

BIOLOGY IN THE SOVIET UNION

By A. G. Morton

THE Session of the All-Union Lenin Academy of Agricultural Science, held in August, 1948, was devoted to a discussion of fundamental biological theory, which centred round the conflict between two opposing trends in genetics, between the Weismann-Morgan-Mendelist trend, the basis of contemporary genetics outside the Soviet Union, and the Michurinist trend, represented by Academician T. D. Lysenko and his co-workers.

The main report* (now available in English) was given by T. D. Lysenko, and after a lively, exhaustive, and hard-hitting discussion, in which the opposition had full opportunity to put their case, the Lysenko-Michurinist standpoint was fully endorsed and thus accepted as the future line of development of biological science.

This controversy has aroused much interest and not a little excitement among geneticists and other scientists outside the Soviet Union, and has also been made the occasion for a number of ill-informed and sometimes ill-natured attacks on Soviet science. A study of the detailed report of this conference (shortly to be available in English) is sufficient answer to attacks of this kind.

In the first place, the serious nature of the discussion is evident; the scientists and agricultural specialists from all over the Soviet Union who took part in it were fully conscious of the vital importance for the future progress of Soviet agriculture of a correct solution of the questions at issue. In the second place, it must be admitted, even by those who disagree with Lysenko, that he has made a very important challenge to current biological theory, which will require serious consideration and which cannot be answered simply by abuse.

Before giving an account of Lysenko's standpoint, it is necessary to remind the reader of the background of the biological controversy in the Soviet Union, since this is essential for a correct understanding of the questions at issue. The conflict between the Mendelists and the Michurinists has, in fact, been going on in the Soviet Union for something like twenty years, although only occasionally has any echo of it reached the British public, owing to the haphazard and often distorted selection of information from Russia by the Press and radio. Thus, to the

Soviet republic, the recent discussion represented the final summing-up and settling of a long and familiar controversy.

Furthermore, the theoretical decision in favour of Michurinism as against Mendelism was only taken when the question had already been settled in practice by the relative contributions of the two theories to the development of Socialist agriculture. Michurinism, as developed by Lysenko, made tremendous contributions to solving the problems of the collective farms, which were reflected in greatly increased yields of agricultural products. Mendelism on the other hand, is considered to have played a relatively insignificant role in the progress of socialist agriculture, and to hold little hope for the future. Any appreciation of Lysenko's theoretical position must take these facts into consideration.

The first part of Lysenko's statement is concerned with the criticism and rejection of the chromosome theory of heredity, which Lysenko regards as merely a development of Weismann's doctrine of the existence of a changeless hereditary substance (the germplasm or, in modern terminology, the genome), which bears the heredity and controls the development of an organism, but which is itself unaffected by the conditions of life of the organism and is passed on unchanged from one generation to the next.

The modern chromosome theory, for all its elaboration of genes and plasmogenes, is essentially based on the Weismann conception of a special hereditary substance isolated from the internal and external environmental conditions of the organism. It is, of course, recognised that certain definite environmental conditions are required for the actual development of an organism and for the realisation of its hereditary potentialities. What Mendelism denies is the existence of any effect of these environmental conditions on the hereditary material, and therefore the possibility of the inheritance of acquired characters is also denied. Changes in the hereditary material are indeed recognised, but these mutations are entirely fortuitous and undirected, even though they may be deliberately induced by the use of colchicine or X-rays.

LYSENKO rejects the basic assumption of Mendelism, the existence of an unchanging hereditary substance, because it is contrary to facts and is idealistic and metaphysical. It is inconsistent, for example, with the existence of vegetative hybrids which the Michurinists

*Lysenko, T. D. *Soviet Biology*.
Birch Books. 1948. 2s. 6d.

have produced in considerable numbers. It leads to the view that since hereditary variation is not dependent on external conditions, therefore it is fortuitous and without definite tendency. Such a theory conflicts with the fact of evolution by adaptation and selection, since in reality it either denies the existence of evolution, or reduces it to merely quantitative changes.

Such a theory also denies the possibility of directing evolution in such a way as to create new plants and animals for agriculture. The Michurinists have shown, however, that plants and animals can be changed by strictly directed selection. Mendelism, on the other hand, has proved in practice to be of relatively little significance for agriculture. This is especially true of animal breeding where Mendelism has never made any contribution, and is ignored by the practical farmer.

It is not possible in a short space to do more than indicate the basis of Lysenko's theoretical criticism of Mendelism, but enough has perhaps been said to show that it is neither frivolous nor superficial. This criticism does not mean that Lysenko rejects any of the observational facts of Mendelian genetics, or that he does not believe in the existence of chromosomes. "Naturally, what has been said above does not imply that we deny the biological role and significance of chromosomes in the development of the cells and of the organism. But it is not at all the role which the Morganists attribute to the chromosomes."

