

The fate of Soviet genetics

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The intellectual heritage of the Russian Revolution in the arena of science as in other fields is largely unknown and buried. It has suited the purposes of the ideologues of capitalism to equate Soviet science with the limited and sometimes bizarre scientific results produced in the stifling intellectual atmosphere engendered by Stalinism.

The October Revolution of 1917 gave a tremendous impetus to a new generation of scientists, to the development of new and innovative ideas, and to critical thought and debate. The first workers' state, even though it was fighting for its very existence in the Civil War, encouraged science as well as the arts and literature and enabled outstanding figures to emerge in every field.

Under the Stalinist bureaucracy, which usurped power in the 1920s, the opposite was the case. Just as Stalin and his henchmen brutally murdered a whole generation of genuine Marxists and socialist-minded workers in the mass purges of the late 1930s to consolidate their rule, so they persecuted the outstanding and independent thinkers in all fields.

Science was increasingly prostituted to the narrow opportunist aims of the Stalinist bureaucrats. Opponents of the official "line," whether in physics or biology, were driven from their posts, imprisoned and their works censored.

Nevertheless, for an all-too-brief period after 1917, the new Soviet state provided the first indications of the vast potential inherent in a society based on production for social need, not profit.

Science began to flourish. In 1921 the revolutionary government set up the Foreign Science and Technology Study Bureau to bring the latest scientific advances into the Soviet Union. Scientists were sent all over the world to collaborate with others in their field. Outstanding figures such as the Nobel Prize winning physiologist, Ivan Pavlov, were given financial support and the facilities needed to continue their research.

In 1923, Leon Trotsky, co-leader of the Russian Revolution with Lenin, summed up the intimate connection between science and socialism in a message to the First All-Russian Congress of Scientific Workers: "Socialist construction is in its very essence conscious planned construction, combining--on a hitherto unprecedented scale--technology, science and carefully thought-out social forms and methods of utilising them."

In biology, a new generation of bright young Soviet scientists began to emerge. The Soviet Union was to produce some of its greatest achievements in one of the newest sciences--genetics.

The Soviet state recognised very early the importance of the subject. In 1919, when the country was gripped by famine, Lenin remarked to a leading geneticist N.K. Koltsov: "The famine to prevent is the next one, and the time to start is now!"

Various schools of evolutionary genetics were given the resources to establish research institutes. In the 1920s Soviet genetics advanced rapidly on major theoretical fronts while developing the most advanced scientific methods of breeding plants and animals.

Of the 900 geneticists who attended the Fifth International Congress of Genetics in Berlin in 1927, the Soviet contingent was one of the largest, outnumbering those from the United States and England.

Commenting on the development of Soviet genetics in the 1920s, the

noted evolutionary biologist G.G. Simpson judged in his book *The Meaning of Biology* that out of 18 leading international geneticists, four were from the Soviet Union or had been trained in the Soviet Union.

Soviet geneticists made many outstanding discoveries. In 1925, G.A. Nadson and G.S. Filippov were the first to artificially induce a mutation in an organism. In 1927 G.D. Karpetchenko was the first scientist to produce a cross between two different plant species, the radish and cabbage.

Another Soviet scientist developed the technique of artificially inducing a polyploid, that is the doubling, tripling and so on of a plant's chromosomes--the structures in the cell nucleus which carry the genes. This technique greatly increases a plant's size and is now a common method for increasing yield.

In 1927, N.K. Koltsov was the first scientist to postulate that inheritance was controlled by a self-replicating chemical using a template mechanism. His theoretical insight was a brilliant anticipation of the discovery of the structure of DNA, which did not take place until 1953.

One of the most brilliant Soviet scientists during this period was N.I. Vavilov, an agricultural scientist and plant breeder.

In 1919, Vavilov set up the Laboratory of Applied Botany in Petrograd, which was to stimulate a vast growth of research into plant breeding. He became the first president of the Academy of Agricultural Sciences in 1929.

One of his chief aims was to obtain a definitive collection of the world's cultivated plants. Vavilov and his fellow scientists accumulated 350,000 cultivated plants--the largest collection in the world.

Vavilov's institute mounted major expeditions to obtain plants in the Soviet Union and internationally. Vavilov visited Afghanistan in 1924, toured the countries surrounding the Mediterranean in 1926, went to China, Japan and Korea in 1929 and the following year visited North and South America.

The plants collected in these expeditions became the basis of an extensive breeding program, designed to improve characteristics such as yield and resistance to drought and insects. The resulting plants were assessed in numerous testing stations across the USSR--covering a range of Soviet soil and climate types. The varieties displaying the best characteristics were then released to farmers.

