ACADEMICIAN
T. D. LYSENKO

THE SITUATION IN BIOLOGICAL SCIENCE

FOREIGN LANGUAGES PUBLISHING HOUSE

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CONTENTS

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1. BIOLOGY, THE BASIS OF AGRONOMY

Agronomy deals with living bodies—plants, animals, microorganisms. A theoretical grounding in agronomy must, therefore, 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 microorganisms.

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

2. THE HISTORY OF BIOLOGY: A HISTORY OF IDEOLOGICAL BATTLE

The appearance of Darwin's teaching, expounded in his book, *The Origin of Species,* marked the beginning of scientific biology.

The leading idea of Darwin's theory is the teaching on natural and artificial selection. Selection of variations favourable to the organism has produced, and continues to

produce, the fitness 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 fitness observable in living nature. His idea of selection is scientific and true. In substance, his teaching on selection is a summation of the age-old practical experience of plant and animal breeders who, long before Darwin, produced varieties 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 causes of the purposiveness 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 the transformation of energy; third, "the proof which Darwin first developed in connected form that the stock of organic products of nature environing us today, including mankind, is the result of a long process of evolution from a few originally unicellular germs, and that these again have arisen from protoplasm or albumen, which came into existence by chemical means."[1]

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 fault is being aggravated by reactionary biologists.

[1] F. Engels, *Ludwig Feuerbach und der Ausgang der klassischen deutschen Philosophie*, Moskau 1946, S. 44.

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 once struck me that under these circumstances favourable variations would tend to be preserved, and unfavourable ones to be destroyed.... Here then *I had* at last *got a theory by which to work*."[1] [My emphasis—*T.L.*]

Many are still not clear about 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 *bellum omnium contra omnes* and the bourgeois economic teaching on competition, along with Malthus' population theory. After this trick (the absolute justification for which, as indicated in point 1, I deny, particularly in regard to Malthus' theory) has been performed, 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 words on it. But if I were to dwell on this at

[1] *The Life and Letters of Charles Darwin*, London 1887, Vol. I, p. 83.

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."[1]

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."[2]

It must be clear to any progressively thinking Darwinist that, even though Darwin accepted Malthus' reactionary theory, it basically contradicts the materialist foundation 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 marks an epoch in science, could not be satisfied with the Malthusian theory, since it is, in fact and fundamentally, at variance with 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 of the "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 of 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.

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1 F. Engels, letter to P. L. Lavrov, 12-17 November 1875.

2 T. R. Malthus, *An Essay on the Principle of Population*, London, New York and Melbourne, 1890, Book 1, p. 2.

Even when Darwin's teaching first made its appearance, it became clear at once that its scientific, materialist core, the theory of 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.

Such eminent biologists as 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 it to new heights would biological science become capable of helping the tiller of the soil to obtain two ears of corn where there was formerly only one.

Darwinism as presented by Darwin contradicted idealistic philosophy, and this contradiction grew deeper with the development of the materialist teaching. Reactionary biologists have therefore done everything in their power to empty Darwinism of its materialist elements. The individual voices of progressive biologists like K. A. Timiryazev were drowned by the chorus of the anti-Darwinists, the reactionary biologists the world over.

In the post-Darwinian period the overwhelming majority of biologists—far from further developing Darwin's teaching—did all they could to debase Darwinism, to smother its scientific foundation. The most glaring manifestation of such debasement of Darwinism is to be found in the teachings of Weismann, Mendel, and Morgan, the founders of modern reactionary genetics.

3. TWO WORLDS—TWO IDEOLOGIES IN BIOLOGY

Weismannism, which made its appearance at the turn of the century, followed by Mendelism-Morganism, was primarily directed against the materialist foundations of Darwin's theory of evolution.

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

The materialist theory of the evolution of living nature necessarily presupposes the recognition of hereditary transmission of individual characteristics acquired by the organism under definite conditions of its life; it is unthinkable without recognition of 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." [1] Referring to earlier statements of his in a similar vein, he declares that "thus war was declared against Lamarck's principle of the direct transforming effect of use and disuse, and, indeed, that marked the beginning of the struggle which is going on to this day, the struggle between the Neo-Lamarckians and the Neo-Darwinians, as the contending parties are called."[2]

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 conceived the idea of a special hereditary

[1] A. Weismann, *Vorträge über Deszendenztheorie*, Bd. 1, Jena 1904, S. 198.
[2] *Ibid.*

substance "to be sought for in the nucleus."[1] *"The sought-for bearer of heredity,"* he stated, *"is contained in the chromosome material."*[2] The chromosomes, he said, contain units, each of which "determines a definite part of the organism in its appearance and final form."[3]

Weismann asserts that there are "two great categories of living material: the *hereditary substance,* or *idioplasm,* and the *'nutrient substance,'* or *trophoplasm*...."[4] He declares that the bearers of the hereditary substance, *"the chromosomes, represent a separate world, as it were,"*[5] a world independent of the body of the organism and its conditions of life.

Having thus disposed of the living body as being merely a nutritive soil for the hereditary substance, Weismann proclaims that the hereditary substance is immortal and is never generated *de novo.*

Thus, he asserts, "the germ-plasm of a species is never generated *de novo*; it only grows and multiplies continually, handed down from generation to generation.... Looked at only from the point of view of propagation, the germ cells are the most important element in the individual specimen, for they alone preserve the species, whereas the body is reduced practically to the status of a mere breeding ground for the germ cells, the place in which they form and, under favourable conditions, feed, multiply, and ripen."[6] The living body and its cells, according to Weismann, are but the *container and nutritive medium* of the hereditary substance; they themselves can never produce the latter, they "can never bring forth germ cells."[7]

Weismann thus endows the mythical hereditary sub-

[1] *Ibid.*, S. 277.
[2] *Ibid.*
[3] *Ibid.*, S. 305.
[4] *Ibid.*, S. 279.
[5] *Ibid.*, S. 239.
[6] *Ibid.*, S. 339-40.
[7] *Ibid.*, S. 339.

stance with the property of continued existence; it is a substance which does not itself develop and at the same time determines the development of the mortal body.

Further: "...the hereditary substance of the germ cell, *prior* to the reduction division, potentially contains all the elements of the body."[1] And although Weismann does state that "in the germ-plasm there is no determinant of a 'hooked nose' just as there is no determinant of the wing of a butterfly with all its parts and particles," he goes on to emphasize, that, nevertheless, the germ-plasm "...contains a certain number of determinants which successively determine the development of an entire group of cells in all its stages, leading to the formation of the nose in such a mode as to result in a hooked nose, exactly in the same way as the wing of a butterfly, with all its little veins, cells, nerves, trachea, glandular cells, form of scales, and pigment deposits, comes into being by the successive action of multitudinous determinants upon the course of the proliferation of the cells."[2]

Hence, according to Weismann, there can be no new formations of the hereditary substance, it does *not* develop with the development of the individual, and is *not* subject to any dependent changes.

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

Weismann's conception has been fully accepted and, we might say, carried further by Mendelism-Morganism.

Morgan, Johannsen, and other pillars of Mendelism-Morganism, declared from the outset that they intended

[1] A. Weismann, *Vorträge über Deszendenztheorie*, Bd. 1, Jena 1904, S. 282.
[2] *Ibid.*, S. 314.

to investigate the phenomena of heredity independently of the Darwinian theory of evolution. Johannsen, for example, wrote in his principal work: "...one of the major aims of our research was to put an end to the harmful dependence of the heredity theories on speculations in the field of evolution."[1] 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.

I have already said that the conflict 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 kolkhoz and sovkhoz system, has given rise to a Soviet biological science, founded by Michurin—a science new in principle, developing in close union with agronomic practice, as agronomic biology.

The foundations of Soviet agrobiological science were laid by Michurin and 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 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

[1] W. Johannsen, *Elemente der exakten Erblichkeitslehre*, Jena 1926, S. 248.

bodies can stand no comparison with our effective Michurinist agrobiological science.

The new vigorous trend in biology, or more truly the new Soviet biology, agrobiology, has met with bitter 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-Darwinians, Weismannists, or, which is the same, Mendelist-Morganists—uphold the so-called chromosome theory of heredity.

Following Weismann, the Mendelist-Morganists contend that the chromosomes contain a special "hereditary substance" which resides in the body of the organism as though in a case and is transmitted to succeeding 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 transmissible and can have no evolutionary significance.

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

The Mendelist-Morganist 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 Mendelist-Morganists, hold that the efforts of investigators to regulate the heredity of organisms by suitably changing the conditions of life of these organisms are utterly unscientific. They therefore call the Michurin trend in agro-

biology Neo-Lamarckian, which, in their opinion, is absolutely fallacious and unscientific.

Actually, it is the other way round.

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

Secondly, the Michurin trend cannot be called either Neo-Lamarckian or Neo-Darwinian. It is creative Soviet Darwinism, rejecting the errors of both 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 Morganists) by the physicist Erwin Schrödinger. In his book, *What is Life? The Physical Aspect 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 the omnipresent, all-comprehending, eternal self." Schrödinger regards this conclusion as "the closest a biologist can get to proving God and immortality at one stroke."[1]

We, the representatives of the Soviet Michurin trend, contend that inheritance of characters acquired by

[1] E. Schrödinger, *What Is Life? The Physical Aspect of the Living Cell*, Cambridge University Press, 1945, p. 88.

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 vegetable 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: *can characters and properties acquired by vegetable and animal organisms in the course of their life be inherited*? In other words, whether qualitative variations of the nature of vegetable and animal organisms depend on the nature of the conditions of life which act upon the living body, upon the organism.

The Michurin teaching, which is in essence materialist and dialectical, proves by facts that such dependence does exist.

The Mendelist-Morganist teaching, which in essence is metaphysical and idealist, 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 proposition regarding the continuity of the germplasm and its independence of the soma, a proposition which K. A. Timiryazev already condemned. In line with Weismann, the Morganist-Mendelists take it for granted that parents are genetically not the progenitors of their offspring. Parents and children, according to their teaching, are brothers or sisters.

Furthermore, neither parents nor children are really

themselves. They are only 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 1945 edition of *The Encyclopedia Americana*, T. H. Morgan, founder 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.* [My emphasis—*T. L.*] This idea of the origin of new characters is held almost universally to-day by biologists."

