THE SCIENCE OF BIOLOGY TODAY

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1. Biology, the Basis of Agronomy

Agronomy deals with living bodies—plants, animals, micro-organisms. A theoretical grounding in agronomy therefore must include knowledge of biological laws. And the more profoundly the science of biology reveals the laws of the life and development of living bodies, the more effective is the science of agronomy.

In essence, the science of agronomy is inseparable from biology. When we speak of the theory of agronomy we mean the discovered and comprehended laws of the life and development of plants, animals, and micro-organisms.

The methodological level of biological knowledge, the state of the science treating of the laws of the life and development of vegetable and animal forms, *i.e.*, primarily of the science known as genetics for half a century now, is of essential importance for our agricultural science.

2. The History of Biology: A History of Ideological Controversy

The appearance of Darwin's teaching, expounded in his book, *The Origin of Species,* marked the beginning of scientific biology. The primary idea in Darwin's theory is the teaching on natural and artificial selection. Selection of variations favorable to the organism has produced the purposefulness which we observe in living nature: in the structure of organisms and their adaptation to their conditions of life. Darwin's theory of selection provided a rational explanation of the purposefulness observable in living nature. His idea of selection is scientific and true. In substance, the teaching on selection is a summation

of the age-old practical experience of plant and animal breeders who, long before Darwin, produced strains of plants and breeds of animals by the empirical method.

Darwin investigated the numerous facts obtained by naturalists in living nature and analyzed them through the prism of practical experience. Agricultural practice served Darwin as the material basis for the elaboration of his theory of evolution, which explained the natural causation of the utility we see in the structure of the organic world. That was a great advance in the knowledge of living nature.

In Engels' opinion, three great discoveries enabled man's knowledge of the interconnection of natural processes to advance by leaps and bounds: first, the discovery of the cell; second, the discovery of transformation of energy; third, the proof which Darwin first developed in connected form that the stock of organic products of nature surrounding us today, including mankind, is the result of a long process of evolution from a few original unicellular germs, and that these again have arisen from protoplasm or albumen which came into existence by chemical means.*

The classics of Marxism, while fully appreciating the significance of the Darwinian theory, pointed out the errors of which Darwin was guilty. Darwin's theory, though unquestionably materialist in its main features, is not free from some serious errors. A major fault, for example, is the fact that, along with the materialist principle, Darwin introduced into his theory of evolution reactionary Malthusian ideas. In our days this major error is being aggravated by reactionary biologists.

Darwin himself recorded the fact that he accepted the Malthusian idea. In his autobiography we read:

"In October 1838, that is, fifteen months after I had begun my systematic enquiry, I happened to read for amusement Malthus on population, and, being well prepared to appreciate the struggle for existence which everywhere goes on from long-continued observation of the habits of animals and plants, it at

* See Frederick Engels, *Ludwig Feuerbach and the Outcome of Classical German Philosophy.*

once struck me that under these circumstances favorable varia tions would tend to be preserved, and unfavorable ones to be destroyed. The result of this would be the formation of new species. Here then *I had at last got a theory by which to work.*"* (My emphasis.—*T.L.*)

Many are still apt to slur over Darwin's error in transferring into his teaching Malthus' preposterous reactionary ideas on population. The true scientist cannot and must not overlook the erroneous aspects of Darwin's teaching.

Biologists should always ponder these words of Engels: "The entire Darwinian teaching on the struggle for existence merely transfers from society to the realm of living nature Hobbes' teaching on war of all against all and the bourgeois economic teaching on competition, along with Malthus' population theory. After this trick has been performed (the absolute justification for which I question, particularly in regard to Malthus' theory), the same theories are transferred back from organic nature to history and the claim is then made that it has been proved that they have the force of eternal laws of human society. The childishness of this procedure is obvious, and it is not worth while wasting any words on it. But if I were to dwell on this at greater length, I should have started out by showing that they are poor *economists* first, and only then that they are poor naturalists and philosophers."†

For the propaganda of his reactionary ideas Malthus invented an allegedly natural law. "The cause to which I allude," he wrote, "is the constant tendency in all animated life to increase beyond the nourishment prepared for it."‡

It must be clear to any progressively thinking Darwinist that, even though Darwin accepted Malthus' reactionary theory, it basically contradicts the materialist principle of his own teaching. Darwin himself, as may be easily noted, being as he was a great naturalist, the founder of scientific biology, whose activity

* *Life and Letters of Charles Darwin,* London, 1888, p. 89.

† Frederick Engels, Letter to P. L. Lavrov, November 12-17, 1875.

