

## AFTER THE FALL OF LYSSENKO

Scientific progress does not consist solely in the discovery of new truths; it also includes the exposure of mistakes. Often errors turned out to be necessary before the truth could finally be discovered. The history of science is thus not only a history of valuable finds, but also one of vagaries, gropings, and failures. There are some mistakes, however, which scarcely belong to the long series of honourable scientific errors and carry a wholly different meaning: these are the mistakes made by scientists or pseudo-scientists who, driven by the will-to-power, have abused science for the temporary achievement of their ambitions.

At this moment a Soviet scientist, half-biologist, half-politician, is being exposed as a failure, after having experienced spectacular successes and being *persona gratissima* with a political regime.

The June number of *Botanitschesskyi Journal*, the most reputable scientific review in Soviet botany, published two articles over two eminent signatures, Mr. Trupin's and Mr. Ivanov's. These two writers attack the theories and methods of Lyssenko. They openly reproach him with having taken possession of Soviet genetics, with having usurped a 'monopoly'

of the field, with unscientifically cutting himself off from any unfavourable criticism, and with having blocked young people's access to scientific work.

These articles appeared during the period of innovations following Stalin's death. One might think that they represent a spectacular gesture of the new regime; with this difference, however, that one of the articles cited invokes the memory of the deceased, who, the author says, always clearly recognised the importance of criticism for scientific progress.

It would be hard to imagine that such criticism could have been formulated without the previous approval of the political authorities. In the Soviet Union one does not lightly attack a man honoured with the Order of Stalin, an agrotechnician of the first authority, a personality who is official in every respect, whose doctrines have been approved by the Central Committee of the Communist Party. This last body has said nothing about the matter since; at least, accessible sources are not discussing it. No doubt can remain, however, on this point: the campaign represents a concerted, co-ordinated attack, the deliberate aim of which is a pre-established one: official disavowal of the official Lyssenko. Proof of this can be found in a brief note published, soon after the two articles mentioned above, by the *Bulletin of the Soviet Academy of Science*, an even more authoritative publication than the *Botanitschesskyi Journal*. There it is emphasised that the Institute of Genetics—one of the research establishments under the Academy's direct authority—has not succeeded in demonstrating experimentally the theories it had advanced. Lyssenko's name is not mentioned; but everyone knows it is he who is the director of the Institute and the author of the theories which it has not been possible to verify.

### *The Man*

Trofim Lyssenko was born in 1898, at Karlovka in the Ukraine. In that infinitely flat country where sunflower-seeds have for centuries anticipated and taken the place of chewing-gum, melons and cucumbers grow amidst immense fields of grain. Lyssenko was of peasant origin. His studies made an agronomist of him, and he decided on a scientific career. Unknown until the age of thirty, he then advanced a violent criticism of classical genetics, which was put forward in a most sensational manner; thus he became famous (in 1936) overnight.

The doctrine he elaborated, and for which he obtained the approval of the Central Committee, denied Mendel's Laws. These laws occupy a

### *After the Fall of Lyssenko*

position in genetics analogous to Newton's Laws in mechanics. Lyssenko quickly rose to a political stature of the highest importance. In the whole affair, this is the most notable fact: the involvement of political power with the triumph of a scientific doctrine, whereas for centuries such a victory had been linked to incontestable experiments rather than to the worldly influence of its promoter. While his theories were taking on the force of law, Lyssenko became vice-president of the Supreme Soviet. He could count among his very numerous distinctions the Order of Lenin, two Stalin Prizes, Membership in the Academy, and the title of Hero of the Soviet Union, in addition to the presidential chair of the Lenin Academy of Agronomy.

His base of operations—outside the Party Secretariat—was the Institute of Genetics, one of the units of the Soviet Academy of Science. As its director he succeeded the well-known botanist Vavilov, author of satisfactorily verified hypotheses which for the most part had been accepted by world science. Vavilov, who was among the most eminent figures in Soviet science, opposed Lyssenko's theories, seeing their weaknesses from the start. But he fell into disgrace, was criticised as 'formalistic' and 'idealistic', accused of being a British spy, and deported to Siberia, where he disappeared. The date of his death is not known; it is believed to have been some time in 1942. The Royal Society in London on several occasions attempted to discover what had happened to their member; the inquiries were never answered. Vavilov's case is evidently linked with that of Lyssenko; and there is no doubt that it was not the only one of its kind. Political power, rather than the verdict of experiments, had the last word. This power did not fail to take steps accordingly.