The same idea differently worded is propounded in the same *Encyclopedia Americana* by Professor 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 the reproductive cell which functions in its origin. The parent is himself merely a byproduct of the fertilized egg (or zygote) out of which he arose. The direct product of the zygote is other reproductive cells, similar to those from which it arose.... Hence heredity (that is, the resemblance between parent and child) depends upon the close connection between the reproductive cells which formed the parent and those which formed the child, one being the immediate and direct product of the other. This principle of the 'continuity of the germinal substance' (reproductive cell material) is one of the foundation principles of genetics. It shows why body changes produced in a parent by environmental influences are not inherited by the offspring. It is because offspring are

not the product of the parent's body but only of the germinal substance which that body harbors. . . . To August Weismann belongs the credit for first making this clear. He may thus be regarded as one of the founders of genetics."

To us it is perfectly clear that the foundation principles of Mendelism-Morganism are false. They do not reflect the reality of living nature and are an example of metaphysics and idealism.

Because this is so obvious, the Mendelist-Morganists of the Soviet Union, though actually fully sharing the principles of Mendelism-Morganism, often conceal them shamefacedly, veil them, conceal their metaphysics and idealism in a verbal shell. They do this because of their fear of being ridiculed by Soviet readers and audiences who are firm in the knowledge that the germs of organisms, or the sex cells, are a result of the vital activity of the parent organisms.

It is only when no mention is made of the fundamentals of Mendelism-Morganism that persons having no detailed knowledge of the life and development of plants and animals can be led to think of the chromosome theory of heredity as a neat system, as in some degree corresponding to the truth. But once we accept the absolutely true and generally known proposition that the reproductive cells, or the germs, of new organisms are produced by the organism, by its body, and not by the very same reproductive cell from which the given, already mature, organism arose, nothing is left of the "neat" chromosome theory of heredity.

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.

Plenty of examples can be cited to show that our home-grown Mendelist-Morganists accept in its entirety

the chromosome theory of heredity, its Weismannist foundations and idealistic conclusions.

Academician N. K. Koltsov, for example, asserts: "Chemically, the genoneme with its genes remains unchanged in the course of the entire ovogenesis and is not subject to metabolism—oxidizing and reduction processes."[1] This assertion, which no literate biologist can accept, denies the existence of metabolism in a section of the living and developing cells. It must be obvious to everyone that N. K. Koltsov's conclusion is fully in line with the Weismannist and Morganist idealist metaphysics.

N. K. Koltsov's false assertion dates back to 1938. It has long since been exposed by the Michurinists, and it would, perhaps, not have been worth while going back to the past if not for the fact that the Morganists persist in holding on to their anti-scientific positions to this day.

We can find further proof of this by turning once more to Schrödinger's book mentioned above. Schrödinger says in substance the same things as Koltsov. Since he shares the idealistic conception of the Morganists, he also asserts that there exists an *"hereditary substance, largely withdrawn from the disorder of heat motion. . . ."*[2] [My emphasis—*T.L.*]

The Russian translator of Schrödinger's book, A. A. Malinovsky (a scientific worker in N. P. Dubinin's laboratory), in his "Postscript" to the book, subscribes—and with good reason—to Haldane's opinion, linking Schrödinger's idea with N. K. Koltsov's views.

In that "Postscript," written in 1947, Malinovsky says: "The view accepted by Schrödinger according to which the chromosome is a gigantic molecule (Schrödinger's 'aperiodic crystal'), was first put forward by the Soviet

[1] Н. К. Кольцов, „Структура хромосом и обмен веществ в них", *Биологический журнал*, том VII, вып. I, 1938 г., стр. 42.

[2] E. Schrödinger, *What Is Life? The Physical Aspect of the Living Cell*, p. 85.

biologist, Professor N. K. Koltsov, and not by Delbrück, with whose name Schrödinger associates this conception."

There is no point, in this case, in going into the question of who is entitled to claim credit for the authorship of this scholastic view. A more important point is the high appreciation of Schrödinger's book by one of our domestic Morganists, A. A. Malinovsky.

Here are a few samples of the praise he showers on this book:

"In a fascinating form, accessible both to the physicist and the biologist, Schrödinger reveals to the reader a new trend rapidly developing in science, a trend largely combining the methods of physics and of biology."

"Strictly speaking, Schrödinger's book represents the first coherent results of this trend. . . . Shrödinger makes a big contribution of his own to this new trend in the science of life, and this quite justifies the enthusiastic opinions voiced about his book in the foreign scientific press."

Since I am no physicist, I shall say nothing concerning the methods of physics which Schrödinger combines with biology. As for the biology in Schrödinger's book, it is Morganist pure and simple, and this, in fact, is what makes Malinovsky go into raptures over it.

The enthusiastic praise of Schrödinger's book in Malinovsky's "Postscript" speaks eloquently enough of our Morganists' idealistic views and positions.

M. M. Zavadovsky, Professor of Biology in the University of Moscow, writes in an article entitled "The Creative Road of Thomas Hunt Morgan": "Weismann's ideas found a wide response among biologists, and many of them have taken the road suggested by that highly gifted investigator. . . . Thomas Hunt Morgan was one of those who highly appreciated the main content of Weismann's ideas."[1]

Now what "main content" is meant here?

[1] *Бюллетень Московского общества испытателей природы*, том LII, вып. 3, 1947 г., стр. 86.

What is meant is an idea of prime importance to Weismann and all Mendelist-Morganists, including Professor M. M. Zavadovsky. The latter formulates that idea as follows: "What came first, the chicken or the egg? And," writes Professor Zavadovsky, "to this clearly put question Weismann gave an explicit, categorical reply: the egg."[1]

It is obvious to anyone that both the question and the answer which Professor Zavadovsky, following Weismann, gives are nothing but a revival, and a belated one at that, of old scholasticism.

In 1947 Professor M. M. Zavadovsky repeats and defends the ideas he set forth in 1931 in his work *Dynamics of Development of Organisms*. There M. M. Zavadovsky considered it necessary to "firmly join with *Nussbaum* who maintains that sexual products do not develop from the maternal organism, but from the same source as the latter,"[2] that "the seminal corpuscles and eggs do not originate in the parent organism, but have a common origin with the latter."[3] And in his "General Conclusion" Professor Zavadovsky wrote: "Analysis leads us to the conclusion that the cells of the germ track cannot be regarded as products of somatic tissue. The germ cells and the cells of the soma should be regarded not as daughter and parent generations, but as twin sisters, of which one (the soma) is the feeder, protector, and guardian of the other."[4]

The geneticist, N. P. Dubinin, Professor of Biology, wrote in his article, "Genetics and Neo-Lamarckism": "Genetics quite rightly divides the organism into two distinct sections—the hereditary plasm and the soma. More, this division is one of its foundation principles, one of its major generalizations."[5]

[1] *Ibid.*
[2] М. Завадовский, *Динамика развития организма*, 1931 г., стр. 321.
[3] *Ibid.*, p. 313.
[4] *Ibid.*, p. 326.
[5] Журнал *Естествознание и Марксизм*, 1929 г., № 4, стр. 83.

We need not continue the list of authors who, like M. M. Zavadovsky and N. P. Dubinin, frankly expound the ABC of the Morganist system of views. In college textbooks on genetics this ABC is called the "Mendelian laws" (dominance, segregation, purity of gametes, etc.). An example of how uncritically our Mendelist-Morganists accept idealistic genetics is the fact that the standard textbook on genetics in many of our colleges has until quite recently been a translated American, strictly Morganistic, textbook—by Sinnott and Dunn.

Fully in line with the main theses of this textbook, Professor N. P. Dubinin wrote in that same article of his ("Genetics and Neo-Lamarckism"): "Thus the facts of modern genetics rule out any recognition of the 'foundation of foundations' of Lamarckism—*the idea that acquired characters are inherited.*"[1] [My emphasis—*T.L.*]

The Mendelist-Morganists have thus thrown overboard one of the greatest acquisitions in the history of biological science—the principle of the inheritance of acquired characters, first put forth by Lamarck and subsequently organically incorporated in Darwin's teaching.

To the materialist teaching that it is possible for plants and animals to inherit individual variations of characters acquired under the influence of conditions of life, Mendelism-Morganism opposes an idealistic assertion, dividing the living body into two separate substances: the mortal body (or soma) and an immortal hereditary substance, germ-plasm. It is further categorically maintained that changes in the soma, i. e., in the living body, have no effect whatever upon the hereditary substance.

[1] Журнал *Естествознание и Марксизм*, 1929 г., № 4, стр. 81.

5. THE IDEA OF UNKNOWABILITY IN THE TEACHING ON "HEREDITARY SUBSTANCE"

Mendelism-Morganism endows the postulated mythical "hereditary substance" with an indefinite variation property. Mutations, i. e., changes of the "hereditary substance," are supposed to have no definite tendency. This assertion of the Morganists is logically connected with the underlying basis of Mendelism-Morganism—the principle that the hereditary substance is independent of the living body and its conditions of life.

The Morganist-Mendelists, who proclaim that hereditary alterations, or "mutations" as they are called, are "indefinite," presume that such alterations *cannot as a matter of principle be predicted.* We have here a peculiar conception of unknowability; its name is idealism in biology.

The assertion that variation is "indefinite" raises a barrier to scientific prediction, thereby handicapping practical agriculture.

Proceeding from the unscientific and reactionary Morganist teaching concerning "indefinite variation," the head of the Department of Darwinism at the University of Moscow, Academician I. I. Schmalhausen, asserts in his *Factors of Evolution* that hereditary variation, in its specific features, does not depend on the conditions of life and therefore has no definite tendency.

"Factors unassimilated by the organism," writes Schmalhausen, "if they reach the organism at all and influence it, can have but an indefinite effect.... Such influence can only be indefinite. Consequently, all new alterations in the organism, which as yet have no past history, will be indefinite. This category of alterations will include, however, not only mutations as new 'hereditary' changes, but any new (i. e., appearing for the first time) modification."[1]

[1] И. И. Шмальгаузен, *Факторы эволюции*, Изд. АН СССР, 1946 г., стр. 12-13.

On a preceding page in the same book Schmalhausen writes: "In the development of any individual, environmental factors perform, in the main, only the role of agents liberating the course of certain form-building processes and the conditions which make it possible to consummate their realization."

This formalistic, autonomistic theory of a "liberating cause" in which the role of external conditions is reduced to the realization of an autonomous process, has long been demolished by the advance of progressive science; it has been exposed by materialism as unscientific in essence, as idealistic.

Schmalhausen and others among our domestic followers of imported Morganism cite Darwin as their authority. In proclaiming the "indefiniteness of variation," they invoke Darwin's statements on the subject. Darwin indeed spoke of "indefinite variability." But that was due to the *limitations* of selection practice in his days. Darwin was aware of that himself and wrote that "we cannot at present explain either the causes or nature of the variability of organic beings."[1] "The subject," he said, "is an obscure one; but it may be useful to probe our ignorance."[2]

The Mendelist-Morganists cling to everything that is obsolete and wrong in Darwin's teaching, at the same time discarding its living materialist core.

