THE GRIM HERITAGE OF LYSENKOISM: FOUR PERSONAL ACCOUNTS

IV. DIFFICULT YEARS IN SOVIET GENETICS

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IN RECENT YEARS several publications have shed light on the difficult times in Soviet biology when T. D. Lysenko and his supporters were in power (Zh. Medvedev, *The Rise and Fall of T. D. Lysenko*, Columbia Univ. Press, New York, 1969; *The Medvedev Papers: The Plight of Soviet Science Today*, Macmillan (St. Martin's Press), London, 1971; *Soviet Science*, Norton, New York, 1978; R. Berg, *Acquired Traits: Memoirs of a Geneticist from the Soviet Union*, Viking-Penguin, New York). These books have raised many questions, not only in the minds of the younger but also in those of the older generations—in fact, among all who possess an interest in biology, yet were neither participants in, nor even witnesses to, the tumultuous events in biology during those difficult years. Even the most interested persons do not know to what disastrous consequences "Lysenkoism" led for the whole of biology, or what harm it did to the national economy.

Even now, several decades later, it is worth answering such questions, after the antiscientific ideas of Lysenko and his supporters have been unmasked and their theories shown to be completely erroneous. It is, in fact, not only worth doing, but in my opinion it is necessary. Contemporary Soviet scientists, especially the younger ones, definitely need to learn the lesson, how important it is, always and everywhere, to stand for scientific truth, and to what fatal results the violation of ethical standards in science may lead. Such violations were typical of Lysenko's supporters, who used every means in their power to eliminate their scientific opponents in order to establish their own careers and to reach their personal goals. It is necessary to understand clearly how dangerous ignorance can be when it is in power. Beyond taking notice of all this, it is necessary to speak out about it, because even now Lysenkoism continues to exist, and no one should pretend that now all is well.

All of these considerations, and more, have made me write down what I know about the lessons Lysenkoism has to teach us, even though it is not easy for me to remember all those difficult and bitter experiences endured by so many Soviet biologists (and I include myself), nor is it comfortable to recall the names of my dear teachers and coworkers who gave their lives for scientific truth.

In the Soviet Union, the golden age of genetics began soon after the great October So-

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cialist Revolution in 1917. In the mid-thirties, genetics in the USSR stood undoubtedly in second place in the world, behind the development of genetics in the United States. To document such a claim, it is sufficient to mention the names of N. I. Vavilov, who described parallel patterns of variability in plant species throughout the world; N. K. Koltsov, who proposed the matrix principle of gene reproduction and postulated the idea that all genes in a chromosome represent one giant molecule, in that way predicting one of the main postulates of modern molecular biology; A. S. Serebrovsky, first to demonstrate the complex structure and divisibility of the gene; S. S. Chetverikov, who may safely be called the father of experimental population genetics; Y. A. Philipchenko, who made outstanding contributions to the genetics of plants and of domestic animals; and G. A. Levitsky, a prominent cytogeneticist and author of a famous monograph in that field. At that time, the students and followers of those named above who were already working actively and were widely known included B. L. Astaurov, I. A. Rapoport, A. A. Prokofieva-Belgovskaya, M. L. Belgovsky, P. F. Rokitsky, G. D. Karpechenko, N. P. Dubinin, N. V. Timoféeff-Ressovsky, M. E. Lobashov, V. V. Sakharov, and many others, including the present writer. Many leading foreign geneticists considered it an honor to visit the genetical laboratories in the USSR: William Bateson and C. D. Darlington from England, Erwin Baur and Richard Goldschmidt from Germany; Calvin B. Bridges, Hermann Joseph Muller, and L. C. Dunn from the United States, S. G. Harland from Great Britain; and D. Kostoff from Bulgaria. Several of these prominent geneticists visited more than once and remained in our laboratories to carry on joint investigations for several years.

By the end of the 1920s, however, the situation in Soviet genetics had already begun to change for the worse. At that time several neo-Lamarckians, including E. S. Smirnov, E. M. Vermel, A. M. Kuzin, and Vladimirsky were actively defending the theory of the inheritance of acquired characters, that is, of modifications of the organism acquired during life. This theory was in opposition to the materialistic theory of Charles Darwin, according to which natural selection, acting upon a background of randomly occurring variability (in modern terms, mutations and their combinations), is the main force in organic evolution. The neo-Lamarckians, however, declared that evolution follows in accordance with Lamarck's laws, that is, by the direct adaptation of organisms to their environments and the subsequent inheritance of such "acquired characters." Such modifications, however, were later repeatedly shown, from the time of Weismann on, not to be inherited.