Vavilov's expeditions were guided by a deep theoretical insight into the evolution of cultivated plants. Vavilov became known internationally for two achievements.

The first was the law of homologous variation. Vavilov made a study of the different varieties of wheat, barley and rye and noted that certain characteristics were held in common by the various cereal species. He was able to predict theoretically that a number of characteristics found in one species of cereal, for example wheat, would be discovered in other species of cereal, for example, barley. The predicted varieties were later discovered by his expeditions.

The second achievement concerned the origin of cultivated plants. Vavilov postulated that agriculture originated in mountain valleys. He went on to predict that these areas would contain many previously unknown varieties which would make valuable breeding material. This also proved to be the case. Vavilov discovered that the various bread-

making varieties of wheat originated in Iran and the macaroni varieties of wheat in Turkey and Armenia. He found the original home of the potato and maize in the Americas, and of oats in the mountains of northern Spain.

By the late 1920s, however, the intellectual climate in the Soviet Union had already deteriorated. The situation facing Soviet scientists and geneticists in particular dramatically worsened.

In 1929 the eminent Soviet population geneticist S.S. Chetverikov was arrested and exiled to the Urals. He was never to work in his chosen field again. Chetverikov's arrest coincided with a developing crisis in agriculture.

From the early 1920s, Trotsky and the Left Opposition had warned of the dangers of fostering the growth of a layer of rich peasants at the expense of agriculture as a whole and of industrial development.

By the end of the decade, the Stalinist bureaucracy, faced with the withholding of produce by wealthy peasants, and armed revolts in the countryside, turned to a brutal policy of forced collectivisation. Peasants burned their crops and killed their animals rather than submit to the orders of the Stalinist regime. Agricultural output plummeted.

In response to the crisis, Stalin began to demand that geneticists develop crop plants more rapidly to solve the problems of famine. Careful scientific work was sacrificed to political expediency. The Stalinist bureaucrats became increasingly impatient with the painstaking methods that scientific breeding required. The actual crossbreeding of varieties and the subsequent testing of the new plants could take as long as a decade.

The Soviet bureaucrats wanted quicker results and turned to breeders who told them what they wanted to hear, no matter how implausible their methods. Under these conditions, T.D. Lysenko, a plant breeder from Odessa, was promoted to the highest posts in the field, destroying many of the gains made by Soviet science.

Lysenko promised a rapid increase in crop yields. He is best known for his fraudulent claims that yield could be increased by a process he called "vernalisation". Contrary to scientific knowledge at the time, Lysenko asserted that one species could be directly converted to another by subjecting it to external influences.

Lysenko claimed that through vernalisation one species of wheat--winter wheat--could be transformed into another--spring wheat. He germinated the winter wheat and then subjecting it to very low temperatures to halt its growth until it was sown in spring. Lysenko believed that the shock of the cold would cause the transformation from one species to another, and produce greater yields.

Vernalisation was introduced on state farms without any testing. A plant breeder from Vavilov's institute set up a five-year test from 1931 to 1935, proving that vernalisation had no effect on yields. Yet these scientific results were ignored, and Lysenko's followers went on to make more and more grandiose claims--that wheat could be transformed into rye, barley into oats and cabbages into swedes.

Lysenko's crackpot ideas were not subjected to scientific scrutiny either in the Soviet Union or internationally. He was elevated not because his ideas had any scientific validity, but because his claims fitted the propaganda requirements of the Stalinist bureaucracy. Lysenko's ideas of rapidly expanding agricultural production dovetailed with the falsified statistics used by Stalin to demonstrate the advances under his regime.

Lysenko was effectively resurrecting the theories of Lamarck--the French biologist who, prior to Darwin, claimed that evolution was the result of acquired characteristics. For example, Lamarck argued that the neck of a giraffe had lengthened during its lifetime to reach the top leaves of trees and this characteristic was then passed on to the next generation.

Darwin demonstrated that evolution was a process of natural selection over many generations. In the case of the giraffe, those individuals born with longer necks were better able to feed themselves and therefore survive in the environment of the African grasslands.

Lysenko had a complete disdain for any theoretical questions. He wrote: "Can such a situation arise in science where theory has made some kind of advance, a step forward, but practice derives no benefit from it? From childhood I have never understood how it could happen, and never tolerate people trying to demonstrate to me that such fruitless theoretical achievements with no practical value are worth anything at all."

