (1949); Conway Zirkle's *The Death of a Science in Russia* (1949); and, finally, *The Situation in Biological Science, a Verbatim Report of the Sessions of the Lenin Academy of Agricultural Sciences, July 31–August 7, 1948*, published separately in German and in English by the Foreign Languages Publishing House, Moscow (1949). In the last-named book (International Publishers, New York), the Russian administrators stand self-condemned. Their temerity in publishing these otherwise incredible proceedings shows how far they now are from a realization of what is meant by science or, indeed, by rational thought itself. Among articles dealing with the subject, see E. Ashby's "Genetics in the Soviet Union" (*Nature*, Dec. 11, 1948); Robert C. Cook's "Lysenko's Marxist Genetics" (*J. Heredity*, July 1949); C. D. Darlington's "A Revolution in Soviet Science" (*J. Heredity*, May 1947); and "Science Rejects Dictation" (*New Leader*, Nov. 26, 1949); Th. Dobzhansky's "Lysenko's Genetics" (*J. Heredity*, Jan. 1946); and "N. I. Vavilov, a Martyr of Genetics" (*J. Heredity*, Aug. 1947); R. B. Goldschmidt's "Research and Politics" (*Science*, Mar. 4, 1949); J. S. Huxley's "Soviet Genetics: the Real Issue" (*Nature*, June 18 and 25, 1949); S. Kaftanov's "In Support of Michurin's Biological Theory in Higher Institutions of Learning" (*Science*, Jan. 28, 1949); J. Langdon-Davies' "The Russian Attack on Reason" (*Fortnightly Rev.*, May 1949); I. M. Lerner's "Genetics in the U.S.S.R., an Obituary" (Pub. Univ. Brit. Columbia, Lecture Ser. 8, 1950); H. J. Muller's "The Destruction of Science in the U.S.S.R.," Pts. I and II (*Saturday Rev. of Lit.*, Dec. 4 and 11, 1948); H. H. Plough's "Bourgeois Genetics and Party-Line Darwinism" (*Am. Scholar*, Summer 1949); T. M. Sonneborn's "Heredity, Environment, and Politics" (*Science*, May 19, 1950); Bertram D. Wolfe's "Science Joins the Party" (*Antioch Rev.*, Spring 1950), and the May and August–September 1949, issues of *Bull. of Atomic Scientists*.

the geneticists' findings that the great changes wrought by differences in environment on living things are not inherited. Thus the Communists, if they are logical from this point on, are driven to believe that those peoples whose environments have given them too little opportunity for mental and physical development must also, by reason of the inheritance of these effects through many past generations, have become stunted and inferior in their inborn capacities. Some leading Russian Communists have admitted to the author that they held to this version of the doctrine of the inferiority of economically underdeveloped peoples. Their dilemma concerning this point explains why, from the time the open attack on genetics was started in the USSR in 1936, the efforts that geneticists there had been making to refute the Nazi racial dogmas were all called off, and awkward but effective steps were taken to avoid being drawn into controversy on this crucial subject.

Since that time, however, after I had called their hand on this point,⁴ other Soviet apologists, including the Soviet Academy of Sciences itself, have tried to dismiss the matter by resorting to the curious doctrine, not unknown elsewhere, that the laws of biological science stop short with man. Man, they proclaim, is a being of such a high order that only social laws apply to him. They do not attempt to reconcile this doctrine with such slogans as "Work and Bread," but it is not clear why, if man's alimentary system requires food, his reproductive system also does not work according to biological principles. This is a good illustration of the depths to which so-called scientific thinking has sunk when it is caught in the great spider-web.

Genetics is by no means the only branch of science that has been directly attacked by the Soviet totalitarianism, obviously on Stalin's orders. The germ theory of disease and the work of Koch have been derided by the Party-sponsored theory of disease of Speransky, which attributes most ailments to malnutrition of the nervous system. Important sectors of psychology, of astronomy, of quantum physics, and of statistical theory are among the other fields that have been openly assaulted. But it is evident that even the branches of science not subjected to a frontal attack must lose their vitality, their spirit of spontaneity and adventure, of free criticism and of objec-

⁴In an open letter to the Academy of Sciences of the USSR, published in *Science*, October 22, 1948.

tivity, and the benefits from the advances made in the rest of the world, in the face of the restrictions, the interference, the insecurity, the terrorism engendered in scientific workers by the all-pervading despotism of Stalin. The conditions basic for continued scientific growth are gone. Although it will doubtless be possible to continue to milk the cow for awhile, the milk will get thinner and more meager, and will at last become positively poisonous.

If civilization does not have sound fundamental science to guide it, it is doomed eventually to decline through the action of numerous, slow-moving, insidious processes that are not evident to the superficial view. Illustrations can be drawn from mutation theory, from geochemistry, and from various other fields. But the question must also be asked, of what value, in any acceptable sense of the word value, would a civilization be in which men's minds were closed, so that they lived in an artificial, unreal world of dogma and illusion, from which they were not allowed to break out? Would it not be better to start afresh as pioneers, or even as savages, contending with the rigors of nature—yes, even with hunger, privation, and sudden death from wild beasts—until men could again rise by their own efforts, rather than to be plunged into the hopeless slavery and delusion of a totalitarian despotism? It would be shortsighted and selfish in the extreme if we should try to buy our own lives at the cost of the intellectual and cultural slavery of our children and descendants.

Let us hope, however, that we shall be confronted with no such decision. It may be that, instead, our long-oppressed brothers east of the Iron Curtain will manage to achieve a loosening of their bonds. We have no quarrel with them, but only the deepest sympathy. In the meantime, it is one of our obligations to exert ourselves to extend and make more effective our own intellectual, cultural, and material freedoms, thereby enriching and making more secure the heritage of our children, and increasing the moral and physical strength of all the people of this rapidly shrinking world. Remember, we should be very thankful that we have the right thus to declare that we ourselves do not yet have as much liberty, democracy, and opportunity, physical or intellectual, as our ideals demand. This right to think differently, to question, and to express our disagreements is the primary moral basis for the development of science and, indeed, for all that is valuable in the intellectual life of man.