The neoLamarckians in the USSR obtained great support from a group of Russian philosophers, including especially M. B. Mitin and P. F. Yudin, who asserted that Lamarck's theory of the inheritance of acquired characters corresponds to the main postulates of dialectical materialism. Opponents of this view were accused of "idealism," in the sense that they denied the influence of environment upon heredity. Although that time the nature of mutations was not fully known, by the end of the 1920s, it was quite well established that mutations occur randomly among genes and chromosomes exposed to an environmental agent such as X-rays (Muller); and that the effect of a mutation upon the viability and fertility of its possessors depends upon the particular environment in which development of the individuals takes place, and in what genetic combinations the respective mutants exist (Timoféeff-Ressovsky).

To prove the correctness of their ideas, neo-Lamarckians often cited the experimental results of the Austrian biologist Paul Kammerer, who had worked with an ascidian (*Cione intestinalis*) and with the midwife toad (*Alytes obstetricans*). They claimed that Kammerer's experiments had proved convincingly that acquired characters may be inherited. Actually, Kammerer performed his experiments carelessly, without the necessary controls, and without any quantitative analysis of the results. He used only primitive tests and estimated his results only approximately. That is why his results were never confirmed by other researchers using appropriate methods. In all cases, when Kammerer declared that his experiments confirmed the inheritance of acquired characters, he was subsequently refuted. In fact the story of Kammerer's claims and the subsequent disclosures of invalidity and fraud is now very well-known to biologists. H. K. Noble, of the American Museum of Natural History, a great

authority on the Amphibia, went to Kammerer's laboratory and found that the enlarged and blackened thumbs of the midwife toads that had been reared under altered conditions were in fact injected with India ink! Kammerer was away at the time, and later claimed that the fraud was perpetrated by an assistant of his who wanted to "make things come out right for his master." Then, Kammerer committed suicide on the train on which he was going to the USSR to take up a high post in biological research.

Soviet scientists at that time supported Kammerer because of his leftist political views. On the basis of the story of his tragic death, the Soviet Minister of Culture, A. V. Lunacharsky, wrote a plot for the film "Salamandra," the principal thesis of which was the progressive role in evolution of the inheritance of acquired characters. This film appeared quickly after Kammerer's death and contributed much to the success of the publications of Smirnov and other neoLamarckians. Many Soviet biologists who were carrying out investigations of a descriptive nature and who were not familiar with genetics and did not read its literature were also sympathetic with Kammerer's ideas. Yet it is noteworthy that in those very years many data were published in the USSR genetical literature refuting the results obtained by Kammerer. Among such authors I mention N. K. Koltzov, A. S. Serebrovsky, Y. A. Philipchenko, M. L. Levin, S. G. Levit, and S. S. Chetverikov.

Among these, Chetverikov was attacked in the pages of *Pravda* for his criticism of the scientific views of the "progressive" Austrian investigator. Hence, even the first and relatively mild wave of repression, beginning in the late 1920s, affected Chetverikov. At that time, he was head of the Department of Genetics of the Institute of Experimental Biology in Moscow, the director of which was Koltsov. Chetverikov had been the first geneticist in the USSR to lecture on biometry and genetics at Moscow University. In 1929 he was arrested, spent several months in prison, and then was exiled from Moscow. He became a teacher in the secondary school of the town Vladimir, and later was appointed to the chair of genetics at Gorky University, where he studied the genetics of the silkworm. In 1959, several months before his death, he was awarded the prized Darwin Medal of the British Royal Society, an award given to a select number of scientists for their outstanding contributions to the study of evolution.

P. F. Rokitsky, one of Chetverikov's students, was arrested at the same time as Chetverikov, and spent several months in prison. After he was released, he became a professor at Minsk University and an academician of the Byelorussian SSR Academy of Science.

During the mid-thirties, intensive debates in genetics began because of the rapid rise of T. D. Lysenko. I must first indicate the postulates on which he based all his applied agricultural practices.

