

TOWARDS THE ADVANCEMENT OF SOVIET GENETICS

(Abridged Translation)

By

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The following translation of the major part of an article by Professor Mitin which appeared in the PRAVDA of December 7, 1939, may perhaps serve a double purpose. It is a timely addition to the documentary materials connected with the significant discussions of basic problems of genetics in the USSR during the past few years.¹ It may also serve to correct certain misimpressions which apparently have gained currency as to the nature of these discussions and the attitude of official organs like PRAVDA or leading representatives of the philosophy of dialectical materialism, like Professor Mitin, towards them.

Professor Mitin's article was written at the close of the latest and most important stage of the genetics discussions—a scientific congress held in Moscow, at the open meetings of which, from October 7 to 14, all the leading representatives of both sides presented papers and engaged in discussions upholding their respective points of view. (For a stenographic report of the meetings, see POD ZNAMENEM MARKSIZMA, Nos. 10 and 11, 1939.)

In justice to the facts it might be said that the mere occurrence of such meetings is enough in itself to correct a good many of the misapprehensions that have entered into the picture, as popularly conceived, of what has happened. Academician Vavilov has sometimes been represented as a man who, because of his views on genetics, was (1) under arrest, (2) in a "concentration camp," (3) deprived of his scientific honors and titles, (4) given no opportunity to present openly his side of the matter and to question and reply to his critics, (5) given no recognition or acknowledgment of his scientific abilities and past achievements by spokesmen close to the Soviet government

1. For a brief summary of the past history of these discussions, see *Bulletin on the Soviet Union*, June 30, 1939.

and Communist Party, (6) at present excoriated and violently abused by such spokesmen.

In view of these meetings and the contents of Professor Mitin's report, it appears that none of these impressions is founded upon fact.

The views expressed by Professor Mitin possess a peculiar importance in the matter because, owing to the nature of his position as a leader of Soviet philosophy and the role played by him in past controversies, his article perhaps comes as close to approximating an "official attitude" as anything that has ever been said in the Soviet Union in regard to the whole controversy. Hence it may serve to correct certain misconceptions of what the "official attitude," if any, may be.

This attitude has sometimes been represented as involving: (1) a "repeal" of Mendel's laws, i.e., a denial that they possess any sort of validity whatsoever, together with (2) the forbidding of any favorable reference to or teaching of them; (3) a lack of interest and a denial of any value or significance in the theoretical side of genetics; (4) a consideration of the question merely from the point of view of Marxist doctrine in the abstract, without any reference to facts or experimental findings; (5) an advocacy of views on genetics not shared by any qualified scientists in capitalist countries.²

Professor Mitin's article appears to contradict these conceptions.

It would seem well to dispose of these surrounding issues, in so far as it is possible to do so, in order that attention may be directed to the intrinsic merits of the matters actually under discussion.

Not long ago a meeting called under the auspices of the journal *Pod Znamenem Marksizma* was held for the purpose of discussing some basic problems of genetics and selection which have been the subject of protracted discussion among advocates of different tendencies in these sciences. Fifty-three speakers were heard at the meeting, among them, people of rank and importance: scientists, academicians, practising geneticists, teachers.

2. For an interesting discussion of genetics theory in the United States, cf. papers presented at the Stanford University symposium, reported in *The New York Times*, July 2 and 3, 1939.

The aim of the present article is to acquaint the reader of *Pravda* with certain results of this meeting at which some of the most important questions of biological science were discussed.

Academician Lysenko, as a consequence of unflagging work carried out over a period of many years, is producing practical results which possess great economic significance. He discovered and put into practice a method of vernalizing grain. He worked out a method of combatting the degeneration of the potato in the south, thanks to which we have found it possible to provide our south with good potatoes. Lysenko is developing a fruitful, Michurinian³ method of vegetable hybridization. It is evident that in all these results, there is still much that must be checked, made more exact, developed further. But it is equally evident that in the results of Lysenko we possess much that is new, valuable and useful.