### *The Tomato Controversy*

It has happened more than once that some simple observation in the science of life unleashed vast movements of thought, sweeping outside the limits of biology. We may recall the famous German zoologist Hans Driesch and his experiments on the sea-urchin's egg, which, when split into two halves, gave two complete organisms. This discovery, followed by a landslide of experiments and philosophical discussions, became one of the pillars of racist thought, and was, despite its author, a source for the biological theories adopted by the National Socialist government of Germany. Driesch protested; he was retired, and died in silence and obscurity.

The experiment by means of which Father Mendel discovered the laws of heredity while cultivating peas on a few square yards of his little monastic garden, has had a comparable career. Not only did it become the basis of the whole modern science of genetics, covering plants, animals and man (including that part of the science of man which studies the transmission of mental qualities), but it went beyond these to exert considerable influence on thought in the fields of education, criminology, theoretical medicine, and psychiatry. It made man reflect on his human nature from a new angle. The 'heredity-environment' dilemma took an unexpected twist in several fields including the knowledge of man.

The facts discussed above are necessary for a better understanding of Lyssenko's doctrines, the interest they had for the rulers of the Soviet Union, and the seriousness of his downfall.

The vegetable that furnished the grounds for Lyssenko's ideas was as far separated from man as Mendel's peas or Driesch's sea-urchin's egg. It was the tomato, another popular Ukranian product. The experiment was a simple one: Lyssenko grafted a tomato-plant bearing yellow fruit to a tomato-plant producing red fruit. According to the classic laws of heredity, the graft should have produced yellow fruit; but in Lyssenko's experiment, the fruits were mixed red-and-yellow in colour, or were pink. This avatar is still susceptible of explanation since, for example, a rose-tree with white flowers when grafted to an oak produces blue flowers. Lyssenko however conceived the idea of planting some seeds from these abnormal fruits; he then was able to watch the development of plants which, instead of going back to the original type with the yellow fruit, continued to yield mixed-coloured or red-striped tomatoes—a much more difficult phenomenon to explain, and one calling for fresh hypotheses.

This would not have been the first time that experimental genetics has been brought up short by an exceptional phenomenon, only to resolve it in the end according to the classic laws while learning in the process some new detail on the way the laws of heredity work. Several possibilities present themselves at first glance in the exceptional case Lyssenko describes. Above all, we should want to have some better assurance that the plant used in the experiment was not a hidden hybrid, which would have produced a varied progeny according to the rules of segregation; and equally, that the observed effect was not the result of an accidental heterogeneous pollinisation, which it is difficult to prevent rigorously, as all geneticists know, even in the most carefully controlled of experiments, and which could have resulted, by ordinary crossing, in a hybrid. In these

*After the Fall of Lyssenko*

two cases, the behaviour of the plants insofar as the fruits' mixed colour is concerned, would be easily explained according to Mendel's Laws. Also, there was never enough proof that the experiment was repeated a sufficient number of times to oblige Lyssenko to make the interpretation he did, or to justify the sweeping conclusions he drew. He himself admitted that the manner in which abnormal fruits make their appearance is not a regular one, but unpredictable.

Another explanation suggested by some of the foreign biologists who were permitted to observe Lyssenko's plants at first hand—and these were few in number—was to see in the mixed-coloured or striped fruits the product of a 'chimera', that is, a mixture of tissues from two different plants, which has often been observed as a consequence of a vegetable graft. A fourth possibility remains to be cited: the abnormal colour might have been attributable to the presence of a virus, the effect of which on the colour and the properties of plants is a matter of current knowledge. Such viruses are transmitted across generations, multiplying along with the cellular tissues and following a type of heredity called 'cytoplasmic', which proceeds at an irregular pace and so is shielded from the validity of Mendel's Laws.