First, he denied the existence of genes and declared that they were a myth invented by bourgeois idealistic scientists. Furthermore, he stated that chromosomes have nothing to do with heredity, and consequently to study them is not worthwhile. Lysenko refused to accept Mendel's laws of heredity, and called them simply "the invention of a Catholic monk."

Second, Lysenko unconditionally accepted the inheritance of acquired characters and denied the leading role of natural selection in evolution. He considered natural selection to have been "Darwin's mistake." He did not understand at all how this fundamental idea in fact provides the material basis for adaptive evolution.

Third, Lysenko asserted that one species may suddenly become transformed into another, without any intermediate stages. Thus, a birch might be transformed into an alder, oats into wheat, cuckoos into another species of bird, and the like. He accepted the notion that in puddles appearing in the springtime, little fishes might arise by means of spontaneous generation rather than from the fertilized eggs carried by birds, as had been so clearly proven in the past.

Lysenko never tried to prove his ideas, either by quantitative experimental analysis or even by reading the scientific literature. He looked through only a small part of the Soviet biological literature and completely rejected the foreign literature in genetics and related fields. He declared that the works of Michurin and Timiriazev represented the major source for his theoretical considerations, yet even this was scarcely true, for he was accustomed to take out of context various unrelated passages from the works of these scientists in order to confirm his own ideas. Lysenko often stated that his concepts were based on Marxist dialectical

materialism. This statement was also not true although it was necessary, for ideological reasons, for him to claim it to be so.

On the basis of his antiscientific and simply ignorant statements, Lysenko asserted that the methods used in agriculture and recommended by geneticists were absolutely pointless and harmful, and should be immediately abolished and replaced by methods he suggested, those of "Michurin's biology," a term he introduced. It is interesting, however, to note that not a single one of Lysenko's statements, cited above, occurs in Michurin's work. Lysenko promised that his methods would bring about a rapid improvement in agriculture, for highly productive plant varieties could be developed by appropriate breeding in two or three years, instead of the ten to fifteen years typically required when the Weismann-Mendel-Morgan methods were used. The phenomenal, indeed magical, rise of Lysenko began with his report in 1933 at the All-Union Congress of Collective Farmers. In that report, he solemnly repeated his promises of a rapid progress in Soviet agriculture provided his revolutionary methods were used.

Stalin was present at the meeting. He applauded Lysenko's report, and in a speech gave high appreciation to that contribution. The proceedings of this congress were published in all the principal newspapers, and Stalin's approval of Lysenko was of course emphasized. Lysenko's rapid promotion followed. In 1934, he was elected an academician of the Ukrainian Academy of Sciences. In 1935, he became an academician of the Agricultural Academy; in 1938, its president; and in 1939, he became an academician of the Academy of Sciences of the USSR. After Vavilov was arrested, in 1940, Lysenko became the director of the Genetics Institute of the Academy of Sciences, which had previously been headed by Vavilov. From 1937 until 1966 Lysenko remained a Deputy of the Supreme Soviet of the USSR, and its Vice Chairman. He was made a State Prize Laureate, was decorated with the Order of Lenin no less than eight times, and in 1945 became a Hero of Socialist Labor.

From the beginning of his rise, Lysenko selected totally loyal assistants. He preferred uneducated people who lacked any serious training in biology, for they would do their best to ingratiate themselves with Lysenko in order to advance their own careers. Thus, Lysenko's chief assistant and supporter, I. I. Prezent, was a lawyer. Lysenko recommended him for a professorship of biology, and he simultaneously held chairs in both the Moscow and Leningrad Universities.

The first detailed public presentation of the antigenetical ideas of Lysenko took place in 1936, at a discussion arranged by M. B. Mitin, who at that time was the managing editor of the journal *Under the Banner of Marxism.* On the arranged program, the principal speech was given by the distinguished American geneticist (and future Nobel Prize winner) H. J. Muller, who at that time was working in the Institute of Genetics in Moscow. The speech was made in English, and translated by myself into Russian. After Muller had finished, Lysenko took the floor and presented his ignorant ideas, concluding with harsh cursing of Morganism-Weismannism-Mendelism and geneticists in general. As far as I can remember, there were two other presentations, both of them brief. One was delivered by A. R. Zhebrak, who defended classical genetics; the other, by Chairman Mitin, who praised Lysenko. Vavilov, who was also present, did not take part in the discussion. The next morning, however, he gathered his coworkers together in his study and told them, with indignation, about Lysenko's speech. Vavilov appealed to all the geneticists who were present to fight with vigor against the aggressive ignorance of Lysenko and his gang. He also emphasized the potential danger of Lysenko's ideas for the future survival of the whole of genetics in the USSR.