The achievements of Lysenko also possess great theoretical significance. They carry science forward, and work out new implications of a number of fundamental doctrines of Darwinism. Let us take, for example, his theory of stages in the growth of plants. In what does the scientific significance of this theory consist? Lysenko proved the existence of a series of consecutive stages in the growth of plants. He showed that such characteristics of yearly growth as summer or winter maturation, adaptability to a short or long day are not changeless or unmodifiable. Such a view as his suggests that it might be possible to transform a plant from a winter to a summer variety and vice versa. Lysenko has shown that it is impossible to understand the characteristics of a plant species apart from the external conditions under which the species exists, that each plant requires specific and definite conditions in the course of its development. The working out of these important doctrines is without doubt a considerable contribution, both to applied agriculture and to biological science.

The basic theses of Academician Lysenko that the plant, both in respect to species and individual forms, is not something unchangeable; that it has no absolutely unchanging characteristics; that all its characteristics are subject to change in the course of

3. I. V. Michurin (1855-1935), a renowned Russian geneticist who won a reputation somewhat similar to that of Burbank in America.

the evolution of the organism; that in this evolution not only the sex cell or its component elements play a part, but the organism as a whole and the cell as a whole; that in the course of its evolution, not only the external characteristics of the organism but also its hereditary base are subject to change; that man can, by means of his active intervention, his deliberate creation of definite environmental conditions, influence the evolution of the organism, directing its development into channels useful to him—all these important theses of Academician Lysenko are not only in harmony with the teachings of Darwin, but represent a further development of a whole series of Darwinian doctrines as well as an extension of the method of dialectical materialism in biological science.⁴

Lysenko does not look upon science as upon some precious rarity which exists only to be admired, and performs no further function. No, science is something necessary for life, for practice, for the modification of nature.

And how do matters stand with the opponents of Lysenko, with the representatives of so-called formal genetics?

Academician N. I. Vavilov is rightly revered as a scientific authority. He has contributed considerable work which possesses a great deal of significance for biological science—work involving the creation of a seed collection which is the only one of its kind in the world. What Academician Vavilov has created has not only practical significance, but also general theoretical interest. But precisely because Academician Vavilov is a leading scientist, our collective society has the right to make demands upon him that are by no means small: namely, to come

4. This kind of statement has sometimes been interpreted as an attempt to decide the matter, not on grounds of factual truth, but by appeal to some sort of authority which runs counter to factual truth. However, it should be noted, in all fairness, that Mitin shows no disposition to proceed in such a fashion either in this or in any of his other writings. Taken in the context of his work as a whole and of Soviet philosophy generally, such a statement as that Lysenko's "theses" represent "an extension of the method of dialectical materialism in biological science" may be taken to mean that it is such theses as those which the dialectical (or evolutionary—these terms are, in basic respects, synonymous) method tends to suggest as being likely ones to work upon, to investigate, to attempt to validate by observation and experiment. There is no evidence to show that it could be taken to mean that such theses should be pronounced true apart from facts or in spite of facts. Although various schools of philosophy maintain an *a priori* or transcendental conception of truth and of methodology which invokes criteria held to be superior to facts, empirical considerations and sense data, it should be noted that dialectical materialism is not one of these. In its teachings it explicitly rejects *a priori*ism, holds empirical factors and scientific methodology to constitute the ultimate criteria. (Cf. article, "Dialectical Materialism," Vol. 22, *Bolshaya Soviet Encyclopedia*). This does not mean, of course, that it could not violate its own criteria. However, there would appear to be no foundation for the impression that its very criteria encourage or obligate it to go beyond facts, beyond empirical verification.

closer to life, to practice, to bridge the gulf between science and practice.

Academician Vavilov spoke, in his report of world science, of world genetics. He gave an interesting review of what is taking place in that field at the present time. However, two things stand out in his review: first, a certain uncritical acceptance of many world authorities in the field of genetics, an absence of a critical attitude towards them in cases where such would have been fully warranted. In the second place, Academician Vavilov put forward the thesis that genetics has been developing along Darwinian lines and is now Darwinian. This thesis represents an incorrect view of the situation, for it shows an indiscriminating attitude towards the actual process of growth of the science under discussion. Is there perhaps one continuous line of development within genetics? Are there in this science no mutually opposing influences, no struggle between antagonistic elements?