In our socialist country, the teaching of the great transformer of nature, I. V. Michurin, has created a fundamentally new basis for directing the variability of living organisms.

Michurin himself and his followers have obtained and are obtaining directed hereditary changes in vegetable organisms literally in immense quantities. Yet Schmalhausen still asserts that:

[1] Ch. Darwin, *The Variation of Animals and Plants Under Domestication*, Vol. II, London 1885, p. 282.
[2] *Ibid.*, p. 237.

"The appearance of individual mutations is by all indications a case of chance phenomena. We can neither predict nor deliberately induce this or that mutation. So far it has been found impossible to establish any causal connection between the quality of mutation and definite changes in the factors of the environment."[1]

On the basis of the Morganist conception of mutations, Schmalhausen has formulated the theory of so-called "stabilizing selection"—a theory profoundly wrong ideologically and hamstringing practical activity. According to Schmalhausen, the formation of breeds and varieties proceeds—presumably inevitably—in a declining curve: the formation of breeds and varieties, rapid at the dawn of culture, increasingly expends its "reserve of mutations" and gradually declines. "Both the formation of breeds of domestic animals and the formation of varieties of cultivated plants," writes Schmalhausen, "proceeded with such exceptional speed mainly, apparently, because of the previously accumulated reserve of variability. Further strictly directed selection is slower. . . ."[2]

Schmalhausen's assertion and his entire conception of "stabilizing selection" follow the Morgan line.

As we know, Michurin, in the course of his lifetime, produced more than three hundred new plant varieties. Many of them were produced without sexual hybridization, and all of them were the result of strictly directed selection, including systematic training. It is an insult to progressive science to assert—in face of these facts and subsequent achievements of followers of Michurin's teaching—that strictly directed selection must progressively decline.

Schmalhausen obviously finds that Michurin's facts do not fit in with his theory of "stabilizing selection." In his book, *Factors of Evolution*, he gets out of the difficul-

[1] И. И. Шмальгаузен, *Факторы эволюции*, стр. 68.
[2] *Ibid.*, pp. 214-15.

ty by making no mention of Michurin's work or of the very existence of Michurin as a scientist. Schmalhausen has written a bulky volume on factors of evolution without ever once mentioning—not even in his bibliography—either K. A. Timiryazev or I. V. Michurin. Yet Timiryazev bequeathed to Soviet science a remarkable theoretical work bearing practically the same title: *Factors of Organic Evolution*. As for Michurin and the Michurinists, they have put the factors of evolution to work for agriculture, revealed new factors and given us a deeper understanding of the old ones.

Schmalhausen has "forgotten" the Soviet advanced scientists, the founders of Soviet biological science. But at the same time he quotes profusely and repeatedly statements of big and small foreign and native representatives of Morgan's metaphysics and leaders of reactionary biology.

Such is the style of Academician Schmalhausen, who calls himself a "Darwinist." Yet at a meeting of the Faculty of Biology at the University of Moscow his book was recommended as a masterpiece in the creative development of Darwinism. The book has been given a high rating by the deans of the Faculties of Biology at the Universities of Moscow and Leningrad; it has been praised by I. Polyakov, Professor of Darwinism at the University of Kharkov, by the Pro-Rector of the University of Leningrad, Y. Polyansky, by the member of our Academy, B. Zavadovsky, and by other Morganists who sometimes pose as orthodox Darwinists.

6. THE STERILITY OF MORGANISM-MENDELISM

The Morganist-Weismannists, i.e., the adherents of the chromosome theory of heredity, have repeatedly asserted—without any grounds and often in a slanderous manner—that I, as President of the Academy of Agricul-

tural Sciences, have used my office in the interests of the Michurin trend in science, which I share, to repress the other trend, the one opposed to Michurin's.

Unfortunately, so far it has been exactly the other way round, and it is of that that I, as President of the Lenin Academy of Agricultural Sciences, may and should be accused. I have been wanting in strength and ability to make proper use of my official position to create conditions for the more extensive development of the Michurin trend in the various divisions of biological science, and to restrict, if ever so little, the scholastics and metaphysicians of the opposite trend. As a matter of fact, therefore, the trend so far repressed—repressed by the Morganists—happens to be the one which the President represents, namely, the Michurin trend.

We, the Michurinists, must squarely admit that we have hitherto proved unable to make the most of the splendid possibilities created in our country by our Party and the Government for the complete exposure of the Morganist metaphysics, which is in its entirety an importation from foreign reactionary biology hostile to us. It is now up to the Academy, to which a large number of Michurinists have just been added, to tackle this major task. This will be of considerable importance in the matter of training forces and providing more scientific aid to collective farms and state farms.

Morganism-Mendelism (the chromosome theory of heredity) is to this day taught, in a number of versions, in all colleges of biology and agriculture, whereas the study of Michurin genetics has in fact not been introduced at all. In the higher official scientific circles of biologists, too, the followers of Michurin and Williams have often found themselves in the minority. They were a minority in the Lenin Academy of Agricultural Sciences, too. But the situation in the Academy has now sharply changed thanks to the interest taken in it by the Party, the Government, and Comrade *Stalin* personally. A con-

siderable number of Michurinists have been added as members and corresponding members of our Academy, and we expect that more will be added shortly, at the coming elections. This will create a new situation in the Academy and new opportunities for the further development of the Michurin teaching.

There is no truth whatever in the assertion that the chromosome theory of heredity, with its underlying metaphysics and idealism, has hitherto been repressed. The very opposite is the truth.

In our country the practical achievements of the Michurin trend in agrobiological science have been standing in the way of Morganistic cytogenetics.

Aware of the practical worthlessness of the theoretical postulates of their metaphysical "science," and reluctant to give them up and to accept the vigorous Michurin trend, the Morganists have bent all their efforts to check the development of the Michurin trend which is inherently opposed to their pseudo science.

It is a calumny to assert that somebody has been preventing the cytogenetic trend in biological science from associating itself with practical agriculture in our country. There is no truth whatever in the assertion that "the right to the practical application of the fruits of their labours has been a monopoly of Academician Lysenko and his followers."

The Ministry of Agriculture might tell us exactly what the cytogeneticists have offered for practical application, and, if there have been such offers, whether they were accepted or rejected.

The Ministry of Agriculture might also tell us which of its scientific research institutes (to say nothing of colleges) have not engaged in cytogenetics in general and, particularly, in the polyploidy of plants obtained by the application of colchicine.

I know that many institutes have been engaged and are engaged in this sort of—in my view—scarcely productive activity. More, the Ministry of Agriculture set up a special institution, headed by A. R. Zhebrak, to study questions of polyploidy. I think that this institution, though it has for some years done nothing besides its work on polyploidy, has produced literally nothing of practical value.

Here is one example which might be cited to show how useless is the practical and theoretical program of our domestic Morganist cytogeneticists.

Professor of Genetics, N. P. Dubinin, Corresponding Member of the Academy of Sciences of the U.S.S.R., who is regarded by our Morganists as the most eminent among them, has worked for many years to ascertain the differences in the cell nuclei of fruit flies in urban and rural localities.

For the sake of complete clarity, let us mention the following. What Dubinin is investigating is not qualitative alterations—in this case, in the nucleus of the cell—resulting from the action of qualitatively different conditions of life. What he is studying is not the inheritance of characteristics acquired by fruit flies under the influence of definite conditions of life, but changes, recognizable in the chromosomes, in the composition of the population of these flies as the result of the simple destruction of a part of them, for one thing, during the war. Dubinin and other Morganists call such destruction "selection." (*Amusement.*) It is this sort of "selection," identical with an ordinary sieve, which has nothing in common with the truly creative role of selection, that constitutes the subject of Dubinin's investigations.

His work is entitled: "Structural Variability of Chromosomes in Populations of Urban and Rural Localities."

Here are a few quotations from it:

"During the study of various populations of *D. funebris* in the work of 1937 the fact was noted that there were noticeable differences as regards concentration of

inversions. Tinyakov stressed this phenomenon on the basis of extensive material. However, only the 1944-45 analysis has shown us that these substantial differences are due to the differences of conditions of habitat in town and in countryside.

"The population of Moscow has eight different orders of genes. In the second chromosome there are four orders (one standard and three different inversions). One inversion in the III chromosome and one in IV... Inv. II—1 has its limits from 23 C to 31 B. Inv. II—2, from 29 A to 32 B. Inv. II—3, from 32 B to 34 C. Inv. III—1, from 50 A to 56 A. Inv. IV—1, from 67 C to 73 A/B. In the course of 1943-45 the karyotype of 3,315 individuals in the population of Moscow was studied. The population contained immense concentrations of inversions, which proved to be different in various sections of Moscow."[1]

Dubinin went on with his investigations during and after the war and studied the problem of the fruit flies in the city of Voronezh and its environs. He writes:

"The destruction of industrial centres during the war upset the normal conditions of life. The *Drosophila* populations found themselves in severe conditions of existence which, possibly, surpassed the severity of wintering in rural localities. It was of profound interest to study the influence of the changes in the conditions of existence caused by the war upon the karyotypical structure of urban populations. In the spring of 1945 we studied populations from the city of Voronezh, one of the cities that suffered the worst destruction as the result of the German invasion. Among 225 individuals only two flies were found to be heterozygous for inversion II—2 (0.88%). Thus the concentration of inversions in this

[1] *Доклады Академии Наук СССР*, 1946 г., том LI, № 2, стр. 152.

large city proved to be lower than in some rural localities. We see here the disastrous influence of natural selection upon the karyotypical structure of the population." [1]

Dubinin, as we see, writes so that outwardly his work may appear to some to be even scientific. As a matter of fact, this was one of the main works on the basis of which Dubinin was elected Corresponding Member of the Academy of Sciences of the U.S.S.R.

But if we were to put it all in plainer terms, stripping it of the pseudoscientific verbiage and replacing the Morganist jargon with ordinary Russian words, we would arrive at the following:

As the result of many years of effort Dubinin "enriched" science with the "discovery" that during the war there occurred among the fruit-fly population of the city of Voronezh and its environs an increase in the percentage of flies with certain chromosome structures and a decrease in the percentage of flies with other chromosome structures (in the Morganist jargon that is called "concentration of inversions" II—2).