Two more discussions of the same sort took place in 1936 and 1938. I was not present on those occasions, but I know that several geneticists, including Vavilov, Dubinin, and Zhebrak presented their views. Lysenko and his clique dominated the exchanges and, in fact, during these years, were highly praised in many newspapers and magazines, whereas the Mendelists-Morganists were attacked more and more severely. To illustrate the attitudes of the scientific administrators toward genetics, the following personal example is sufficient. In 1936, while working in the Genetics Institute, I finished my doctoral thesis which dealt with

the genetic structure of the heterochromatic regions of the chromosomes. This dissertation was successfully defended at the Scientific Council of the Institute, Vavilov being the chairman. The distinguished geneticists Serebrovsky, S. Navashin, and D. Kostoff were the formal opponents at the defense. Afterwards, the dissertation was sent, as usual, to the High Attestation Committee. Already, before the decision of that Committee, I had moved from Moscow to Kiev, in response to an invitation of the Presidium of the Academy of Sciences of the Ukrainian SSR to become head of the Department of Genetics of the Zoology Institute. I soon received a call to attend a session of the High Attestation Committee meeting in Moscow. Professor Y. I. Polyansky, from Leningrad, was also summoned to attend, as a referee. He evaluated my work positively and took part in the subsequent session. The entire meeting turned out to be a farce. In the first place, I was not admitted to the meeting; only Polyansky was permitted to be present. After he had read his favorable review, I was invited to enter the Hall. The only other biologist to be present was Lysenko. He asked me two questions: "Why are you declaring in your dissertation ideas that are contrary to the concepts of K. A. Timiriazev? How do you describe in your work the nature of the gene?" I answered briefly, that my investigation was purely of a cytogenetic nature, and that Timiriazev had nothing to do with cytogenetics; hence, there could be no contradictions in my dissertation with his ideas. Furthermore, I mentioned that I had said nothing about the nature of the gene in my dissertation, but took it for granted that genes undoubtedly represent the material basis of heredity. After this statement, Lysenko in a 90-minute speech characterized me as a typical Morganist-Mendelist and requested that my dissertation be rejected. And so it was. My subsequent doctoral thesis was on the subject of genetic polymorphism and natural selection in natural animal populations. I successfully defended it seven years later, and it was unanimously approved during the absence of Lysenko. My first doctoral thesis was published in 1939, in Ukrainian, as a monograph. Many years later, in 1958, I received a reprint from the American geneticist D. L. Lindsley of an article of his published in the journal *Genetics*. In that article Lindsley wrote that he had had my monograph translated, had repeated my experiments, and confirmed all my conclusions.

A similar experience was met by the later distinguished Russian geneticist A. A. Prokofieva-Belgovskaya, in her own doctoral defense. After her dissertation was rejected by Lysenko, she had to defend another one several years afterward.

The widespread anti-genetics campaign launched in the press and headed by Lysenko and Prezent at first described geneticists as scientific enemies of "Michurin's biology." Later, geneticists were regarded as ideologically harmful personalities, and finally they were declared to be enemies of the whole Soviet system. Two outstanding biologists, Koltzov and Vavilov, were most severely criticized. In 1939, a long, fierce article about Koltzov appeared in *Pravda*. Following that, a commission of the Presidium of the Academy of Sciences, including Lysenko as a member, condemned the entire direction of investigation taking place in the world-famous Institute of Experimental Biology which Koltzov had organized. On the basis of the conclusions of this commission, Koltzov was dismissed from his directorship of that institute, and it was then totally reorganized. The persecution he underwent damaged the health of Koltzov, and several months later he died of a heart attack. His wife, and for many years his coworker, M. P. Sadovnikova, committed suicide on the same day. In 1940, Vavilov was arrested and sentenced to death. After two years in a death cell, and without ever seeing his family, the death sentence was commuted and reduced to twenty years of imprisonment. Less than a year later, Vavilov died of exhaustion in the Saratov prison and was buried in a common grave. The exact burial place of this outstanding biologist is unknown.