Actually, there is taking place in genetics a sharp struggle between Darwinism and anti-Darwinism. There is the case of Punnett, certainly one of the leading geneticists in "world science," who is anti-Darwinist. In 1938 he announced in the article "Forty Years of Evolutionary Theory" that, "the beginning of our century is connected with the inauguration of Mendelism, and the appearance of the work of Bateson and De Vries can be counted as a landmark, as registering the end of the Darwinian era and the beginning of the Mendelian era in evolutionary theory."

Shull, the well-known American geneticist, moves in the direction of a denial of the creative role of selection, criticizes the Darwinian theory of mimicry.

Heribert Nilsson, prominent Swedish geneticist and selectionist has gone as far as a denial of the theory of evolution and selection, and openly calls for a return to Linnaeus and Cuvier. He holds that "Darwinian evolution has shown itself unable to meet the requirements of life."

Finally, take Morgan — central authority of contemporary genetics. Here is what he writes in his book, *Experimental Foundations of Evolution*: "Since all this appears debatable, should we still make use of the term 'natural selection' as a part

of the mutation theory, or should we exclude it because now it no longer possesses that meaning which the followers of Darwin gave to his theory?"

All this testifies to the fact that it is impossible to speak of a "world science" as of something single, whole and continuous. The development of science in class, in bourgeois society proceeds through contradictions. In science we find a struggle between advanced and backward tendencies. Consequently it is necessary to approach the course of developments in "world science" with a discriminatory attitude.

Holding as we do a high opinion of the role and significance of the works of Academician Lysenko, conscious of the positive values in the practical and theoretical results of his movement, we must not, however, refrain from criticism of the specific exaggerations and faults of the movement nor from criticism of individuals connected with it.

One of the central questions discussed at the meeting was the question of Mendelism. Darwin set up a scientific biology. On the basis of enormous factual material he founded the theory of evolution in the organic realm. But that does not mean that there were no shortcomings in Darwin's work or that he elucidated all the problems of organic evolution. On the contrary, precisely on that level to which Darwin elevated himself, there stands a whole series of new problems which Marx and Engels even then very keenly observed, forecasting the direction of the further development of Darwinism.

Darwin's theory of evolution is constructed on the basis of the recognition of variation, inheritance and selection as the controlling factors in the evolution of organic species. Out of all these factors of evolution Darwin placed the chief emphasis on *selection* and worked out, in the main, the problem of the actual operation of selection. The problem of the causes of individual variations of organisms Darwin did not work out.

After Darwin, science amassed a huge amount of new factual material. The structure of Darwinism expanded to colossal proportions and the study of inheritance and variation developed in vigorous fashion. Contemporary genetics, together with a whole series of related sciences, addressed itself to these questions.

Since the beginning of the twentieth century a series of outstanding discoveries has been made in research on the mechanism of inheritance and the phenomenon of variation. The foundation of the science of the cell—cytology—was laid. The study in all its details of the structure of the cell, of the role and significance of the chromosome apparatus in general, particularly in connection with the transmission of hereditary characteristics—such investigations certainly belong in the class of outstanding and undeniable scientific achievements.

From this point of view let us examine particularly the question of the Mendelian laws. There is no doubt about the fact that Mendel discovered certain laws in connection with the inheritance of definite characteristics: the phenomenon of segregation among hybrid offspring, the well-known mathematical law of this segregation, the relative independence of certain hereditary characteristics. Mendel's discoveries in the field of inheritance were then connected with processes within the cells of the organism, in particular in the sex cells. [Mitin here discusses the attitude of the biologists Timiriázev and Michurin towards Mendel's laws, citing passages from their works. Associating himself with their attitude, he speaks of "a just, clear, scientifically objective evaluation of Mendel and Mendelism, avoiding as one-sided either an uncritical adulation of Mendelism or a wholesale rejection of its significance in the science of inheritance." He then proceeds.]

If even a very small part of nature's processes is brought to light by any scientist whomsoever, why should we not profit by such knowledge? We must. The discoveries of Mendel unquestionably reveal certain aspects of the phenomenon of inheritance, and thus embody knowledge of which we must avail ourselves.

Let us pass over to the following question which also was subjected to long and serious discussion. That is the question of the significance and role of cytogenetical investigations in connection with the study of problems of inheritance.