Lyssenko favoured another explanation. His experiment, according to him, invalidated Mendel's Laws, even in their modernised version, as elaborated principally in America by the Morgan school of geneticists. There are no genes, said Lyssenko; heredity is not transmitted by chromosomes enclosed within the cellular nucleus; the plant must be considered, instead, as a protoplasmic whole, reacting in its organic totality to the conditions of the environment, which influence it and shape it. There is no fixity of hereditary characters, there is no specific nuclear protoplasm which determines this fixity. On the contrary, he presents us with the idea of the vital plasticity of the complete organism. A yellow tomato, according to Lyssenko, revealed itself sufficiently plastic to be influenced by a neighbouring tissue containing red-colour heredity factors. One heredity penetrates the other, without the intermediary of fertilisation, and so without the participation of the chromosome substance. Everything that genetics had taught until then was false, because Western scientific thought in genetics was blinded by a sterile 'bourgeois' logic which was fearful of change and dozed peacefully in the delusion that there were no rapid developments, that everything was subject to the rule of heredity, that fixer of norms, stabiliser of living nature. If Western scientists found an often astonishing correspondence between their microscopic and their

statistical data, if they had verified Mendel's Laws not only by cytological observations but by mathematical analyses, based on thousands of experiments, then this was merely because they were mistakenly attributing to statistics a value that it does not have. One should, indeed, be scornful of statistics, for living phenomena are intimately bound up with the individuality of the organism.

To any objection that his mixed-coloured tomato was perhaps a 'chimera', Lyssenko's answer is that nobody until now has succeeded in producing two such monsters that were identical. If any one voices a suspicion with regard to the genetic purity of the plants used in his experiments, the response is that no such purity exists anywhere, and that it is a false hypothesis invented by a false bourgeois science. And if, finally, the hypothesis be ventured that perhaps a virus might be the cause of the phenomenon, the Soviet scientists simply reject the existence of viruses, which are invisible. (The electron microscope, which has proved their existence *ad oculos*, risks, in its turn, being found 'suspect'.)

### *Heredity and Environment*

Yet another digression is necessary before we can fully understand the problem. It is in order at this point to examine the practical bearing of this biological alternative: is the nature of living things—including among them human beings—determined by the laws of heredity and immutable, once the organism, which is responsible for all that the living entity can ever become, has been conceived? Or do not rather the environment, nutritional conditions, the influence of the organism's immediate setting, mould it, and end by completely transforming its nature, despite the hard lines of heredity, to give it its definitive form?

For more than a century, science has unanimously admitted that heredity and environment both play determining parts. But these two poles cannot be exchanged, or take on one another's functions: heredity cannot cause the effects of environment, and the latter is powerless to compensate for gaps in the biological inheritance. Green plants, for example, possess the hereditary capacity to produce chlorophyll, but only when in the light; inversely, plants lacking this capacity, such as certain vegetable parasites, can hardly be expected to produce chlorophyll although they should remain continuously in the light. Similarly, a child who is endowed with hereditary mental capacities develops them only thanks to a suitable education; and a child who is weak-minded because of hereditary defect,

### *After the Fall of Lyssenko*

can never become a genius, whatever education we give him. Anyone who wants to object that the hereditary process in man can hardly be assimilated to that of plants, should recognise that despite the difference in complexity which, to be sure, exists between the colour of a plant and the mental life of a child, still, the Mendelian laws determining the transmission of these traits from generation to generation are simple and remain the same—just as one and the same Newtonian law takes account of the falling of a stone and of a fine watch.

The heredity-environment division continues to keep alive a most fertile scientific discussion. Science has already found substances which constitute a link between heredity and environment. Light brings out the colour of certain flowers, by activating substances with hormonal functions which affect the buds and complete the biochemical equipment. Human diabetes has an inherited form which like the ordinary type can be held in check by insulin. Experimental medicine is on the way to the discovery of analogous substances the lack of which no doubt underlies certain hereditary troubles of the brain and of mental life. We are, indeed, no longer completely without weapons in the face of an inherited nature. However, the constantly enriched arsenal of our resources does not in any way authorise us to proclaim—as did Lyssenko—that heredity of the classical type does not exist, that it is easy to transform it and to conquer it, that its laws are false and that statistics has no part to play. Only a perseverance which is ill-informed or ridden with prejudice—or both—could permit anyone stubbornly to assert the contrary.

### *Lyssenko and the Racists*

Following this digression, we are in a position to understand how Lyssenko's doctrine is related, by contrast, to that of National Socialist racism.

Reckoning from the doctrines of heredity and of the biological unit, the National Socialists attempted to found their political philosophy on the conviction that environment plays no part and that hereditary nature alone counts in the destiny of individuals and of nations. The reader will remember that, for them, the ideal nation would have been composed of individuals with identical heredity or of the same race: the best of nations is then the one whose heredity is best, that is, a nation of superhuman heroes of the Nordic race. No other could equal it, despite the resources of environment, which are changeable. Progress consists in cultivating this

ideally pure race, guaranteeing it living space, and exterminating, when need arises, the other races with inferior heredities.