After Vavilov's arrest, several of his coworkers along with other brilliant Soviet geneticists were also arrested and died in Stalin's torture chambers. I shall mention only three of them, each of whom I knew personally. They were Levitsky, mentioned earlier in this article, who died in prison at the age of 66 years; Karpechenko, the first geneticist to create a new plant species by means of interspecific hybridization and polyploidization of the hybrid.

Later it was proved that this type of speciation takes place in nature in many plant groups. Karpechenko, an excellent scientist, died in the prime of life, at age 43. The third person I mention was G. K. Meister, an outstanding geneticist and plant breeder from Saratov, who created several wheat varieties and obtained hybrids between wheat and rye. The entire list of the executed, Vavilov's students and coworkers, would be far too long to record here. It is worth noting, however, that several geneticists were arrested and killed before Vavilov's arrest. During the wave of repression in 1937 to 1939, I was personally acquainted with N. K. Belyaev, and worked with him in Chetverikov's group studying the structure of natural populations of *Drosophila*. He was arrested and executed in 1937. At the same time, S. G. Levit, one of A. S. Serebrovksy's students, was also arrested and executed. He was the director, as well as founder, of the Medical-Genetical Institute in Moscow, the first of its kind in the USSR and one of the very first such institutions in the entire world. Several others, such as the outstanding geneticists I. Agol and M. Levin, were also arrested and executed.

The well-known session of the All-Union Agricultural Academy in August, 1948, became the apotheosis of Lysenko's monopoly in Soviet biology. The destruction of genetics at this meeting had been carefully planned and prepared. The entire procedure was a true farce, organized by Lysenko's closest collaborators, Prezent, M. A. Olshansky, and Lobanov. After Lysenko's initial speech, more than fifty persons took the floor to laud his ideas and to vilify and accuse the practitioners of genetics. Only eight persons attempted a defense. They were I. A. Rapoport, M. M. Zavadovsky, S. I. Alikhanian, I. A. Polyakov, P. M. Zhukovsky, I. I. Schmalhausen, A. R. Zhebrak, and V. S. Nemchinov. In a concluding speech, Lysenko once more demolished genetics and the geneticists. Then he stated that his report had been read and fully approved by Stalin. That led three of the geneticists who were present to take the floor and declare that they withdrew their previously expressed opinions favoring genetics. These three were Alikhanian, Polyakov, and Zhukovsky. In any case, after Lysenko's ideas had received the formal approval of Stalin it was no longer possible to continue the argument. Many prominent Soviet scientists who occupied positions of leadership in the Soviet Academy of Sciences thereafter began to praise Lysenko in speeches and articles, and to cast opprobrium upon genetics and geneticists. The list of such lip-servers included the head of the Biological Department of the USSR Academy of Sciences, A. I. Oparin; Academician Keller, Corresponding Members of the Academy, Koshtoianz and N. Y. Nuzhdin; and Professors A. N. Studitsky, P. P. Lobanov, V. N. Stoletov, P. A. Vlasiuk, N. V. Turbin, and others.

In the Ukraine, in September of 1948 and soon after that "famous" session just described had taken place, a meeting of the scientific public was called. Olshansky, one of the closest of Lysenko's supporters, made a long speech describing the August session and its outcome. In his report, praising Lysenko and excoriating the geneticists and their concepts, Olshansky accused the geneticists directly of inflicting great harm upon science and the national economy of Russia. He criticized four geneticists who were working in the Ukraine by name: Academician N. N. Grishko, Professors Delone and I. A. Polyakov, and the present writer. We were described as the representatives of a reactionary ideology. After he had concluded, many other Lysenko supporters followed suit in accusing us. These were for the most part persons unknown in scientific circles. Only at the end of the meeting, in witness of the atmosphere of that time, was the floor given to the four accused geneticists.