It is evident to all that in recent times a whole series of important studies have been made in connection with the cell. The study of the role of the cell and of its separate elements in connection with the development of different characteristics

of the organism is flourishing. For instance, the significance of the differentiation of specific cell structures in regard to the isolation of species in the process of evolution is being clarified. Cytogenetic studies permit us partly to lift the veil on the question of the inheritance of properties of organisms. Much is cleared up in relation to the characteristics of sex. These are all matters possessing great scientific significance. It is necessary to carry on elaborate research work in these fields.

But at the same time that important achievements are being won in the field of cell research, there have grown up in this science certain empty, metaphysical conceptions which are obstacles to its further development. A very serious example of such barren conceptions which hinder the further development of genetics is the metaphysical theory of the gene which at the present time occupies something of a central place in formal genetics, and which, as it figures in contemporary genetics, is basically incompatible with the theory of evolution.

By "genes" in contemporary genetics is understood some sort of factor (or complex of factors) placed in the chromosomes of the nucleus of the cell and determining the characteristics of the adult form. The chromosome itself is represented as a complex of such particles. This is what geneticists have in mind when they speak of "the material basis of inheritance," when they speak of contemporary genetics explaining materialistically the phenomenon of inheritance.

However, we must be much more cautious than to take such a definition of gene as "materialism." We must remember that there is mechanistic, vulgar, *metaphysical* materialism irreconcilable with the theory of evolution and there is dialectical materialism, founded on the theory of evolution.

Geneticists, rejecting the theory of preformation which asserts that in the seed or embryo of an organism are contained in complete but smaller form all the characteristics of its adulthood, emphasize that in the embryo, in its chromosomes, there are not the characteristics of the adult individual, *but there are only genes, factors, the possibilities or potentialities of characteristics which become actualities only in case there are present certain definite external conditions.* In the embryo of the black

rabbit, they say, *there is no "black color," but there is a factor which can lead to "black color"* if the embryo evolves under suitable conditions.

Notwithstanding such a reservation, the net result of this view is that the chromosome is a combination of factors, already containing the possibility of certain specific adult characteristics. This means that in one way or another the formal genetics theory involves the view that there exists a complete correlation between the characteristics of the adult individual and the factors, capacities, contained in the embryo. This is what contradicts the principle of evolution. Particularly it contradicts the law of Darwin and Haeckel, according to which the individual in its embryological development reproduces in shortened form the path of development of the species to which it belongs.

The mistake of the doctrine of the gene consists in this, that it is too simple, it crudely and mechanically connects the characteristics of the *adult individual* with capacities in the *embryo* of this individual. Formal geneticists do not give due consideration to the fact that between the embryonic cell of the individual and its adult stage lies a *long path of evolution*. In the evolution of the species this path sometimes takes up tens and hundreds of thousands of years. In the evolution of the embryo it is reduced to minimum time. But it is important to note that in this evolution—from the embryo to the fully formed organism—there take place various *qualitative transformations*. For the evolution of the species to be reproduced in that of the embryo means that in this latter evolution the embryo undergoes changes of its characteristics, its structure and of all the material elements contained therein. Now when the embryo reaches the stage where it has already acquired traits of its adulthood, it possesses characteristics for which, earlier, there were not and could not be any special factors or "genes." Here we may witness how the doctrine of the gene forces us into a whole series of absurdities. If the human embryo in its intra-uterine development reaches a stage where it is like an amphibian, possessing gills, then becomes like a lower mammal, then like its simian ancestor, we must conclude, according to the gene theory, that in the chromosomes of its parents there were factors determining all

characteristics of the organism at all stages of its embryological development and at all stages of its development as an adult.

The doctrine of evolution and the phylogenetic law testify convincingly against the theory that in the embryo there are *already* factors determining the characteristics of the adult. It is obviously an over-simplified conception.

The theory of evolution says that in the course of evolution a series of *qualitative transformations* are possible and that accordingly there can arise anew in the adult individual and in the embryo as well, at the different stages of its development, characteristics for which in the embryonic cell there were originally no genes, no corresponding factors. Living organic matter possesses an attribute not yet explained by science: to reproduce in the development of the embryo the qualitative transformation gone through by the species.