‡ Thomas Robert Malthus, *Essay on the Principle of Population,* Book I, Ch. I.

marks an epoch in science, could not be satisfied with the Malthusian theory, since it is, in fact and fundamentally, in contradiction to the phenomena of living nature.

Under the weight of the vast amount of biological facts accumulated by him, Darwin felt constrained in a number of cases radically to alter the concept "struggle for existence," to stretch it to the point of declaring that it was just a figure of speech.

Darwin himself, in his day, was unable to fight free of the theoretical errors of which he was guilty. It was the classics of Marxism that revealed those errors and pointed them out. Today there is absolutely no justification for accepting the erroneous aspects of the Darwinian theory, those based on Malthus' theory of overpopulation with the inference about a struggle presumably going on within species. And it is all the more inadmissible to represent these erroneous aspects as the cornerstone of Darwinism (as I. I. Schmalhausen, B. M. Zavadovsky, and P. M. Zhukovsky do). Such an approach to Darwin's theory prejudices the creative development of its scientific core.

Even when Darwin's teaching first made its appearance, it became clear at once that its scientific, materialist core, the teaching on the evolution of living nature, was antagonistic to the idealism that reigned in biology.

Progressively thinking biologists, both in our country and abroad, saw in Darwinism the only right road to the further development of scientific biology. They took it upon themselves to defend Darwinism against the attacks of the reactionaries, with the Church at their head, and of obscurantists in science, such as Bateson.

Eminent biologists like V. O. Kovalevsky, I. I. Mechnikov, I. M. Sechenov and, particularly, K. A. Timiryazev defended and developed Darwinism with all the passion of true scientists. K. A. Timiryazev, that great investigator, saw distinctly that only on the basis of Darwinism could the science of the life of plants and animals develop successfully, that only by further developing Darwinism and raising is to new heights is biological science capable of helping the tiller of the soil to obtain two ears of corn where only one grows today.

Darwinism, as presented by Darwin, contradicted the ideali philosophy, and this contradiction grew deeper with the devel ment of the materialist teaching. Reactionary biologists h therefore done everything in their power to empty Darwin of its materialist elements. The individual voices of progress biologists like K. A. Timiryazev were drowned out by the cho of the anti-Darwinists, the reactionary biologists the world ov

In the post-Darwinian period the overwhelming majority biologists—far from further developing Darwin's teaching—d all they could to vulgarize Darwinism, to smother its scienti foundation. The most glaring manifestation of such vulgari tion of Darwinism is to be found in the teaching of Augu Weismann, Gregor Mendel, and Thomas Hunt Morgan, t founders of modern reactionary genetics.

3. Two Worlds—Two Ideologies in Biology

Weismannism, followed by Mendelism-Morganism, whic made its appearance at the beginning of this century, was prima ily directed against the materialist foundations of Darwin' theory of evolution.

Weismann named his conception Neo-Darwinism, but, i fact, it was a complete denial of the materialist aspects of Darwin ism. It insinuated idealism and metaphysics into biology.

"The [materialist theory of evolution of animated nature] in volves recognition of the necessity of hereditary transmission o individual characteristics acquired by the organism under the conditions of its life; it is unthinkable without recognition o the inheritance of acquired characters. Weismann, however, set out to refute this materialist proposition. In his lectures on evolutionary theory, he asserts that "not only is there no proof of such a form of heredity, but it is inconceivable theoretically."* Referring to earlier statements of his in a similar vein, he declares that "thus war was declared against the Lamarckian principle of the direct effect of use and disuse, and there arose a strife

* August Weismann, *The Evolution Theory*, London, 1904, Vol. I, p. 242.

which has continued to this day, the strife between the Neo-Lamarckians and the Neo-Darwinians, as the two disputing parties have been called."*

Weismann, as we see, speaks of having declared war against Lamarck's principle; but it is easy enough to see that he declared war against that without which there is no materialist theory of evolution, that under the guise of "Neo-Darwinism" he declared war against the materialist foundations of Darwinism.

Weismann denied the inheritability of acquired characters and elaborated the idea of a special hereditary substance to be sought for in the nucleus. "The sought for bearer of the inheritance," he stated, "is contained in the substance of the chromosome."† The chromosomes, he said, contain units, each of which "determines a definite part of the organism in its appearance and final form."

Weismann asserts that there are "two great categories of living substance—the hereditary substance or idioplasm, and 'nutritive substance' or trophoplasm."‡ And he goes on to declare that the bearers of the hereditary substance, "the chromosomes, represent a separate world, as it were," a world independent of the organism and its conditions of life.