Dubinin is not content with these discoveries, "highly valuable" from the theoretical and practical standpoint, which he made during the war. He sets himself further tasks for the restoration period. He writes:

"It will be very interesting to study in the course of several coming years the restoration of the karyotypical structure of the urban population in connection with the restoration of normal conditions of life."[2] (*Animation. Laughter.*)

That is typical of the Morganists' "contribution" to science and practical activity before the war and during the war, and those are the vistas of the Morganist "science" for the restoration period! (*Applause.*)

[1] *Ibid.*, p. 153.
[2] *Ibid.*

7. MICHURIN'S TEACHING, THE FOUNDATION OF SCIENTIFIC BIOLOGY

Contrary to Mendelism-Morganism, with its assertion that the causes of variation in the nature of organisms are unknowable and its denial that directed changes in the nature of plants and animals are possible, I. V. Michurin's motto was: "We cannot wait for favours from Nature; we must wrest them from her."

His studies and investigations led I. V. Michurin to the following important conclusion: "It is possible, with man's intervention, *to force* any form of animal or plant *to change more quickly and in a direction desirable to man.* There opens before man a broad field of activity of the greatest value to him." [1]

The Michurin teaching flatly rejects the fundamental principle of Mendelism-Morganism that heredity is completely independent of the plants' or animals' conditions of life. The Michurin teaching does not recognize the existence in the organism of a separate hereditary substance which is independent of the body. Changes in the heredity of an organism or in the heredity of any part of its body are the result of changes in the living body itself. And changes of the living body occur as the result of departure from the normal in the type of assimilation and dissimilation, of departure from the normal in the type of metabolism. Changes in organisms or in their separate organs or characters may not always, or not fully, be transmitted to the offspring, but changed germs of newly generated organisms always occur only as the result of changes in the body of the parent organism, as the result of direct or indirect action of the conditions of life upon the development of the organism or its separate parts, among them the sexual or vegetative germs. Changes in heredity, acquisition of new characters and

[1] И. В. Мичурин, *Сочинения*, том IV, стр. 72.

their augmentation and accumulation in successive generations are always determined by the organism's conditions of life. Heredity changes and its complexity increases as the result of the accumulation of new characters and properties acquired by organisms in successive generations.

The organism and the conditions required for its life constitute a unity. Different living bodies require different environmental conditions for their development. By studying the character of these requirements we come to know the qualitative features of the nature of organisms, the qualitative features of heredity. Heredity is *the property of a living body to require definite conditions for its life and development and to respond in a definite way to various conditions.*

Knowledge of the natural requirements of an organism and its response to external conditions makes it possible to govern the life and development of the organism. By regulating the conditions of life and development of plants and animals we can probe their nature ever more deeply and thus establish what are the means of changing it in the required direction. Once we know the means of regulating development we can change the heredity of organisms in a definite direction.

Each living body builds itself out of the conditions of its environment after its own fashion, according to its heredity. That is why different organisms live and develop in the same environment. As a rule, each given generation of a plant or animal develops largely in the same way as its predecessors, particularly its close predecessors. *Reproduction of beings similar to itself is a general characteristic of every living body.*

When an organism finds in its environment the conditions suitable to its heredity, its development proceeds in the same way as it proceeded in previous generations. When, however, organisms do not find the conditions they require and are forced to assimilate environmental

conditions which, to some degree or other, do not accord with their nature, then the organisms or sections of their bodies become more or less different from the preceding generation. If the altered section of the body is the starting point for the new generation, the latter will, to some extent or other, differ from the preceding generations in its requirements and nature.

The cause of changes in the nature of a living body is a change in the type of assimilation, in the type of metabolism. For example, the process of vernalization (yarovization) of spring cereals does not require lowered temperatures. Normally it proceeds in temperatures such as obtain in the spring and summer in the fields. But by using lower temperature conditions in the vernalization of spring cereals it is possible, after two or three generations, to turn them into winter cereals. And winter cereals cannot pass through the process of vernalization without lowered temperatures. Here is a concrete example showing how a new requirement is induced in the offspring of these particular plants—the requirement for lowered temperatures as a condition for vernalization.

Sex cells and any other cells through which organisms propagate are produced as the result of the development of the whole organism, by means of conversion, by means of metabolism. The phases in the development of an organism are accumulated, as it were, in the cells from which the new generation originates.

We may therefore say that to the extent to which in the new generation the body of an organism (a plant, say) is built anew to that same extent also all its properties, including heredity, develop.

In one and the same organism the development of different cells and of different parts of cells, the development of individual processes, requires different external conditions.

Besides, these conditions are assimilated in different ways. It should be stressed that in this case we mean by

external that which *is assimilated,* and by *internal* that which *assimilates.*

The life of an organism proceeds through innumerable correlated processes and conversions. The food that enters the organism from the external environment undergoes a series of conversions whereby it is assimilated by the living body, changing from external to internal. This internal, since it is living matter, enters into metabolic relations with the substances of other cells and particles of the body, feeding them and thus becoming external with regard to them.

Two kinds of qualitative changes are observed in the development of vegetable organisms.

1. Changes connected with the process of the realization of the individual cycle of development, when natural requirements, i.e., heredity, are normally met by the *corresponding external conditions.* The result is a body of the same breed and heredity as the preceding generations.

2. Changes in the nature of the organisms, i.e., the changes in heredity. Such changes are also the result of individual development, but deviating from the normal, usual course. Changes in heredity are as a rule the result of the organism's development *under external conditions which, to one extent or other, do not correspond to the natural requirements of the given organic form.*

Changes in the conditions of life make the very type of development of vegetable organisms change. A changed type of development is thus the primary cause of changes in heredity. Organisms which cannot change in accordance with the changed conditions of life do not survive, leave no progeny.

Organisms, and hence also their nature, are created only in the process of development. Of course, a living body may undergo an alteration also outside the process of development (a burn, a break in joints, in roots, etc.),

but such alterations will not be characteristic or necessary for the vital process.

Numerous facts go to show that changes in various sections of the body of a vegetable or animal organism are not fixed by the reproductive cells with the same frequency or to the same extent.

This is explained by the fact that the process of development of each organ, of each particle of the living body, requires relatively definite external conditions. These conditions are selected from the environment by the development of each organ and minutest organule. Therefore, if a section of the body of a vegetable organism is forced to assimilate conditions relatively unusual for it and as a result undergoes alteration and becomes different from the analogous section of the body in the preceding generation, the substances which it sends forth to neighbouring cells may not be selected by the latter, may not be joined into the further chain of corresponding processes. Of course, there will still be a connection between the altered section of the vegetable organism and the other sections of the body, for otherwise it could not exist at all; but this connection may not be fully reciprocal. The altered section of the body will be receiving this or that food from the neighbouring sections; but it will not be able to give away its own specific substances, because the neighbouring sections will refuse to select them.

This explains the frequently observed phenomenon when altered organs, characters, or properties of an organism do not appear in the progeny. But the altered sections of the body of the parent organism always possess an altered heredity. Fruit growers and horticulturists have long known these facts. An altered twig or bud of a fruit tree or the eye (bud) of a potato tuber cannot as a rule influence the alteration of heredity of the offspring of the given tree or tuber which are not directly generated from the altered sections of the parent organism. If, however, the altered part is cut away and grown separately as an independent plant, the latter, as a rule, will possess a changed heredity, the one that characterized the altered part of the parent body.

The extent of the hereditary transmission of alterations depends on the extent to which the substances of the altered section of the body join in the general process which leads to the formation of reproductive sex or vegetative cells.

Once we know how the heredity of an organism is built up, we can change it in a definite direction by creating definite conditions at a definite moment in the development of the organism.

Good varieties of plants or animals are always produced only by the application of proper methods of cultivation or breeding. Under poor cultivation no good varieties can ever be produced out of poor ones, and in many cases even good cultivated varieties will deteriorate after a few generations. It is a basic rule in seed growing that plants grown for seed must be tended with the utmost care. They must be provided with conditions meeting the optimum of the hereditary requirements of the given plants. Of well-cultivated plants the very best are selected for seed. That is the way varieties of plants are improved in practice. Under poor cultivation, no selection of the best plants for seed will produce the required results—all the seeds obtained will be poor, and the best among them will still be poor.

According to the chromosome theory of heredity, hybrids can only be produced by sexual reproduction. That theory denies the possibility of obtaining vegetative hybrids, for it denies that the conditions of life have any specific influence upon the nature of plants. I. V. Michurin, on the other hand, not only recognized the possibility of producing vegetative hybrids, but elaborated the "mentor" method. This method consists in the following: by grafting cuttings (twigs) of old varieties of

fruit trees on the branches of a young variety, the latter acquires properties which it lacks, these properties being transmitted to it through the grafted twigs of the old variety. That is why I. V. Michurin called this method "mentor." The stock is also used as a mentor. By this method Michurin produced new and improved existing varieties.

I. V. Michurin an the Michurinists have found methods of obtaining vegetative hybrids in large quantities.

The vegetative hybrids are cogent proof that Michurin's conception of heredity is correct. At the same time they represent an insuperable obstacle to the theory of the Mendelist-Morganists.

Organisms grafted before they have reached the phase of full formation, i.e., before they have completed their cycle of development, will always undergo changes of development as compared with plants which have their own roots i.e., ungrafted plants. In the union of plants by means of grafting the product is a single organism with varying breed, that of the scion and that of the stock. By planting the seeds from the scion or the stock it is possible to obtain offspring, individual representatives of which will possess the characteristics not only of the breed from which the seed has been taken, but also of the other with which it has been united by grafting.

Obviously, the stock and the scion could not have exchanged chromosomes of the cell nuclei; yet inherited characters have been transmitted from stock to scion and vice versa. Consequently, *the plastic substances produced by the scion and the stock possess the characters of the breed,* are endowed with definite heredity *just as the chromosomes, and just as any particle of the living body.*

Any character may be transmitted from the one breed to another by means of grafting just as well as by the sexual method.

The wealth of factual material concerning vegetative transmission of various properties of potatoes, tomatoes,

and a number of other plants leads us to the conclusion that vegetative hybrids do not differ in principle from sexual hybrids.

The representatives of Mendel-Morgan genetics are not only unable to obtain alterations of heredity in a definite direction, but categorically deny that it is possible to change heredity so as adequately to meet the action of environmental conditions. The principles of Michurin's teaching, on the other hand, tell us that it is possible to obtain changes in heredity *fully corresponding to the effect of the action of conditions of life.*

A case in point is the experiments to convert spring forms of bread grains into winter forms, and winter forms into still hardier ones in regions of Siberia, for example, where the winters are severe. These experiments are not only of theoretical interest. They are of considerable practical value for the production of frost-resistant varieties. We already have winter forms of wheat obtained from spring forms, which are not inferior, as regards frost-resistance, to the most frost-resistant varieties known in practical farming. Some are even superior.

Many experiments show that when an old established property of heredity is being eliminated, we do not at once get a fully established, solidified new heredity. In the vast majority of cases, what we get is an organism with a plastic nature, which I. V. Michurin called "destabilized."