Before this meeting, I had been summoned by the Party Secretary of the Ukrainian Academy of Sciences, Comrade Isacovitch. He strongly suggested that in my speech I should criticize genetics and concede some merit to Lysenko's doctrines. Were I to refuse, I would be discharged from the Academy and expelled from the Party. He further reminded me that before coming to Kiev I had been a student of Vavilov and had worked with him—a man who had been arrested as the "people's enemy." Equivalent advice was given to the other "Mendelists-Morganists" who had been selected to be picked apart at the forthcoming meeting.

At the meeting, when they gave me the floor, I did not proceed to reject the main postulates of genetics, but simply admitted that Soviet genetics was, as a whole, open to certain just

criticisms. For example, there had been no criticism of certain attempts abroad to use genetics as a basis of reactionary eugenic theories and approaches. I admitted, moreover, that my own investigations had not been useful to agricultural improvement; and that Lysenko's efforts to use science to aid the national economy were correct. Comparable speeches were made by Grishko and by Delone. As for Polyakov, on the other hand, he completely rejected classical genetics and pronounced himself a follower of Lysenko. All these speeches were recorded in shorthand, but when we asked to see the records, we were refused. It followed that our remarks were misrepresented in the published account of the meeting. It seems important to mention this, because I have recently found, in one of the issues of the periodical *Ogonyok* (No. 2: 7, 1988), an article by V. Soyfer concerning Lysenko in which a distorted portion of my speech was quoted. This author had probably taken it from the published report of the meeting.

In his concluding comments, Olshansky mentioned that the struggle of the Michurinists with the Weismannists represented a form of the international class struggle of socialism with both capitalism abroad and with some surviving bourgeois ideology lingering in the minds of some Russian scientists. He also declared that a victory of Michurin's revolutionary doctrine over the reactionary ideas of the Weismannists-Morganists was of great importance for the strengthening of the scientific basis of Marxism-Leninism. All persons who continued to support the antiscientific doctrine of Weismann-Mendel-Morgan would be unmasked and ruthlessly persecuted.

After that August 1948 session of the Agricultural Academy and similar meetings held in various cities of the USSR, the victory of Lysenko's doctrine throughout the country was complete. All geneticists who had been teaching in universities or institutes of the USSR were dismissed as being enemies of the doctrines of Michurin, by order of the Minister of Higher Education, S. V. Kaftanov. I, too, was dismissed from Kiev University, where I had been head of the Department of Genetics and Darwinism. All laboratories headed by geneticists were either closed or transformed into the new Lysenko model.

The Department of Genetics in the Institute of Zoology of the Academy of Sciences of the Ukrainian SSR was among those closed, and all its employees were dismissed. I was transferred, in the simple rank of "scientist," to another department of the Institute, where the ecology of the silkworm was being investigated. Later, however, the Presidium of the Academy thrice raised the question whether I ought not to be expelled from the Academy altogether, as being one of the enemies of Michurin's doctrines. Only the support of my Party comrades, those with whom I had worked in the town of Ufa during World War II, saved me from dismissal. I was fortunate, for I emphasize that almost all geneticists in the Soviet Union had a hard time indeed during this period.

All positions formerly occupied by geneticists were then taken either by persons who were ignorant in the field of biology, or by persons who understood that Lysenko's theory was antiscientific, yet nevertheless supported him in order to build their own careers. The well-known sociologist I. B. Bestuzhev-Lada recently wrote about this situation in an article entitled "Truth and Only Truth," which was published in the newspaper *Nedelia*. To quote him exactly:

> T. D. Lysenko took advantage of the atmosphere of repression to make his pseudo-scientific career literally on the bones of real scientists, and destroyed an entire branch of Science. He replaced the real scientist with a gang of his own, some of whom are still alive today.

The level at which "genetics" was taught in the universities and institutes of our country after 1948 may be seen by a glance at a manual written by N. V. Turbin, entitled *Genetics and Selection*, and published in 1950. This book remained an offical manual until 1963, and in some places even until 1968. Such topics as the following were included in the *Manual*: "The struggle of the progressive Michurin theory in genetics with the reactionary genetics of Mendel and Morgan"; "Reactionary distortions in bourgeois genetics originating from the class ideology of the imperialistic bourgeois"; "Complete bankruptcy of modern Morganism in theory and practice"; "The Golden Age of Michurin's genetics and selection in the USSR"; "The August session of the Agricultural Academy

and its importance for the development of biological science"; etc., etc.