The philosophy of Lyssenko's 'backers' tends toward opposite conclusions. The idea of heredity leads to fatalism, seeing that everything is assumed to be determined by that factor and given that too small a portion is reserved to environmental influence. The notion of heredity enabled ideological racists to develop harmful, antidemocratic ideas, stressing the innate inequality of human beings and of groups. It was therefore important to weaken the determinism of heredity, to elaborate a new doctrine freeing man from the chains that reactionary theories of heredity had forged for him, and to reinforce those arguments which show that environment predominates and is capable of changing the very course of heredity. The surroundings shape the organism. Social environment makes the man. An individual's value depends, not on his racial origin, but solely upon the social frame, the class into which he was born and which gave him its lifelong imprint.

In a century during which biology and its derivative sciences, such as medicine and agronomy, show a vitality comparable to the liveliness of the mechanical and physical sciences a century or so before, political thinkers find themselves absorbed in an effort to give the human community some organic model. The National Socialist state attempted quite frankly to constitute itself on the model of an organism. The biological element predominated in practice in several sectors of its activity, for example, the racial purges and the emphasis put upon fertility and the growth of population. The Marxist state conforms to a model at once mechanical and organic. The National Socialist organic state seems a romantic idea, going back to Aristotle's theological conceptions; while the Marxist state rather recalls the organism-mechanism of a Galileo or a Descartes—a conception which, when you confront it with modern biology, seems no less romantic and hopelessly dated.

Neither National Socialism nor Marxism, to be sure, openly avowed the remote beginnings or the prophets of their ideologies. But to any one who studies the synthetic history of the European mind, the influence of an out-of-date, misunderstood biology is evident. It is natural that the two ideologies, largely indebted as they were to biological thinking, should each have tried to increase, in turn, the importance of biological conceptions in the life of the state. Thus National Socialism stressed heredity; and Marxism gave its backing to those who battled for a dominant environment.



## *After the Fall of Lyssenko*

### *Marxism and Biology*

Biology is a weak point for Marxism: this is not surprising, inasmuch as the beginnings of the doctrine go back to a time when biology, in the modern sense of the term, scarcely existed. The only contribution that Marxism brought to human biology was the idea that the monkeys became human beings through labour. This conception was evidently wrong and the Marxists did not say much more about it; however, they feel that a gap exists on this score in the structure of their thinking, which lacks a modern biological theory of man's place in the universe and in society, insofar as that position is a result of the laws of nature. They have been looking for the great biological thinker who would fill this gap.

The problem worried the Soviet leaders more than the Western world is aware. Scientific and cultural organisations, the several Party committees, never dropped the question, groping, hesitating, never free, never sure what the supreme power would say. One of the major promoters of the movement was Lunacharsky, formerly Commissar of Public Instruction. He sought to prove and disseminate the idea that environment shapes the hereditary nature of organisms and man. In 1928, he personally edited the scenario for a film designed to attack Father Mendel's findings. This film uncritically accepted some 'discoveries' of that period, emanating from the Viennese school of biologists, which were shortly afterward shown to be false. It accused 'bourgeois' science of being one of the instruments by which capitalism tried to uphold the idea that environment cannot modify hereditary gifts and the belief that a man is destined, by his unchangeable biological nature, to occupy the place his birth assigns him.

This campaign wound up without success. But the attacks against occidental genetics hardly stopped there. The criminal mistakes of the National Socialists, who declared themselves solidly upheld by the scientific laws of heredity, gave new weapons for the controversy. It is astonishing to see to what extent those modern scientific ideas which succeeded in reaching Russia, arrived there via Germany, falsified and discredited by political misuse; they were not able to spread directly or, as it were, to skip over a Germany deeply mired in anti-scientific thought. The struggle of the Russian geneticists against Mendelianism became in large part a struggle against the racists' formulation of human genetics.

It was in this atmosphere that Lyssenko began his career as prophet. Associated with an official philosopher, Prezent by name, he published in collaboration with him in 1935 a book incorporating a violent attack

against Mendelian genetics with a theory sponsored by the supreme organs of the Party. Soviet genetics from then on presented a performance of solemn discussions steered from above and aimed at a pre-established end, decided in advance in the offices of politicians. From this moment, also, Soviet biology experienced nothing but downfalls, purges, disappearances, on the one hand; and on the other, rapid promotions, photogenic careers, and spectacular ordinations.