Vegetable organisms with a "destabilized" nature are those in which their conservatism has been eliminated, and their selectivity with regard to external conditions is weakened. Instead of conservative heredity, such plants preserve, or there appears in them, only a *tendency* to show some preference for certain conditions.

The nature of a vegetable organism may be destabilized:

1. By grafting, i.e., by uniting the tissues of plants of different breeds;

2. By bringing external conditions to bear upon it at definite moments, when the organism undergoes this or that process of its development;

3. By crossbreeding, particularly of forms sharply differing in habitat or origin.

The best biologists, first and foremost I. V. Michurin, have devoted a great deal of attention to the practical value of vegetable organisms with destabilized heredity. Plastic vegetable forms with unestablished heredity, obtained by any of the enumerated methods, should be further bred from generation to generation in those conditions, the requirement of which, or adaptability to which, we want to induce and perpetuate in the given organisms.

In most vegetable and animal forms new generations develop only after fertilization—the fusion of female and male reproductive cells. The biological significance of the process of fertilization is that thereby organisms are produced with a dual heredity—maternal and paternal. Dual heredity lends vitality to organisms and widens the range of their adaptability to varying conditions of life.

It is the usefulness of enriching heredity that determines the biological necessity for crossbreeding forms differing from each other even if ever so slightly.

The vitality of vegetable forms may be renovated and strengthened also by the vegetative, asexual method. This is brought about by the living body assimilating new external conditions, conditions unusual for it. In experiments in vegetative hybridization, in experiments with the aim of producing spring forms from winter forms or vice versa, and in a number of other cases of the nature of organisms being destabilized, we may observe the renovation and strengthening of the vitality of organisms.

By regulating external conditions, the conditions of life of vegetable organisms, we can change varieties in a definite direction and create varieties with desirable heredity.

Heredity is the effect of the concentration of the action of environmental conditions assimilated by the organism in a series of preceding generations.

By means of skilful hybridization, by the method of sexual conjugation of breeds, it is possible at once to unite in one organism that which has been assimilated and solidified in the crossed breeds by many generations. But, according to Michurin's teaching, no hybridization will produce the desired results, unless the conditions are created which will promote the development of the characters which we want the newly-bred or improved variety to inherit.

I have here propounded Michurin's teaching in most general outline. The important point that must be stressed here is that it is absolutely necessary for all Soviet biologists to make a profound study of this teaching. The best way for scientific workers in various branches of biology to master the theoretical depths of the Michurin teaching is to study Michurin's works, to read them over again and again, and to analyze them with a view to solving problems of practical importance.

Socialist agriculture stands in need of a developed, profound biological theory which will help us quickly and properly to perfect the methods of cultivating plants and obtaining plentiful crops and stable yields. It stands in need of a profound biological theory which will help workers in agriculture to obtain in a short time the highly productive forms of plants they need, to correspond to the high fertility which the collective farmers are creating on their fields.

Unity of theory and practice—that is the highroad for Soviet science. The Michurin teaching best embodies this unity in biological science.

In my speeches and writings I have cited numerous examples of the successful application of the Michurin teaching in solving questions of practical importance in various departments of plant breeding. Here I shall take

the liberty to dwell briefly on some questions of animal breeding.

As in the case of vegetable forms, the development of animal forms is closely linked with their conditions of life, with the conditions of their environment.

The basic factors for increasing the productivity of domestic animals, for improving existing breeds and producing new ones, are their food and the conditions in which they are kept. This is particularly important if the effectiveness of crossbreeding is to be heightened. Various breeds of domestic animals have been and are produced by men for various purposes and under various conditions. Each breed therefore requires its own conditions of life, those that contributed to its formation.

The greater the divergences between the biological properties of a breed and the conditions of life provided for the individual animals, the less will be the economic value of the given breed.

For example, the advantages—from an economic standpoint—of rich pastures and good feeding with succulent and concentrated fodders are smaller in the case of cattle which by nature cannot give much milk than in the case of cattle with high milking capacities. In the former case we obviously have a breed which, in the economic respect, does not justify the conditions provided for it. Such a breed should be improved by crossbreeding so as to adjust it to the conditions of feeding and maintenance.

On the other hand, a breed noted for its milk-yielding properties, when placed in conditions of poor feeding and maintenance, will not only fail to live up to its reputation as a milk producer, but its chances of survival will be diminished. In such cases the conditions of feeding and maintenance should be improved so as to adjust them to the breed.

Our science and practice of animal breeding, in line with the state plan for obtaining produce in the required

quantities and of proper quality, must be guided by the principle: *to select and improve breeds in accordance with the conditions of feeding, maintenance and climate, and at the same time to create conditions of feeding and maintenance most suitable to the given breeds.*

The principal method of constantly improving breeds is to select pedigreed animals best suited for the required aim and at the same time to improve the conditions of feeding, maintenance and care that are most conducive to the development of the animals in the desired direction.

Crossbreeding is a radical and quick method of changing breeds, that is to say, the progeny of the given animals.

In crossbreeding we get, as it were, a union of two breeds evolved by man in the course of a long period of time by creating various conditions of life for the animals. But the nature (heredity) of crosses, particularly in the first generation, is usually unstable and easily responds to the action of the conditions of life, feeding, and maintenance.

Therefore, in crossbreeding it is of especial importance, when choosing a breed for the improvement of a local breed, to bear in mind the conditions of feeding, maintenance, and climate. At the same time, in order to develop the characters and properties which we want to induce in the local breed by crossbreeding, we must provide conditions of feeding and maintenance conducive to the development of the new improving breed properties; otherwise, we may fail to establish the desired qualities and the local breed may even lose some of its good qualities.

I have given an example of the application of the general principles of the Michurin teaching to animal husbandry to show that Soviet Michurin genetics, revealing as it does the general laws of the development of living bodies in order to cope with problems of practical importance, is also applicable to stockbreeding.

When we speak of mastering the teaching of Michu-

rin we also mean the development and deepening of this teaching, the development of scientific biology. That is the line along which we must secure the growth of the forces of our Michurinist biologists so as to provide ever increasing scientific assistance to the collective farms and state farms in coping with the tasks set by the Party and the Government. (*Applause.*)

8. YOUNG SOVIET BIOLOGISTS SHOULD STUDY THE MICHURIN TEACHING

Unfortunately, so far the Michurin science has not been taught in our universities and colleges. We Michurinists are greatly to blame for this. But it will be no mistake to say that it is also the fault of the Ministry of Agriculture and the Ministry of Higher Education.

To this day Morganism-Mendelism is taught in the majority of our universities and colleges in the departments of genetics and selection, and in many cases also in the departments of Darwinism, whereas the Michurin teaching, the Michurin trend in science, fostered by the Bolshevik Party and by Soviet reality, remains in the shade.

The same may be said of the position with regard to the training of young scientists. By way of illustration, we shall cite the following. In an article "On Doctors' Theses and the Responsibility of Opponents," printed in issue No. 4 of the *Vestnik Vysshey Shkoly* (*Higher Education Messenger*) for 1945, Academician P. M. Zhukovsky, who is the Chairman of the Biology Experts' Commission under the Highest Committee on Academic Degrees, wrote: "A deplorable situation has developed in the matter of theses on genetics. *Theses on genetics are very rare*; they represent, in fact, solitary instances. This is to be explained by the abnormal relations, which have assumed the character of enmity, between the adherents of the chromosome theory of heredity and its opponents. The truth of the matter is that the former somewhat fear the latter, who are very aggressive in their polemics. It would be better to put an end to this situation. Neither the Party nor the Government forbid the chromosome theory of heredity, and it is freely propounded in universities and colleges. So let the controversy go on."[1]

Let us first note that P. M. Zhukovsky confirms that the chromosome theory of heredity is freely taught in universities and colleges. That is true. But he wants more: he wants Mendelism-Morganism to be still more widely propounded in our colleges. He wants us to have many more Mendelist-Morganist Masters and Doctors of Science who would still more extensively propagate Mendelism-Morganism in our universities and colleges. That, in fact, is what Academician Zhukovsky is driving at in a large section of his article, and that reflects his general line as Chairman of the Biology Commission.

No wonder therefore that the Commission set up all sorts of obstacles in the case of theses on genetics whose authors attempted, even if ever so timidly, to develop this or that principle of Michurin genetics. On the other hand, theses by Morganists, enjoying P. M. Zhukovsky's patronage, appeared and were passed on favourably not at all so rarely—in any event, oftener than the interests of true science required. True enough, theses with a Morganist tendency appeared more rarely than Academician P. M. Zhukovsky would have liked. But there are reasons for this. Under the influence of the Michurin criticism of Morganism young scientists with philosophical training have in recent years come to realize that the Morganist views are utterly alien to the world outlook of Soviet people. In this light the position of Academician P. M. Zhukovsky is rather dubious, seeing that he advises young biologists to pay no heed to the Michurinists'

[1] *Вестник высшей школы*, № 4, 1945 г., стр. 30.

criticism of Morganism, but to go on developing the latter.

Soviet biologists are right when they are suspicious of the Morganist views and refuse to listen to the scholasticism of the chromosome theory. They stand to gain, always and in everything, if they will ponder more often on what Michurin said of this scholasticism.

I. V. Michurin held that Mendelism "... contradicts the truths of nature, before which no artful structure reared out of wrongly understood phenomena can stand up." "What I would like," he wrote, "is that the thinking unbiased observer should ponder over this and personally test the truth of these conclusions; they represent a basis which we bequeath to naturalists of coming centuries and milleniums."[1]

9. FOR A CREATIVE SCIENTIFIC BIOLOGY

I. V. Michurin laid the foundations for the science of regulating the nature of plants. These foundations have wrought a change in the very method of thinking when dealing with problems of biology.

A knowledge of *causal* connections is essential for the practical work of regulating the development of cultivated plants and domestic animals. For biological science to be in a position to render the collective and state farms ever greater assistance in obtaining higher crop yields, higher yields of milk, etc., it must comprehend the complex biological interrelations, the laws of the life and development of plants and animals.

A scientific handling of practical problems is the surest way to a deeper knowledge of the laws of development of living nature.

Biologists have paid very little attention to the study of the interrelations, the natural and historical connections

[1] И. В. Мичурин, *Сочинения*, том III, стр. 308-09.

that exist between individual bodies, individual phenomena, parts of individual bodies and links of individual phenomena. Yet only these connections, interrelations, and natural interactions enable us to understand the process of development, the essence of biological phenomena.

But when living nature is studied in isolation from practical activity the scientific principle of the study of biological connections is lost.