The job of attempting to theoretically justify Lysenko's work was taken up by Prezent from Leningrad University. He claimed that Lysenko was the direct successor of Darwin.

Prezent accused the geneticists of being "Morgano-Mendelian-Weissmannites". In this denunciation Prezent was referring to three great scientists who had laid the foundation for modern evolutionary biology and genetics.

August Weissmann working at the end of last century, determined that chromosomes controlled inheritance in the cell. Gregor Mendel was an Austrian monk who discovered the laws of inheritance in the 1850s. His work was ignored at that time and only rediscovered 45 years later. The most significant of the Mendelians to emerge in this period was T.H. Morgan, an American scientist who pioneered the use of the *Drosophila* fruit fly in genetics and showed the importance of mutations in evolution.

Prezent's attacks were based on such scientific ignorance that some of Lysenko's supporters even denied the existence of chromosomes. As for genes, they were denounced as "bourgeois constructs".

Prezent's onslaught on scientific genetics was not simply the outcome of the Stalinist bureaucracy's response to the crisis in Soviet agriculture.

During the 1930s, there was a growing socialist-based opposition to the regime. Determined to cling onto power, Stalin resorted to increasingly repressive measures. In 1937 he made his infamous "enemies of the people" speech, launching the Moscow show trials. All the outstanding leaders of the Russian Revolution were found guilty of betraying the revolution and then executed.

In the purges that followed an estimated 800,000 to 900,000 people were killed. Stalin's chief targets were the genuine revolutionary Marxists led by Leon Trotsky and the Left Opposition. But the repression extended to broad layers of intellectuals and workers, including some of the finest representatives in the fields of science, art and culture.

Stalin was determined to stamp out any independent or critical thought. It was only in such an atmosphere that charlatans like Lysenko and Prezent were able to dominate the field of biology.

In 1933 Vavilov was called before Stalin's Central Committee and was forbidden to continue travelling. He was denounced in *Pravda*, the central organ of the Communist Party, for not doing any practical work and not producing any new plant varieties. Vavilov was also condemned for being a pre-World War I student of the English geneticist William Bateson--one of the scientists who had championed Mendel's laws of inheritance.

The year 1937 saw widespread arrests of geneticists who were now referred to as "Trotskyite agents of international fascism". The Seventh International Congress of Genetics, which was to be held in Moscow with Vavilov as chairman, was cancelled. Lysenko did not dare subject his ludicrous schemes to close international scrutiny. The Soviet scientific and popular press launched a bitter attack on Vavilov and his supporters. Genetics was declared as "a maidservant of Goebbels' department" and geneticists denounced as "knights of the gene".

In spite of these vitriolic attacks, Vavilov continued to conduct a polemic against Lysenko and his supporters, demonstrating theoretically and practically that his methods were wrong.

In an address to the All-Union Institute of Plant Breeding (AIPB) in 1939, Vavilov stated: "It must be said that the discord is very serious. I cannot go into details here, but shall simply say that there are two positions: that of the Odessa institute (Lysenko) and that of the AIPB (Vavilov). It should be noted that the AIPB position is also that of contemporary world science, and was without doubt developed not by

fascists, but by ordinary progressive toilers...

"And, if we had here an audience of the most outstanding breeders, practical and theoretical, I am sure they would have voted with your obedient servant and not with the Odessa institute. This is a complex matter. It is not to be solved by decree of even the Commissariat of Agriculture. We shall go to the pyre, we shall burn, but we shall not retreat from our convictions. I tell you, in all frankness, that I believe and insist on what I think is right, and not only believe--because taking things on faith in science is nonsense--but also say what I know on the basis of wide experience. This is a fact, and to retreat from it simply because some occupying high posts desire it, is impossible."

Vavilov was arrested in 1940. On July 9, 1941 he was sentenced to death. His institute was dispersed and its farms and other properties seized by local authorities. Vavilov died of cardiovascular failure and dystrophy, as a result of solitary confinement in prison, on January 26, 1943. The fate of Vavilov was suffered by a whole generation of geneticists. Any further development of genetics in the Soviet Union was impossible. Not only Soviet science, but world science was the poorer.

The pall of Stalinism had a similar impact in other areas of science. Scientific thought was subordinated to the immediate needs of the Stalinist bureaucracy. The traditions of the October revolution, which had encouraged and fostered scientific debate, were trampled on. Bright and creative scientists were replaced by the second-rate, the charlatans, and the yes-men.

All of this was not the product of socialism or Marxism but of its opposite--Stalinism.



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