It is the positive alternative to Mendelism propounded by Lysenko which is, however, of greatest interest to biologists, and which is likely to awaken the greatest opposition. Whilst Mendelism makes an idealistic separation between hereditary substance and the rest of the organism, the correct materialist view is, according to Lysenko, that heredity is inherent in all parts of the living organism. This implies that the conditions of life of the organism must affect its heredity—in other words, that acquired characters are inherited. "Materialism requires the recognition of the inheritance of acquired characters." The proof of this is to be found in the facts accumulated by the Michurinists.

Thus Lysenko re-states unequivocally the Lamarckian belief in the inheritance of acquired characters. It is quite clear, however, that he does not thereby imply the inheritance of acquired characters in general. What he claims is that in *certain specific conditions* organisms can inherit changes induced by the environment, and that the Michurinists have begun to define the conditions in which this type of inheritance becomes possible. If established, this is obviously a matter of the greatest theoretical and practical importance. Biologists have long been attracted by Lamarckianism for theoretical reasons, but have been held back by the lack of definite evidence in its favour. Among botanists, indeed, Lamarckianism has often been almost in the nature of a heresy which everyone believes but no one likes to acknowledge. The establishment of the particular conditions in

which heredity can be altered has extremely important practical consequences, since it permits the creation of new varieties of animals and plants of agricultural value in a way that Mendelism, limited to the selection and re-combination of existing varieties, cannot do. This is the claim made by Lysenko for Michurinism.

THERE are three ways in which heredity can be altered according to the Michurinists:—

1. By changes in external conditions at certain critical physiological periods—e.g., at the vernalisation stage.
2. By graft hybridisation and the "training" of plants by grafting.
3. By sexual hybridisation followed by directed selection of the progeny.

These methods are based on the work of Michurin, who himself created many new varieties of plants. Lysenko and his co-workers have enormously developed these methods and extended their theoretical and practical significance. This development has only been possible on the basis of the extremely developed nature of socialist agriculture and the close connection between Soviet agronomy and the work of the collective farms. Lysenko has always drawn the collective farmers into active participation in his work, and this is the reason for the rapid advances which have been made.

The theoretical principles of Michurinism, given by Lysenko, will probably be found the least satisfactory part of his statement by biologists. This is partly due to the use of old terms in a new sense, and partly to the provisional nature of the formulations. Theory has arisen out of practice, and there is no reason to suppose that Lysenko has given a final theoretical statement. Anyone at all familiar with his earlier writings will recognise that his thought has already undergone considerable development.

Biologists outside the Soviet Union cannot form any final judgment on Michurinism until they have had a chance to study the factual material on which it is founded. It is clear, however, that Michurinism has found acceptance in the Soviet Union because of its practical successes and that these successes are connected with its fundamental theory. The new trend in biology can no longer be ignored—its challenge will require careful study and the reconsideration of contemporary biological theory. In the writer's opinion, it opens up the way to great theoretical and practical advances in biology.

The Session of the All-Union Lenin Academy of Agricultural Science registered the abandonment of the Weismann-Morgan-Mendelist trend, and the establishment of the Michurin trend in Soviet biology.

A few weeks later an enlarged meeting of the Presidium of the Academy of Sciences of the U.S.S.R. met to discuss the position and tasks of biological science in the Institutes and Establishments of the Academy. In addition to members of the Presidium there were

present a number of Academicians, Corresponding-Members of the Academy, and scientific workers from its Institutes, as well as the Minister for Higher Education, the Minister for Agriculture, and the Minister for State Farms.

At the end of the three-day meeting (August 24th—26th) the President of the Academy (S. I. Vavilov) read the text of a resolution prepared by a group of members of the Presidium together with participants in the Session. After a short discussion, the resolution embodying a number of practical steps for the strengthening of the Michurin trend was approved by the meeting and adopted by the Presidium. Readers will be specially interested in the following passages from this resolution.

RESOLUTION of the Presidium of the Academy of Science of the U.S.S.R. with regard to the position and tasks of biological science in the Institutes and Establishments of the Academy of Science of the U.S.S.R.

"The Session of the All-Union Lenin Academy of Agricultural Science has set a series of vital problems before Soviet biological science, the solution of which will contribute to the great work of socialist construction."

"... The material of the Session very clearly showed that in biological science a conflict had been going on between two trends diametrically opposed in their ideological and theoretical attitudes: the struggle of the progressive, materialist, Michurin trend against the reactionary, idealist Weismann-Morganist one.

"The Michurin trend, which has constructively enriched the theory of evolution, and discovered laws of the development of living nature, has made an outstanding contribution to the practice of socialist agriculture by its methods of directed alteration of plant and animal nature."

"... The report of Academician Lysenko, which was approved by the Central Committee of the Communist Party of the Soviet Union, has placed before the scientists of the Soviet Union, and above all, before the biologists and representatives of the other branches of natural science, a series of new questions of principle which demand from the scientific establishments, a full and fundamental reconstruction of the work of research in biology and the real transformation of biological science into a mighty weapon with which to change living nature in the interests of the construction of a Communist society.