The Michurinists, in their investigations, take the Darwinian theory of evolution as their basis. But in itself Darwin's theory is absolutely insufficient for dealing with the practical problems of socialist agriculture. That is why the basis of contemporary Soviet agrobiology is Darwinism transformed in the light of the teachings of Michurin and Williams and thereby converted into Soviet creative Darwinism.

Many problems of Darwinism assume a different aspect as the result of the development of our Soviet agrobiological science, of the Michurin trend in agrobiology. Darwinism has not only been purified of its deficiencies and errors and raised to a higher level, but has undergone a considerable change in a number of its principles. From a science which primarily *explains* the past history of the organic world, it is becoming a creative, *effective means* of systematically mastering living nature, making it serve practical requirements.

Our Soviet Michurinist Darwinism is a creative Darwinism which poses and solves problems of the theory of evolution in a new way, in the light of Michurin's teaching.

I cannot in this report touch on many of the theoretical problems of great practical significance.

I shall dwell briefly on only one of them—namely, the question of intra- and interspecific relations in living nature.

The time has come to consider the question of speciation, approaching it from the angle of the transition of

quantitative accumulation into qualitative specific distinctions.

We must realize that speciation is a transition—in the course of the historical process—from quantitative to qualitative variations. Such a leap is prepared by the vital activity of organic forms themselves, as the result of quantitative accumulations of responses to the action of definite conditions of life, and that is something that can definitely be studied and directed.

Such an understanding of speciation, an understanding of natural laws, places in the hands of biologists a powerful means of regulating the vital process itself and consequently speciation as well.

I think that in posing the question this way we may assume that what leads to the appearance of a new specific form, to the formation of a new species out of an old one, is not the accumulation of quantitative distinctions by which varieties within a species are usually recognized. The quantitative accumulations of variations which lead to the leap which changes an old form of species into a new form are variations of a *different order*.

Species are not an abstraction, but actually existing links in the general biological chain.

Living nature is a biological chain broken up, as it were, into individual links or species. It is therefore wrong to say that a species does not retain the constancy of its qualitative definiteness as a species for any length of time. To insist on that would be to regard the evolution of living nature as proceeding as if along a plane, without any leaps.

I am confirmed in this opinion by the data of experiments for the conversion of hard wheat (durum) into soft (vulgare).

Let me note that all systematists admit that these are good, indisputable, independent species.

We know that there are no true winter forms among hard wheats, and that is why in all regions with a rela-

tively severe winter hard wheat is cultivated only as a spring, not a winter, crop. Michurinists have mastered a good method of converting spring into winter wheat. It has already been mentioned that many spring wheats have been experimentally converted into winter wheat. But all of those belonged to the species of soft wheat. When experiments were started to convert hard wheat into winter wheat it was found that after two, three or four years of autumn planting (required to turn a spring into a winter crop) durum becomes vulgare, that is to say, one species is converted into another. Durum wheat with 28 chromosomes is converted into several varieties of soft 42-chromosome wheat, nor do we, in this case, find any transitional forms between the durum and vulgare species. *The conversion of one species into another takes place by a leap.*

We thus see that the formation of a new species is prepared by an alteration of vital activity under definite new conditions in a number of generations. In our case it is necessary to bring autumn and winter conditions to bear on hard wheat in the course of two, three or four generations. Then it can change by a leap into soft wheat without any transitional forms between the two species.

I think that it may be pertinent to note that what led me to study the essentially theoretical problems of species and of intraspecific and interspecific relations among individuals, was never mere curiosity or a fondness for abstract theorizing. I was and am led to study these questions of theory by my work in the course of which I have to find answers to purely practical problems. For a correct understanding of the relations among individuals within a species and between species it was necessary to have a clear idea of the qualitative distinctions of intraspecific and interspecific diversities of forms.

It thus became possible to find new solutions to such problems of practical importance as weed control in farming, or the choosing of ingredients for the sowing of

grass mixtures, or the speedy and extensive afforestation of steppe areas, and many others.

That is what led me to make a new study of the problem of intra- and interspecific struggle and competition, and after a thorough and comprehensive investigation I have come to the conclusion that there exists no intraspecific struggle and mutual assistance among individuals within a species, and that there does exist interspecific struggle and competition and also mutual assistance between different species. I regret that I have so far done very little to elucidate the theoretical implications and practical significance of these questions in the press.

* * *

I shall now conclude. Thus, Comrades, as regards the theoretical line in biology, Soviet biologists hold that the Michurin principles are the only scientific principles. The Weismannists and their followers, who deny the heritability of acquired characters, are not worth dwelling on at too great length. The future belongs to Michurin. (*Applause.*)

V. I. Lenin and *J. V. Stalin* discovered I. V. Michurin and made his teaching the possession of the Soviet people. By their great paternal attention to his work they saved for biology the remarkable Michurin teaching. The Party, the Government, and *J. V. Stalin* personally, have taken an unflagging interest in the further development of the Michurin teaching. There is no more honourable task for us Soviet biologists than creatively to develop Michurin's teaching and to follow in all our activities Michurin's style in the investigation of the nature of the development of living beings.

Our Academy must work to develop the Michurin teaching. In this it ought to follow the personal example of concern for the work of I. V. Michurin shown by our great teachers—*V. I. Lenin* and *J. V. Stalin*. (*Loud applause.*)

CONCLUDING REMARKS

(August 7, 1948)

Comrades, before I pass to my concluding remarks I consider it my duty to make the following statement.

The question is asked in one of the notes handed to me, What is the attitude of the Central Committee of the Party to my report? I answer: The Central Committee of the Party examined my report and approved it. (*Stormy applause. Ovation. All rise.*)

I shall now take up some of the points brought out at our session.

The adherents of the so-called chromosome theory of heredity who spoke here denied that they were Weismannists and all but proclaimed themselves antagonists of Weismann. On the other hand, it has been clearly shown in my report and in many of the speeches of representatives of the Michurin trend that Weismannism and the chromosome theory of heredity are one and the same thing. Mendelist-Morganists abroad make no secret of this. In my report I quoted articles by Morgan and Castle published in 1945, in which it is plainly stated that the so-called teaching of Weismann is the basis of the chromosome theory of heredity. By Weismannism (which is the same as idealism in biology) is meant any conception of heredity which maintains that the living body is divided into two substances which are different in principle: the ordinary living body, presumably possessing no heredity but subject to alterations and transformations, that is to say, to development; and a specific hereditary substance, presumably independent of the living body and

not subject to development under the influence of the conditions of life of the ordinary living body, or the *soma*. That much is beyond any doubt. No efforts of the advocates of the chromosome theory of heredity, neither those who spoke nor those who did not speak at the session, to lend their theory a materialist appearance can change the character of this theory, which is essentially idealistic. (*Applause.*)

The Michurin trend in biology is a materialist trend, because it does not separate heredity from the living body and the conditions of its life. There is no living body without heredity, and there is no heredity without a living body. The living body and its conditions of life are inseparable. Deprive an organism of its conditions of life and the living body will die. The Morganists, however, maintain that heredity is isolated, something apart from the mortal living body, from what they call the soma.

Those are the principles on which we differ with the Weismannists. And connected with them is also our difference on a question which has a long history behind it, namely, the question of inheritance of characters acquired by plants and animals. The Michurinists say that inheritance of acquired characters is possible and necessary. This principle has once more been fully confirmed by the abundant factual material demonstrated at this session. Morganists, among them those who spoke at our session, cannot comprehend this principle so long as they have not fully discarded their Weismannist notions.

It is still not clear to some that heredity is inherent not only in the chromosomes, but in any particle of the living body. They therefore want to see with their own eyes cases of hereditary properties and characters transmitted from generation to generation without the transmission of chromosomes.

These questions, so incomprehensible to the Morganists, can best be answered by demonstrating and explaining experiments in vegetative hybridization carried on extensively in our country. It was I. V. Michurin who elaborated vegetative hybridization. And experiments in vegetative hybridization show incontrovertibly that heredity is a property not only of the chromosomes, but of every living thing, every cell and every particle of the body. For heredity is determined by the specific type of metabolism. You need but change the type of metabolism in a living body to bring about a change in heredity.

Academician P. M. Zhukovsky, as becomes a Mendelist-Morganist, cannot conceive transmission of hereditary properties without transmission of chromosomes. He cannot conceive that the ordinary living body possesses heredity. According to his views, that is the property of the chromosomes only. He therefore does not think it possible to obtain plant hybrids by means of grafting, he does not think it possible for plants and animals to inherit acquired characters. I promised Academician Zhukovsky to show him vegetative hybrids, and I have now the pleasure of demonstrating them at this session.

In this case one of the participating plants was a variety of tomatoes with leaves not dissected, as usual, but like those of the potato. Its fruits are red and oblong in shape.

The other variety that participated in the grafting was one with the usual dissected tomato leaves. The fruits when ripe are not red, but yellowish, white.

The variety with the potato leaves was used as the stock, and the variety with the dissected leaves was the scion.

In the year when the graft was made no changes were observed either in the scion or in the stock.

Seeds were gathered from the fruits that had grown on the scion and from those that had grown on the stock. These seeds were then planted.

Most of the plants that grew from the seeds taken from the fruits of the stock did not differ from the initial variety, that is to say, they were potato-leafed and their

fruits were red and oblong in shape. Six plants, however, had dissected leaves, and some of them had yellow fruits, that is to say, both the leaves and the fruits had changed under the influence of the other variety, the one which had been the scion.

Academician P. M. Zhukovsky has expressed doubt as to the purity of the experiments in vegetative hybridization, pointing out that cross-pollination of the varieties might have occurred—in other words, that it was a case of sexual hybridization. But how, Comrade Zhukovsky, can the results of the experiments I demonstrate be explained by cross-pollination?

All who have had anything to do with the hybridization of tomatoes know that when the plants with dissected leaves and yellow fruits are cross-pollinated with the plants with potato leaves and red fruits, the first generation will have dissected leaves, but invariably red fruits.

But see what we have got in our experiments. The leaves are indeed dissected, but the fruits are not red but yellow. How, then, can these results be explained by accidental cross-pollination?

Here are the fruits of the other of these vegetative hybrids. The leaves of this plant are also dissected, but of the ripe fruits on the cluster, one, as you see, is red and the other yellow. Variety within a single plant is a quite frequent phenomenon among vegetative hybrids. It should be borne in mind that vegetative hybridization is not the usual mode of union of breeds, not the one that has developed in the course of their evolution. That is why as the result of grafting we often get organisms that are destabilized and therefore prone to vary.

It is not in all plants by any means that we can observe easily perceptible alterations in the year of the grafting or even in the first seed generation. None the less we already have every ground to assert that every graft of a phasically young plant produces changes in heredity. To prove this point we are going on with our work on veg-

etative hybrids of tomatoes at the Institute of Genetics of the Academy of Sciences of the U.S.S.R.