Marxists view the whole of culture—science, art, philosophy—as derivative, in the sense of a secondary epiphenomenon, from the fundamental material process of economic production. Translated into non-Marxist language, this formula reduces to the following alternative: does the mind provide resources for power, or does power furnish mind with the essentials of its existence? The liberal solution grants that both these propositions are true, to a degree and in a relationship which an old-school Marxist might call a 'dialectical synthesis'. In totalitarian dictatorships, however, it is clear that power dominates—and must dominate—the mind. That is why, from time to time, totalitarian politics creates artificial situations, in which creative minds are put to the test. At such times philosophers, artists, philologists, or scholars are asked to renounce their conceptions, and they give in. Thus Alexandrovsky's *History of Philosophy*, coming out with official approval shortly after the war, had to be withdrawn because he had mentioned the idealistic philosophers, in the process of criticising them. Everyone will recall the case of Shostakovitch, whose symphonies were reproached for using notes that were too 'plaintive' for the working-class culture. The affair of Marr the linguist also comes readily to mind, whose work was the occasion for a controversy to which the head of the government himself put a sudden end with an article in the official government newspaper. Since Galileo's time, examples are rare indeed in which temporal power has entered to this extent into the evaluation of scientific research. Galileo, at least, although he submitted, was not required to accuse himself and to apologise, while contemporary scientists sometimes find themselves obliged to treat their convictions as if it were a matter of an unsatisfactory model of a tractor, badly made furniture, or poorly sewed shoes.

It is not truth or beauty at all that scholars and artists are called upon to embody or defend under such conditions; they do no more than keep alive a faith, a belief, a myth necessary to keep them in favour, or give organised form to some argument which is psychologically fitted to convince the masses that everything the State undertakes rests on an

## *After the Fall of Lyssenko*

unquestionable logic and is absolutely justified by science. The official doctrine represents a solid system, held to be healthy because it is natural, and corresponds to the needs of a multitude whose instruction and organisation are kept at just the degree desired. Once again, the comparison between the two ideologies, National Socialist and Marxist, is inviting. In the extreme case and on the lowest level, the theory of relativity was false because Einstein is a Jew. For the Marxists, the classic laws of heredity are suspect because Mendel was a monk of the Catholic Church.

What conclusion can we draw from this affair, as the dispute comes to an end?

Above all, there is the comforting conclusion to be drawn that despite several dozen years of oppression, the true scientific spirit lives on, and that it finds the strength to make itself heard on the first occasion that is offered, in this case by a shake-up in the apparatus of political power.

Secondly, it must be admitted that the Lyssenko affair, seen whole, bears witness to a grave crisis in science in the Soviet Union. During the relatively few years that Lyssenko held political power in his two hands, he succeeded in taking Russian biological investigations back at least a hundred years, even, in certain respects, turning the clock to the days of Van Helmont and the alchemists. For a whole flock of servile, assiduous biologists were assembled around him; multiplying, under his tutelage, the most weird ideas and the least dependable of experimental reports. Did they do so willingly? No one knows. Perhaps a quest for the myth replaced the quest for the truth, and certain scientists lost their critical faculty and came to believe in those absurdities.

Lastly, the catastrophe in Soviet biology shows that, despite the unheard-of sums spent on scientific organisation, before and especially after the war, despite the new buildings at Moscow University, which are the most spacious in the world, despite the legions of scientists who form a materially privileged class, profiting from an extraordinary political obligingness, science did not prosper so much as was expected. It grew, but it degenerated at the same time. Where liberty of thought is absent, an essential element in scientific life is missing from the creative atmosphere. Science buried under money but deprived of its liberty can produce—and even produce a great deal—but it is not creating anything, like plants in the darkness that put forth a tangled mass of branches too weak to flower.

On an occasion of this kind, the Marxists should carefully investigate whether the dependence of intellectual forces on an economic base is as

close as their creed requires them to think it is. Would they then continue to consider it normal for scientific truths to be decided by the vote of committees?

Lyssenko's 'science' gave nothing back in return to the economic processes on which it depended, for it depended on them too closely. Lyssenko's tomatoes, and his other phantom discoveries, will soon be forgotten. His work, far from having given Marxist doctrine the proofs it was hoping for, becomes an anecdote current for a day, the aftertaste of which is not without some bitterness.