"... The Presidium of the Academy of Science of the U.S.S.R. resolves:—

1. To release Academician L. A. Orbeli from the duties of Academician-Secretary of the Department of Biological Science. Temporarily (until election by general assembly) to place the duties of Academician-Secretary on Academician A. I. Oparin. To include Academician

T. D. Lysenko in the Bureau of the Department of Biological Science.

2. To release Academician Shmalhausen from the duties of Director of the Severtzov Institute of Evolutionary Morphology.
3. To close down within the Institute of Cytology, Histology, and Embryology, the cytological laboratory under the direction of Correspondent-Member N. P. Dubinin, because of the adoption of an anti-scientific attitude which proved its barrenness over a number of years. In the same Institute, to close down the laboratory of botanical cytology as having the same incorrect unscientific trend. To close down the laboratory of phenogenesis in the Severtzov Institute of Evolutionary Morphology.
4. To place on the Bureau of the Department of Biological Science, the duty of revising the plans of scientific research for 1948-1950, bearing in mind the elaboration and development of Michurin's teaching and the subordination of the scientific research of the establishments of the Biological Department to the needs of the national economy of the country.
5. To place on the Editorial Council and the Department of Biological Sciences, the duty of preparing during 1948-1949 a scientific biography of Michurin in the series "Classics of Science."
6. To revise the composition of the scientific councils of the Biological Institutes, the Editorial Collegium of the Scientific Journals, to remove from them the supporters of Weismann-Morganist genetics and to replace them with representatives of advanced Michurin biological science.
7. To entrust to the Department of History and Philosophy the inclusion, in the plan of work of the Department, of works on the theoretical generalisation of the Michurin trend in biology, and criticism of the pseudo-scientific Weismann-Morganist trend.
8. To entrust to the Bureau of the Department of Biological Sciences, the re-examination of the structure, trend of work, and staff of cadres of the scientific establishments of the Department. To present within a month a proposal for the reorganisation of the Severtzov Institute of Evolutionary Morphology and the Institute of Cytology, Histology, and Embryology.
9. The Editorial Council within a month to revise the publication plans so as to ensure that scientific works of the Michurin School of Biology are published.
10. The Department of Biological Science to organise in October, 1948, an extended session devoted to the problems of the development of Michurin's teaching. This session to be arranged with the participation of the All-Union Lenin Academy of Agricultural Sciences, the biological establishments

of the Academies of the Republics, affiliates and bases of the Academies of Science of the Soviet Socialist Republics.

11. To entrust to the Bureau of the Department of Biological Science the revision of the plan for training post-graduate students at the Institutes of the Department of Biological Science, the need to develop the Michurin School of Biological Science being taken as a guide in the task of training scientific cadres.
12. To publish the material of the extended meeting of the Presidium in the next number of the Journal of the Academy of Sciences.

THE Department of Biological Sciences, of which Academician Oparin replaces Academician Orbeli as Academician Secretary, administered, according to the Academy Handbook of 1945, twelve institutes, seven laboratories, three research stations and the chief Botanical Gardens, and was also responsible for four commissions and three All-Union Societies.

Orbeli, L. A. (b. 1882, Erivan). Physiologist. Was made corresponding member of the Academy in 1932, and Academician in 1935. He is a Stalin Prize-winner, First Vice-President of the Academy of Sciences, Director of the Pavlov Physiological Institute, Leningrad, and was Academician-Secretary of the Department of Biological Science. He has recently been appointed head of the Special Commission set up by the Leningrad Physiological Society to organise the centenary celebrations of the birth of the famous Russian physiologist, Ivan Pavlov (b. 1849, d. 1936).

At the session of the Presidium of the Academy of Sciences, the President of the Academy, S. I. Vavilov, in summing up before presenting the resolution, said of L. A. Orbeli: "Academician Orbeli has to conduct very great and very responsible work in the Academy of Sciences and in other establishments, mainly in Leningrad. In this important period through which Soviet biological science is now passing, a considerable expansion in the work of directing the Department will undoubtedly be needed. Therefore I consider that it would be correct to relieve Leon Abgarovich from his duties as Academician-Secretary of the Department of Biological Sciences. Temporarily, until election by the General Assembly, I put forward the proposal that the duties of Academician-Secretary be placed on Alexander Ivanovich Oparin."

Oparin, A. I. (b. 1894, Uglich, Yaroslav region), was elected corresponding-member of the Academy in 1939 and Academician in 1946. Specialist in biochemistry of plants. Deputy Academician-Secretary of the Department of Biological Sciences. An English translation of his book "The Origin of Life" was published in 1938. (Oparin, A. I. "The Origin of Life." Macmillan. New York. 264 pages.)