I shall now show you plants of the second seed generation obtained from the same graft; but these are from seeds taken from plants which gave no visible alterations in the first seed generation. On a number of plants from the second seed generation the leaves are changed—they are not like potato leaves in appearance, but dissected, and the fruits are not red but yellow. In this case, too, there is no reason to doubt the purity of the work or to suspect cross-pollination. In the first generation these plants had potato leaves and red fruits. If the dissected leaves in the plants of the second generation are the result of cross-pollination, why are the fruits not red but yellow?

We thus see that as the result of grafts we obtain directed, adequate alterations; we obtain plants combining the characters of the breeds joined in the grafting, that is to say, we get true hybrids. New formations are also observed. For example, among the progeny of the same graft there are plants that have borne small fruits, like those of uncultivated forms. But we all know that in the case of sexual hybridization, too, we observe, besides the transmission to the progeny of characters of the parent forms, also the appearance of new forms.

I could cite many more cases of the production of vegetative hybrids. It is no exaggeration to say that there are hundreds and thousands of them in our country. The Michurinists not only understand how vegetative hybrids are produced, but produce them in large numbers from numerous varieties.

I have dwelt at length on vegetative hybrids because they provide instructive material of great significance. For not only Mendelists, but even materialists who have not seen vegetative hybrids, may refuse to believe that everything that is alive, every particle of a living body, possesses heredity as well as the chromosomes. This can be easily demonstrated by the examples of vegetative hybrid-

ization. Chromosomes cannot pass from stock to scion and vice versa—that is a fact no one disputes. Yet hereditary properties, such as the colouring of the fruit, its shape, the shape of the leaves, and others, are transmitted from scion to stock and from stock to scion. Now show us any properties of two breeds united into one by means of sexual hybridization—in the case of tomatoes, for instance—which could not be united or have not been united by the Michurinists, by means of vegetative hybridization.

Thus experiments in vegetative hybridization provide unmistakable proof that any particle of a living body, even the plastic substances, even the sap exchanged between scion and stock, possesses hereditary qualities.

Does this detract from the role of the chromosomes? Not in the least. Is heredity transmitted through the chromosomes in the sexual process? Of course it is.

We recognize the chromosomes. We do not deny their existence. But we do not recognize the chromosome *theory* of heredity. We do not recognize Mendelism-Morganism.

Let me remind you that Academician P. M. Zhukovsky promised that if I showed him vegetative hybrids, he would believe and revise his position. I have now kept my promise and shown him vegetative hybrids. But I must remark, firstly, that dozens and hundreds of such hybrids could be seen in our country for at least a decade now; and, secondly, is it possible that Academician Zhukovsky, a botanist, does not know what is known to many, even if not all, horticulturists—namely, that in decorative horticulture a great deal has been done, and is being done, to change the heredity of plants by means of grafting?

Some of the Morganists who spoke at this session alleged that, together with the chromosome theory of heredity, Lysenko and his followers reject all the experimental facts obtained by Mendelist-Morganist science.

Such allegations are false. We do not reject any experimental facts, and this holds good for the facts concerning chromosomes.

Some go so far as to assert that the Michurin trend denies the action upon plants of the so-called mutagenic factors, such as X-rays, colchicine, etc. But how is it possible to assert anything of the sort? Certainly, we Michurinists cannot deny the *action* of such factors. We recognize the action of the conditions of life upon the living body. Why then should we refuse to recognize the action of such potent factors as X-rays or a strong poison like colchicine, etc.? We do not deny the action of the so-called mutagenic substances. But we insist that such action, which penetrates into the organism not in the course of its development, not through the process of assimilation and dissimilation, can only rarely and only *fortuitously* lead to results useful for agriculture. It is not the road of systematic selection, not the road of progressive science.

The protracted and numerous efforts made in the Soviet Union to produce polyploid plants with the aid of colchicine and similar potent factors have in no way led to the results so widely advertized by the Morganists.

A great deal has been said and written to the effect that a geranium began to give seeds after its chromosome complement had been increased. But this geranium is not being grown for the market, and I, as a scientist, venture the opinion that it never will be so grown, because it is much more practical to propagate geraniums by cuttings. Currants, for example, can be grown from seeds, but in practice they are propagated by cuttings. Potatoes can also be grown from seeds, but it is more practical to plant tubers. As a rule, plants which can be propagated both by seeds and by cuttings (i.e., by the vegetative method) are propagated for practical ends by the latter method.

This does not mean that we minimize the importance of the fact that a geranium has been obtained which

is capable of producing seeds. If not for practical ends, this form can be of use in the study of plant breeding.

And what I have said of geraniums applies also to mint.

What other polyploids are often represented by the Morganists as highly important achievements? Wheat, millet, buckwheat, and a few other plants. But, according to the statements which we have heard here from the Morganists themselves (A. R. Zhebrak, for example), all these polyploids—wheat, millet, buckwheat—have so far, as a rule, been found to be of small fertility, and their authors themselves have refrained from recommending their cultivation for practical ends.

There only remains the tetraploid kok-saghyz. This is the first year it is being tested on collective farms. It goes without saying that, if it proves to be good, it ought to be introduced in practical farming. So far, however, according to the data of three years of government seed testing, it is not superior to the ordinary diploid varieties, such as Bulgakov's, for example. This is the first year tetraploid kok-saghyz is being tested on collective farms. In another two or three years we shall have practical proof of how good it is. I sincerely wish that it may prove to be the best of all kok-saghyz forms. Our agriculture can only gain thereby.

At the same time we must not forget that among the varieties of cultivated plants there are plenty of polyploids whose origin has nothing to do with colchicine and the mutagenic theory, nor, for that matter, with the theory of Morganism-Mendelism as a whole. For centuries people did not know that many good varieties of pears, for example, are polyploids. But we have also as many equally good varieties of pears which are not polyploids. These facts alone provide enough grounds for the conclusion that it is not the number of chromosomes that determines the quality of a variety.

There are good and bad varieties of durum wheat with 28 chromosomes, and there are good and bad varieties of soft 42-chromosome wheat.

Is it not obvious that breeding must be conducted, not with a view to the number of chromosomes, not with a view to polyploidy, but with a view to inducing good qualities and properties?

When a good variety has been produced, we can also determine the number of its chromosomes. But no one, certainly, will think of discarding a good variety only because it has turned out to be a polyploid or not a polyploid. No Michurinist, no serious-minded person generally, can approach the question from such an angle.

Our Morganists, among them some who spoke at this session, in order to adduce proof that their theory is effective, often point to some varieties of cereal grains which are widespread in practical farming, as, for example, Lutescens 062, Melanopus 069, and some other varieties of long standing which they claim have been produced on the basis of Morganism-Mendelism. But actually Mendelism has nothing to do with the production of these varieties. How, for example, have varieties like Lutescens 062, Melanopus 069, Ukrainka, and some others been produced? They were produced by the ancient method of selection from local varieties.

I shall quote here Professor S. I. Zhegalov, who wrote in his work, *An Introduction to the Selection of Agricultural Plants*: "Under ordinary farming conditions we have to deal, not with pure forms, but with 'varieties' representing more or less complex combinations of various forms.... The first, perhaps, to draw attention to this fact in the first quarter of the nineteenth century [long before the appearance of Weismannism—*T. L.*] was the Spanish botanist Mariano Lagasca, who published his observations in Spanish. There is an interesting story extant about a visit he paid to his friend, Colonel Le Couteur, at the latter's estate on Jersey Island. During an

inspection of the fields he drew the attention of his host to the considerable diversity of forms among the plants and suggested that individual forms be selected for further pure breeding. The idea appealed to Le Couteur, who selected twenty-three different forms and began to test their relative merits. As a result of the tests, he found one of the forms to be the very best, and in 1830 put it on the market as a new variety named 'Talavera de Bellevue.' Since then this kind of work has been tried many times, and it has led to the production of many valuable varieties. In substance, it consists in separating the initial mixtures into their component parts. That is why this method is known as '*analytical selection.*' At present it is the principal method employed in work with self-pollinating plants and is systematically applied by all stations, particularly in the early stages of the work on plants formerly little affected by selection."[1]

A little farther Professor S. I. Zhegalov writes: "The method of analytical selection lends meaning to an aphorism credited to Jordan: 'In order to produce a new variety, we must first have it.' "[2]

Comrade Shekhurdin, was the form of wheat now called Lutescens 062 to be found among the local Poltavka variety or not? [*Voice from the audience*: "Yes, positively."] The same is true of the forms called Ukrainka and Melanopus 069.

That is why S. I. Zhegalov accepts the aphorism that in applying the method of analytical selection it is necessary, in order to produce a new variety, first to have it. The named varieties, to which our Mendelists usually point, have indeed been obtained in this manner.

We Michurinists, however, cannot agree with Professor S. I. Zhegalov and his interpretation of Darwinian selection. For it is possible to begin to select plants with

[1] С. И. Жегалов, *Введение в селекцию сельскохозяйственных растений*, 1930 г., стр. 79-80.
[2] *Ibid.*, p. 83.

scarcely perceptible, still feeble useful characters, in order to reinforce and develop these useful characters by repeated selection and proper cultivation. But, as is obvious to anyone, the described Darwinian method of selection has no bearing whatever on the Mendel-Morgan theories.

It should be mentioned that formerly varieties were bred only on the basis of the above method. For that matter, this method is being applied today and will be applied in future. It is a useful method, and practical breeders who successfully apply it should be appreciated and encouraged.

Far from rejecting the method of continuous improving selection, we, as is well known, have always insisted on it. The Morganists, on the other hand, have ridiculed the application of repeated improving selections in practical seed growing.

Weismannism-Morganism has never been, nor can it be, a science conducive to the systematic production of new forms of plants and animals.

It is significant that abroad, in the United States for example, which is the home of Morganism and where it is so highly extolled as a theory, this teaching, because of its inadequacy, has no room in practical farming. Morganism as a theory is being developed *per se*, while practical farmers go their own way.

Weismannism-Morganism does not reveal the real laws of living nature; on the contrary, since it is a thoroughly idealistic teaching, it creates an utterly false idea about natural laws.

For instance, the Weismannist conception that the hereditary characteristics of an organism are independent of environmental conditions has led scientists to affirm that the property of heredity (i. e., the specific nature of an organism) is subject only to chance. All the so-called laws of Mendelism-Morganism are *based entirely on the idea of chance.*

Here are a few examples.