In Weismann's opinion, the living body is but a nutritive soil for the hereditary substance, which is immortal and never generated again.

So, he asserts, "the germ plasm of a species is thus never formed de novo, but it grows and increases ceaselessly; it is handed down from one generation to another. . . . If these conditions be considered from the point of view of reproduction, the germ cells appear the most important part of the individual, for they alone maintain the species, and the body sinks down almost to the level of a mere cradle for the germ cells, a place in which they are formed, and under favorable conditions are nourished, multiply, and attain to maturity."§ The living body

* *Ibid.*
† *Ibid.*, p. 339.
‡ *Ibid.*, p. 341.
§ *Ibid,* p. 416.

and its cells, according to Weismann, are but the *container an nutritive medium* of the hereditary substance; they themselv can never produce the latter, they "can never bring forth ger cells."

Weismann thus endows the mythical hereditary substan with the property of continued existence; it is a substance whic does not develop itself and at the same time determines th development of the mortal body.

Further: " . . . the hereditary substance of the germ cel *prior* to the reduction division, potentially contains all the el ments of the body." And although Weismann does state tha "the germ plasm no more contains the determinants of a 'crooke nose' than it does those of a butterfly's tailed wing," he goes o to emphasize that, nevertheless, the germ plasm . . . "contair a number of determinants which so control the whole cell-grou in all its successive stages, leading on to the development of th nose, that ultimately the crooked nose must result, just as th butterfly's wing with all its veins, membranes, tracheae, glan dular cells, scales, pigment deposits and pointed tail arise through the successive interposition of numerous determinant in the course of cell multiplication."*

Hence, according to Weismann, the hereditary substance pro duces no new forms, does *not* develop with the development o the individual, and is *not* subject to any dependent changes.

An immortal hereditary substance, independent of the quali tative features attending the development of the living body directing the mortal body, but not produced by the latter—tha is Weismann's frankly idealistic, essentially mystical conception which he disguised as "Neo-Darwinism."

Weismann's conception has been fully accepted and, we migh say, carried further by the Mendelian-Morganists.

Morgan, Johannsen and other pillars of Mendelism-Mor ganism declared from the outset that they intended to investigate the phenomena of heredity independently of the Darwiniar theory of evolution. Johannsen, for example, wrote in his prin cipal work: ". . . one of the major aims of our research was tc

* *Ibid,* p. 384.

put an end to the harmful dependence of the heredity theories on speculations in the field of evolution."* The purpose of the Morganists in making such declarations was to wind up their investigations by assertions which in the final analysis denied evolution in living nature, or recognized it as a process of purely quantitative changes.

As noted above, the controversy between the materialist and the idealist outlook in biological science has been going on throughout its history. In the present epoch of struggle between two worlds the two opposing and antagonistic trends penetrating the foundations of nearly all branches of biology are particularly sharply defined.

Socialist agriculture, the collective and state farming system, has given rise to a Soviet biological science, founded by I. V. Michurin—a science new in principle, developing in close union with agronomic practice as agronomic biology.

The foundations of the Soviet agro-biological science were laid by Michurin and V. R. Williams, who generalized and developed the best of what science and practice had accumulated in the past. Their work has enriched our knowledge of the nature of plants and soils, our knowledge of agriculture, with much that is new in principle.

Close contact between science and the practice of collective farms and state farms creates inexhaustible opportunities for the development of theoretical knowledge, enabling us to learn ever more and more about the nature of living bodies and the soil.

It is no exaggeration to state that Morgan's feeble metaphysical "science" concerning the nature of living bodies can stand no comparison with our effective Michurinian agro-biological science.

The new vigorous trend in biology, or, more truly, the new Soviet biology, agro-biology, has met with strong opposition on the part of representatives of reactionary biology abroad, as well as of some scientists in our country.

The representatives of reactionary biological science—Neo-

* W. Johannsen, *Elemente der exakten Erblichkeitslehre*, 1909.

Darwinians, Weismannists, or, which is the same, Mendelian Morganists—uphold the so-called chromosome theory of heredity.

Following Weismann, the Mendelian-Morganists contend that the chromosomes contain a special "hereditary substance" which resides in the body of the organism as if in a case and is transmitted to coming generations irrespective of the qualitative features of the body and its conditions of life. The conclusion drawn from this conception is that new tendencies and characteristics acquired by the organism under the influence of the conditions of its life and development are not inherited and can have no evolutionary significance.