Let us take as an example the evolution of the butterfly. In the beginning it is a fertilized egg cell, then a caterpillar, then a chrysalis, then a colored butterfly. By virtue of what does this lump of embryonic matter from which the butterfly emerges accomplish such transformations? It would be an extremely simple and very mechanistic explanation to say that the *embryo* of this living creature possesses genes of the caterpillar, the chrysalis and the butterfly.

It would be much more complex and much more correct to approach this problem from the point of view of the theory of evolution. It is a problem we can solve only by means of a study of the embryo in its development, taking into account the evolution of the individual and the species as a whole.

Here is an instance of the complexity of the theory of evolution: it allows for *qualitative changes* in the development of the embryo. But the theory of genes permits only the *extension*, the further *manifestation* of that which was originally placed in the embryo.

It is sometimes said that nowadays the adherents of the theory of genes acknowledge their relative modifiability. If such is the case, why do they not explicitly criticize the claim, so pervasively asserted in so-called "classic" genetics literature, that the gene is unalterable?

Here is an example. In the article "Genetics" printed in 1929 in Volume XV of the *Bolshaia Soviet Encyclopedia*, Academician Vavilov writes: "The gene represents a definite, invariable unit of heredity which can be compared with the atom in chemistry and physics. . . . The genes are transmitted from generation to generation without changing their nature."

If this older statement of the matter in respect to the unalterability of the genes is now rejected by Academician Vavilov, then it is necessary openly to criticize it and thus clear the deck for further work. We ought to give up the theory of genes, metaphysical from start to finish, and free ourselves from something that stands in the way of an evolutionary treatment of the cell. It is necessary, on the basis of the wealth of factual material which has accumulated, to set up a whole series of new problems which will raise our Soviet genetic science to a new level, corresponding in fact to that height on which our country stands in comparison with the capitalist world.

Let us take the following group of questions which once again bear witness to the blind alley in which formal genetics finds itself and to the importance of avoiding these blind alleys.

Take for instance the concepts of genotype and phenotype. Unquestionably, they possess genuine scientific significance. It is necessary to distinguish between the hereditary element of the organism and its outward development. Dialectics teaches us to distinguish, for example, substance from its manifestations. We utilize, and cannot fail to utilize, the concepts of genotype and phenotype in our practical and theoretical work. Formal geneticists, however, think of these two concepts as belonging to two different realms, separated by a metaphysical Chinese wall. The *theoretical* result of all this is simply *metaphysics*. The *practical* result is a fruitless, hampering theory which we must thoroughly root out.

The divorcement in principle set up in contemporary genetics between genotype and phenotype, between so-called mutations and modifications, between internal and external factors of development does not exist in nature.

Formal geneticists have fallen into the habit of accusing of Lamarckianism all those who in the slightest degree acknowledge the action of the surrounding life conditions of the organ-

ism on its hereditary elements. They accuse of Lamarckianism even Darwin himself, who acknowledged the influence of climate and food, exercise and non-exercise and in general environment in the broadest sense. Formal genetics, not being able to find a bridge between organism and environment, between mutation and modification, between genotype and phenotype, is cut off from the road leading to the actual influencing of the nature of organisms through manipulating the external conditions of their existence.

It is time to put an end to such metaphysics. It is necessary to address ourselves with the utmost attention to those practical achievements with which actual life confronts us, in particular to those which are connected with the works of Academician Lysenko. It is time to implement enthusiastic declarations of attachment to dialectical materialism by a genuine attempt to set these problems before ourselves in our scientific fields.

The meeting showed that on the part of many representatives of so-called formal genetics there is an egregiously disdainful attitude towards new phenomena, new sides of life—an attitude unsuited to Soviet scientists. It is necessary to struggle against a certain pontifical attitude, professorial cliquishness, aloofness, hostility to the new, distaste for self-criticism, which may be found among formal geneticists.

But at the same time it is also necessary to struggle against even the slightest manifestation of an improper attitude towards our Soviet intelligentsia, contributing to the welfare of socialism.

We can and indeed must have disagreements in science. We can and must have our theoretical quarrels. We should therefore rebuke and exclude from science any administrators who would hinder such developments.