Lysenko's doctrines were propagandized in the press on an unprecedented scale, and many who were not biologists but belonged to the higher echelons of power took part in the campaign. So we find the Chairman of the Council of Ministers of the USSR, V. M. Molotov, publishing a paper praising Lysenko. It is sad to relate that many academicians and professors also joined in the campaign.

Lysenko's ideas, which were devoid of any scientific basis, were officially incorporated into agricultural practice. These included such ideas as the rapid production of new plant varieties by proper nutrition, the transformation of varieties of hard wheat into soft ones, the planting of potatoes in the summer, the transformation of plants by means of "vegetative hybridization," and increasing milk fat and the breeding of cows by intensive feeding of mothers. All these measures, pursued on the collective farms for many years, were discredited by their bad results, but Lysenko and his supporters did their best to conceal the real consequences and, by whatever means, to portray them as successes.

With each passing year it became more difficult to hide the complete failure, throughout the entire country, to improve agriculture by means of all the practices incorporated by the direct orders of Lysenko into plant breeding. Then, after the death of Stalin, scattered publications appeared daring to criticize Lysenko's dogmas. Interestingly, it was physicists and chemists who initially spoke out. Later, they were joined by biologists and representatives of progressive agriculture.

It finally became clear that Lysenko and his supporters had destroyed a vital branch of Soviet science and had done great harm to the national economy. The ultimate fall of Lysenko became clear when, in 1965, there appeared an article in *Vestnick [Messenger] of the Academy of Sciences of the USSR* giving an account of the report of a committee that had been checking on the investigations carried out on Lysenko's farm near Moscow. The purported aim of those experiments was to create a new breed of cows by appropriate husbandry. The committee established that there had been clear-cut falsification of records, quite incompatible with the standards of serious scientific work. It should not be overlooked, however, that real genetics began to be restored long before 1965. For example, M. E. Lobashov began to give lectures in modern genetics at Leningrad University in 1957; and the first postwar textbook in genetics, which Lobashov wrote, was published in 1963. Thus, by the early 1960s, investigations in genetics were being carried on in many scientific institutes of our country. In the Ukrainian branch of the Academy of Sciences, the Department of Genetics was restored to being in 1958. In that same year, Professor P. K. Shkvarnikov began to give a lecture course in genetics at Kiev University.

It seems desirable in closing to mention two additional points. First, it is necessary to consider the great harm done by Lysenko to other branches of the biological sciences besides genetics. Second, it is important to draw attention to the existence even today of echoes of the Lysenko doctrine.

The complete domination of Soviet biology by Lysenko's dogma, with its official sanction, excluded any criticism of it for more than twenty years. It led to the destruction of classical and modern genetics and had disastrous consequences for most other branches of biology in the USSR. Microbiology and epidemiology were particularly heavily damaged. Lysenko and his patrons strongly supported the absurd ideas of O. B. Lepeshinskaya, who postulated that new cells may appear not by division of parent cells, but directly from "cell-free" substance. Lepeshinskaya claimed that she had refuted Virchow's doctrine, *omne cellula e cellula* (every cell from a cell), which had been formulated by that distinguished scientist (on the basis of the work of Pasteur, Schleiden and Schwann, and many later cytologists) during the last half of the 19th Century.

Lepeshinskaya considered Virchow's dictum to be a myth invented by a bourgeois idealist. She attempted to prove her theory by experiments in which she ground up the tissues of freshwater hydras as a base for spontaneous generation of new organisms. All her experiments, however, were primitive in nature and were interpreted in ignorance of the vast amount of work done on this issue by other scientists over several centuries. When the results of her investigations were repeated by Soviet and foreign scientists, none of the results she claimed could be confirmed. Sad to say, Lepeshinskaya's absurd theory was praised

highly not only by Lysenko, but by many serious scientists who were in a position to appreciate its absurdity. For example, her theory was supported by Oparin, who had become one of Lysenko's allies; by Professor Makarov, who was working as a cytologist in Leningrad University and who included Lepeshinskaya's theory in his textbook; and by Professor Novikoff of Kiev University (also a cytologist), who understood the foolishness of her ideas but notwithstanding praised her highly in his own book and in public lectures.