According to this theory, characters acquired by plant and animal organisms cannot be handed down, *are not inherited.*

The Mendel-Morgan theory does not include in the scientific concept "living body" the conditions of the body's life. To the Morganists, environment is only the background—indispensable, they admit—for the manifestation and operation of the various characteristics of the living body, in accordance with its heredity. They therefore hold that qualitative variations in the heredity (nature) of living bodies are entirely independent of the environment, of the conditions of life.

The representatives of Neo-Darwinism, the Mendelian-Morganists, hold that the efforts of investigators to regulate the heredity of organisms by changes in the conditions of life of these organisms are utterly unscientific. They therefore call the Michurinian trend in agro-biology Neo-Lamarckian, which, in their opinion, is absolutely faulty and unscientific.

Actually, it is the other way round.

Firstly, the well-known Lamarckian propositions, which recognize the active role of external conditions in the formation of the living body and the heredity of acquired characters, unlike the metaphysics of Neo-Darwinism (or Weismannism), are by no means faulty. On the contrary, they are quite true and scientific.

Secondly, the Michurinian trend cannot be called either Neo-Lamarckian or Neo-Darwinian. It is creative Soviet Darwinism, rejecting the errors of each, and free from the defects of the

Darwinian theory in so far as it included Malthus' erroneous ideas.

Furthermore, it cannot be denied that in the controversy that flared up between the Weismannists and Lamarckians in the beginning of the twentieth century, the Lamarckians were closer to the truth; for they defended the interests of science, whereas the Weismannists were at loggerheads with science and prone to indulge in mysticism.

The true ideological content of Morgan's genetics has been well revealed (to the discomfiture of our geneticists) by the physicist Erwin Schroedinger. In his book, *What Is Life? The Physical Aspects of the Living Cell,* he draws some philosophical conclusions from Weismann's chromosome theory, of which he speaks very approvingly. Here is his main conclusion: ". . . the personal self equals omnipresent, all-comprehending eternal self."* Schroedinger regards this conclusion as "the closest the biologist can get to proving God and immortality at one stroke."†

We, the representatives of the Soviet Michurinian trend, contend that inheritance of characters acquired by plants and animals in the process of their development is possible and necessary. Ivan Vladimirovich Michurin mastered these possibilities in his experiments and practical activities. The most important point is that Michurin's teaching, expounded in his works, shows every biologist the way to regulating the nature of plant and animal organisms, the way of altering it in a direction required for practical purposes by regulating the conditions of life, *i.e.,* by physiological means.

A sharp controversy, which has divided biologists into two irreconcilable camps, has thus flared up over the old question: Is it possible for features and characteristics acquired by plant and animal organisms in the course of their life to be inherited? In other words, whether qualitative variations of the nature of plant and animal organisms depend on the conditions of life which act upon the living body, upon the organism.

* Erwin Schroedinger, *What Is Life? The Physical Aspect of the Living Cell,* New York, 1947, p. 88.

† *Ibid.*

The Michurinian teaching, which is materialist and dialectica in its essence, proves by facts that such dependence does exis

The Mendel-Morgan teaching, which is metaphysical an idealist in its essence, denies the existence of such dependence though it can cite no evidence to prove its point.

4. The Scholasticism of Mendelism-Morganism

The chromosome theory is based on Weismann's absurd prop osition regarding the continuity of the germ-plasm and its inde pendence of the soma, a proposition which already K. A. Timi ryazev condemned. In line with Weismann, the Mendelian-Morganists take it for granted that parents are genetically not the progenitors of their offspring. Parents and children, accord ing to their teaching, are brothers or sisters.

Furthermore, neither parents nor children are really themselves. All they are are by-products of the inexhaustible and immortal germ-plasm. Variations in the latter are absolutely independent of its by-product, that is, of the body of the organism.

Let us turn to the Encyclopedia, where we, naturally, may expect to find the quintessence of the question under discussion.

In the 1947 edition of the *Encyclopedia Americana* (Vol. XIV, p. 124), T. H. Morgan, one of the founders of the chromosome theory, writes, in the article entitled "Heredity":

"The germ-cells become later the essential parts of the ovary and testis respectively. In origin, therefore, *they are independent of the rest of the body and have never been a constituent part of it. . . . Evolution is germinal in origin and not somatic as had been earlier taught.* This idea of the origin of new characters is held almost universally today by biologists." (My emphasis.—*T.L.*)

The same idea differently worded is propounded in the same *Encyclopedia Americana* (Vol. XII, p. 391) by Professor W. E. Castle in the article on "Genetics." After stating that usually the organism develops from a fertilized egg, Castle goes on to set forth the "scientific" foundations of genetics as follows:

"In reality the parent does not produce the child nor even