"Gene" mutations, according to the theory of Mendelism-Morganism, appear fortuitously. Chromosome mutations are also fortuitous. Due to this, the direction of the process of mutation is also fortuitous. Proceeding from these invented fortuities, the Morganists base their experiments too on a fortuitous choice of substances that might act as mutagenic factors, believing that they are thereby acting on their postulated hereditary substance, which is just a figment of their imagination, and hoping to obtain fortuitously what may by chance prove to be of use.

According to Morganism, the separation of the so-called maternal and paternal chromosomes at reduction division is also a matter of pure chance. Fertilization, according to Morganism, does not occur selectively, but by the chance meeting of germ cells. Hence the segregation of characters in the hybrid progeny is also a matter of chance, etc.

According to this sort of "science" the development of an organism does not proceed on the basis of the selection of conditions of life from the environment, but again on the basis of the assimilation of substances fortuitously entering from without.

In general, living nature appears to the Morganists as a medley of fortuitous, isolated phenomena, without any necessary connections and subject to no laws. Chance reigns supreme.

Unable to reveal the laws of living nature, the Morganists have to resort to the theory of probabilities, and, since they fail to grasp the concrete content of biological processes, they reduce biological science to mere statistics. It is not for nothing that statisticians like Galton, Pearson, and latterly Fisher and Wright, are also regarded as founders of Mendelism-Morganism. Probably that is also the reason why Academician Nemchinov has told us here that, as a statistician, he found that he could

easily take in the chromosome theory of heredity. (*Amusement, applause.*)

Mendelism-Morganism is built entirely on chance; this "science" therefore denies the existence of necessary relationships in living nature and condemns practical workers to fruitless waiting. There is no effectiveness in such science. With such a science it is impossible to plan, to work toward a definite goal; it rules out scientific prediction.

A science which fails to give practical workers a clear perspective, the power of finding their bearings and confidence that they can achieve practical aims does not deserve to be called science. (*Applause.*)

Physics and chemistry have rid themselves of fortuities. That is why they have become exact sciences.

Living nature has been developing and is developing on the basis of strict laws inherent in it. Organisms and species develop in line with natural necessities inherent in them.

By ridding our science of Mendelism-Morganism-Weismannism we will expel fortuities from biological science. (*Applause.*)

We must firmly remember that *science is the enemy of chance.* (*Loud applause.*) That is why Michurin, who was a transformer of nature, put forward the slogan: "We cannot wait for favours [i.e., lucky chance—*T. L.*] from Nature; we must wrest them from her." (*Applause.*)

Aware of the practical sterility of their theory, the Morganists do not even believe in the possibility of the existence of an effective biological theory. Ignorant even of the ABC of the Michurinist science, they cannot to this day imagine that for the first time in the history of biology a truly effective theory has come into being—the Michurin teaching. (*Applause.*)

A great deal can be scientifically predicted on the basis of the Michurin teaching, thus freeing practical plant

breeders to an ever-increasing extent from the elements of chance in their work.

Michurin himself elaborated his theory, his teaching, only in the process of solving problems of practical importance, in the process of the production of good varieties. That is why *the Michurin teaching is, by its very spirit, inseparable from practice.* (*Applause.*)

Our kolkhoz system, our socialist agriculture, created all the conditions for the flowering of the Michurin teaching. Let us recall Michurin's words: "In the person of the collective farmer the history of agriculture of all times and all nations has an entirely new type of farmer, one who has taken up the struggle with the elements marvellously armed technically and acting on nature as a man with the views of a renovator."[1]

"I see," wrote I. V. Michurin, "that the system of collective farming, by means of which the Communist Party is inaugurating the great work of renovating the land, will lead labouring humanity to real dominance over the forces of nature.

"The great future of our entire natural science is in the collective farms and state farms."[2]

The Michurin teaching is inseparable from the practical collective farm and state farm activity. It is the best form of unity of theory and practice in agricultural science.

It is clear to us that the Michurin movement could not develop extensively, if there were no collective farms and state farms.

Without the Soviet system, I. V. Michurin would have been, as he himself wrote, "an obscure hermit of experimental horticulture in tsarist Russia."[3]

The strength of the Michurin teaching lies in its close association with the collective farms and state

[1] И. В. Мичурин, *Сочинения*, том. I, стр. 477.
[2] *Ibid.*
[3] *Ibid.*, Vol. IV, p. 116.

farms, in the fact that it *elucidates profound theoretical problems by solving important practical problems of socialist agriculture.*

Comrades, our session is drawing to its close. This session has vividly demonstrated the strength and potency of the Michurin teaching. Many hundreds of representatives of biological and agricultural science have taken part in it.

They have come here from all parts of our vast country. They have taken an active part in the discussion on the situation in biological science and, convinced in the course of many years of practical activity that the Michurin teaching is right, are ardently supporting this trend in biological science.

The present session has demonstrated *the complete triumph of the Michurin trend over Morganism-Mendelism.* (*Applause.*)

It is truly a historic landmark in the development of biological science. (*Applause.*)

I think I shall not be wrong if I say that this session has been a great occasion for all workers in the sciences of biology and agriculture. (*Applause.*)

The Party and the Government are showing paternal concern for the strengthening and development of the Michurin trend in our science, for the removal of all obstacles to its further progress. This imposes upon us the duty to work still more extensively and profoundly to arm the state farms and collective farms with an advanced scientific theory. That is what the Soviet people expect of us.

We must effectively place science, theory, at the service of the people, so that crop yields and the productivity of stockbreeding may increase at a still more rapid pace, that labour on state farms and collective farms may be more efficient.

I call upon all Academicians, scientific workers, agronomists, and animal breeders to bend all their

efforts and work in close unity with the foremost men and women in socialist farming to achieve these great and noble aims. (*Applause.*)

Progressive biological science owes it to the geniuses of mankind, *Lenin* and *Stalin*, that *the teaching of I. V. Michurin has been added to the treasure house of our knowledge, has become part of the gold fund of our science.* (*Applause.*)

Long live the Michurin teaching, which shows how to transform living nature for the benefit of the Soviet people! (*Applause.*)

Long live the Party of Lenin and Stalin, which discovered Michurin for the world (*applause*) and created all the conditions for the progress of advanced materialist biology in our country! (*Applause.*)

Glory to the great friend and protagonist of science, our leader and teacher, Comrade Stalin! (*All rise. Prolonged applause.*)

RESOLUTION

Adopted by the Session of the Lenin Academy of Agricultural Sciences of the U.S.S.R. on the address delivered by T. D. Lysenko on the Situation in Biological Science

After hearing and discussing the address delivered by Academician T. D. Lysenko, President of the Lenin Academy of Agricultural Sciences of the U.S.S.R., on "The Situation in Biological Science," this session of the Academy fully approves of the address, which contains a correct analysis of the present situation in the science of biology.

Two diametrically opposite trends have become defined in biology: one trend is the progressive, materialist, *Michurin* trend, named after its founder, the distinguished Soviet naturalist and great transformer of nature I. V. Michurin; the other is the reactionary-idealistic *Weismann* (Mendel-Morgan) trend, founded by the reactionary biologists Weismann, Mendel and Morgan.

The Michurin trend proceeds from the premise that the new characters which plants and animals acquire under the influence of their conditions of life can be transmitted by inheritance. The Michurin theory arms practical workers with scientifically founded methods for the planned alteration of the nature of plants and animals, for improving existing varieties of agricultural plants and breeds of animals and creating new ones.

The Michurin trend in biology is the constructive development of Darwin's theory, a new and higher stage of materialist biology. Basing itself in its researches on I. V. Michurin's outstanding theory of the development

of plan[illegible] and on V. R. Williams' theory of soil formation and on his methods of creating conditions for high soil fertility, Soviet agrobiological science, further developed in the researches of T. D. Lysenko and the whole body of progressive Soviet biologists, has become a powerful instrument for the active and planned transformation of living nature. The Michurin trend in biology is day after day rendering assistance to practical socialist agriculture. It is developing a new, progressive agrobiological science which renders ever increasing assistance to the collective farms and state farms in their efforts to secure high productivity in socialist agriculture. Unity of theory and practice, which is an essential condition for knowing the laws of development of living nature, is fully and clearly embodied in the Michurin agrobiological science. Thanks to this unity, modern agrobiological science has already achieved considerable success in the scientific knowledge and control of living nature. There can be no doubt that the further development of I. V. Michurin's theory will progressively increase our successes in subjecting nature to the will of man. The overwhelming majority of researchers in the field of the agricultural sciences are following the Michurin path. These researchers must be given every assistance and support.

The Mendelist-Morganist trend in biology propounds the idealistic and metaphysical theory of Weismann that the nature of an organism is independent of its external environment, the theory of the so-called immortal "hereditary substance." The Mendelist-Morganist trend is divorced from life and its researches are practically fruitless.

This session of the Lenin Academy of Agricultural Sciences of the U.S.S.R. is of the opinion that the Michurin trend headed by Academician T. D. Lysenko has performed great and fruitful work in exposing and shattering the theoretical positions of Mendelism-Morganism.

This work is of great positive importance for the development of progressive biological science and practical agriculture.

This session notes that to this day scientific research in a number of biological institutes and the teaching of genetics, plant breeding, seed cultivation, general biology and Darwinism in universities and colleges, is based on syllabuses and plans that are permeated with the ideas of Mendelism-Morganism, which is gravely prejudicial to the ideological training of our cadres. In view of this, this general meeting is of the opinion that scientific research in the field of biology must be radically reorganized and that the biological sections of the syllabuses of educational institutions must be revised.

The purpose of this reorganization must be to help to arm scientific research workers and students with the Michurin theory. This is a necessary condition for success in the work of specialists in production and in scientific research connected with urgent problems in the field of biology. Simultaneously with the revision of syllabuses, work should be organized for the issue of high-quality textbooks, and of books and pamphlets to popularize Michurin's theory.

The Lenin Academy of Agricultural Sciences of the U.S.S.R. must become a genuine scientific centre for the comprehensive and deep study of Michurin's theory.

This session of the Academy is of the opinion that the researches conducted in the Academy's institutions should be subordinated to the task of assisting the collective farms, machine and tractor stations and state farms in their efforts to secure higher yields of agricultural crops and livestock produce.

This session of the Academy appeals to the body of research workers in the field of agricultural science, to all agronomists, zootechnicians and leading workers in the collective farms to rally more closely around the

Lenin Academy of Agricultural Sciences of the U.S.S.R. and, under the leadership of the Party of Lenin and Stalin, and of the great leader of the working people, teacher and friend of Soviet scientists, Joseph Vissarionovich Stalin, to unite their efforts to develop Michurin's theory, the progressive agrobiological science, which is capable of fulfilling the tasks our Party and Government have set before the workers in agriculture.