In these times there appeared in microbiology a theory proposed by G. I. Boshian, and strongly supported by Lysenko and his patrons. Boshian asserted that under certain specific conditions viruses may become transformed into bacteria, or the reverse. On the basis of this theory he advocated drastic changes in modern medicine, in particular in microbiology and epidemiology. Had these ideas been realized in practice, they would have done great harm to many people. True scientists who tried to criticize Boshian's ideas were severely attacked in the press as enemies of Michurin's biology. Professor B. G. Drobotko of Kiev was among those who suffered. Boshian's doctrine was officially included in microbiology courses in the universities and institutes of the USSR.

Lysenko also brought harm to plant physiology, inasmuch as he denied the existence of the plant hormones that regulate the growth of plants. He called them simply the inventions of bourgeois scientists. This position led the Director of the Institute of Physiology in Kiev, Academician P. A. Vlasyk, to severely attack Professor N. G. Kholodny, who was one of the first scientists in the world to investigate phytohormones. A strong reason to remember the events of Lysenko's domination over Soviet biology is the lingering harmful effect of his ideas right to the present time. They have possessed strong viability.

Like many other university scientists, I often meet people in the USSR who, on account of their practical activities, have something to do with variation and heredity in plants, humans, or other animals and who have a very keen interest in those phenomena, even though scarcely able to understand them. These include such professional persons as agronomists, teachers, veterinarians, and medical workers. I assume full responsibility for stating that many of these workers in applied fields have very dim ideas about the nature of modern genetics and molecular biology. Many of them, indeed, have considered Lysenko's doctrine to be true and useful. One can hardly blame any of these persons, for they were taught by professors and teachers in Lysenko's time.

Even now, among Soviet biologists, one may meet persons who not only share Lysenko's ideas but are still trying to propagandize them in their lectures and articles. In the last two or three years, for example, there has appeared a series of booklets written by Professor B. T. Ioganzen, of Tomsk University, and Professor E. A. Logachev, of the Kemerovo Medical Institute. These authors have tried hard to rehabilitate the main ideas of Lysenko, by combining them with certain concepts of modern molecular genetics. These booklets were widely distributed by the authors to different parts of the country. Such efforts may be dangerous to the minds of unprepared readers, since they create views that do not correspond to the modern state of science and might even be harmful if applied to the practice of medicine or agriculture. Taking this reasoning to heart, three Soviet biologists, Academician L. A. Takhtajan, Corresponding Member of the National Academy of Sciences Y. I. Poliansky, and I myself published in the journal *Priroda* (Nature) a collective review containing a detailed criticism of the booklets written by Iogonsson and Logachev. After this article appeared, we received many letters from readers approving our critique, but also letters of quite another kind, in which the writers accused us of attacking the progressive ideas of Lysenko. The mere existence of such letters demonstrates the continuing vitality of Lysenko's doctrine.

Another example of the long persistence of Lysenko's ideas was recently provided by an article written by A. N. Studitsky and published in "Science and Life," a Russian magazine. During the time of Lysenko's supremacy in Soviet biology, Professor Studitsky was one of his supporters. At the present time, Studitsky has changed his position slightly. He now admits that "Lysenko retarded the development of Soviet genetics by forty years." At the same time, Studitsky continues to believe in the inheritance of acquired characters.

In his article, Studitsky once again cited Kammerer's experiments and other irrelevant

evidence to support his belief. Once again, he attacks modern genetics and highly praises "Michurin's biology." He mentions that he wrote this article under the influence of reading V. V. Dudintsev's novel *White Coats*, a story about Soviet biologists in Stalin's time. Studitsky considers the publication of that novel to have been a mistake, inasmuch as it is not necessary, in his opinion, to rehash the tragic events of forty years ago. I have sometimes heard other persons express similar opinions in ignorance of what happened to Soviet genetics.

The very best answer to all such persons, I think, is to be found in the speech of M. S. Gorbachev at the seventieth anniversary of the Great October Socialist Revolution:

> Even now we encounter attempts to hide away from sick questions of our history, to silence them and pretend that nothing wrong has happened. We cannot agree with such a position. To behave so means to neglect historical truth and [show] disrespect for the memory of the victims of lawlessness and tyranny.