

Growth factors

Putting the ideas of Russian agronomist Trofim Lysenko into political and scientific context.

The Lysenko Effect: The Politics of Science

by Nils Roll-Hansen

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The theories on plant breeding, hybridization and selection propounded by Trofim D. Lysenko from the mid-1920s became a *cause célèbre* in international scientific circles. In 1948, his views were enshrined as the official basis for the Soviet Union's agricultural policy. As the Cold War was reaching its height, the West held up the Lysenko case as a perversion of the liberal view of science as an autonomous enterprise into a 'socialist' view of science controlled by authoritarian and repressive political figures.

A cornerstone of Lysenko's plant-breeding programme was 'neo-lamarckism', the idea that changes to an organism during its lifetime can be transmitted to its offspring. This notion was highly controversial both inside and outside the Soviet Union, and by the mid-1930s it had been rejected by most Western biologists. How a whole agricultural programme came to be based on theories rejected by the rest of the world's biologists is a question that has intrigued historians ever since.

The problem with the traditional historiography of the Lysenko case is the view that Lysenko's science was bogus quackery from the beginning; that it was imposed from the top by Stalinist terror; and that biologists and agronomists in the Soviet Union were 'eliminated' if they voiced any criticism.

In *The Lysenko Effect*, Nils Roll-Hansen does not apologize for some of the worst transgressions of 'lysenkoism', but after a close reading of much of the published primary literature, as well as the extensive use of newly opened archives, he is able to paint a much more complex picture. He has achieved what no previous author has attempted: to take seriously the science propounded by Lysenko, and to understand how the debates within Soviet scientific and agricultural circles were framed in the light of the prevailing biological theory. The result is a refreshing look at a familiar but traditionally misunderstood episode in the history of science that has relevance for discussions about the organization of science, science policy and the relationship between scientific theory and technological practice today.

According to Roll-Hansen, to understand



Taking root: the policies of Trofim Lysenko (left) were officially approved by the Soviet Union in 1948.

Lysenko's rise to prominence it is necessary to separate his work in plant physiology from his later anti-mendelian and neo-lamarckian theories. Roll-Hansen provides a detailed examination of Lysenko's background and early research, set in the context of the history of work in Russian plant physiology. The factors stimulating germination and early flowering in a wide variety of crop species had attracted considerable research interest in Russia and Germany in the late nineteenth and early twentieth centuries. One of the key debates that had emerged by the 1920s was between proponents of day length (photoperiodism) and exposure to cold temperature (vernalization) as the major factors stimulating early germination and, more importantly, flowering.

The 1917 Bolshevik revolution and subsequent civil war disrupted agriculture, and by 1921, food shortages were acute. The critical problem for Soviet agriculture was to increase yield, both by learning how to manipulate environmental conditions and by developing genetic strains that could flower early and thus produce two crops in a season. Cold treatment had long been known to affect flowering time, but it was not clear precisely how best to use it;

moreover, what worked for one strain in one locality did not necessarily work elsewhere. For a country where much of the arable land lies above the latitude of Minnesota, these are not inconsequential issues. It was in the context of this debate in the early 1920s that the young Lysenko made his scientific debut.

Despite coming from a peasant background and being largely self-educated, Lysenko graduated from the Kiev Agricultural Institute in 1925. His early papers on plant physiology, particularly vernalization, were not groundbreaking, but they attracted the attention of Nikolai Vavilov, the leading figure in Russian plant biology and agriculture at the time. Vavilov became a staunch supporter of Lysenko's work until the late 1930s. Lysenko eventually linked vernalization and selection to create genetically stable lines of early flowering varieties, and to bring flowering times into synchrony so he could make hybrids between strains from different areas with different flowering times. It was when he sought to convert one strain into another by 'education' — that is, by repeated exposure to low temperatures so that the plant's acquired adaptation to cold eventually becomes inherited — that his

theories ran counter to established biological opinion. However, by recognizing Lysenko's prominence in plant physiology, Roll-Hansen shows why his genetic theories were not so easily dismissed.

The book is strongest in its analysis of the events and trends leading up to the Second World War; the post-war period and the final enshrinement of lisenkoism in 1948 are treated more sketchily. Roll-Hansen gives a prominent place to Marxist philosophy of science in framing debates about agricultural policy and practice. He shows convincingly that Marxist philosophy was not mere window-dressing for many biologists in the Soviet Union at the time, but represented a distinct world-view that many scientists tried to put into practice in their work. In this sense, Roll-Hansen follows and extends the earlier work of Loren Graham, who was one of the first Western historians to seriously explore the role of dialectical materialism in Soviet science. Ironically, it was Lysenko's failure to apply the dialectical method rigorously to his own work that ultimately led to his failure to revolutionize Soviet agriculture.

Throughout the discussion, Roll-Hansen emphasizes both the need to increase production on the farms and the importance, in Marxist terms, of the unity of theory and practice. Soviet agronomists often complained that academic scientists were "obsessed with fruit-flies" and had little interest in the crops needed for the rapid improvement of agriculture, and even less interest in peasant farming practices. Unlike many researchers of the time, Lysenko portrayed himself as a practitioner, a man of the people who sought to use the experience of the masses to improve both his theories and his practical breeding programmes.

Roll-Hansen also emphasizes the controversies that existed within Soviet biology and agriculture about mendelian theory. As he points out, none of these issues was peculiar to Soviet biology. Many of Lysenko's ideas about phenotypic plasticity, the physiological aspects of development, and the over-simplicity of the atomistic mendelian gene were remarkably similar to those of Richard Goldschmidt in Germany, Ross Harrison in the United States and Albert Dalcq in Belgium. Similarly, neo-lamarckism retained a strong following in this period in France and Germany. Even in the United States, where mendelian theory had been accepted early on, its application to agriculture had barely begun to yield results.

Particularly problematic for Soviet geneticists was the association of mendelian theory in the West with opposition to the darwinian theory of natural selection and with eugenics. Darwinism, with its emphasis on variation and selection, had received strong support in Russia since the nineteenth century. Mendelian genetics, which emphasized the stability of the gene, and Wilhelm Johannsen's pure-line experiments, which showed the limits of selection, were seen as contradictions to Darwin

that undermined its application to agriculture. The fact that many supporters of classical genetics had also supported eugenics did not place mendelian theory in a particularly favourable light: it was held up as an example of reductionistic, atomistic, bourgeois science.

In his concluding chapters, Roll-Hansen describes the debate about Lysenko's programmes throughout the 1930s and 1940s. Questions were raised about how valid his practical results really were (he was accused of over-optimistic reporting, if not the outright falsification of field results), about the demonstrability of lamarckian inheritance, and about his frequent refusal to deal with criticism. In the years immediately after the war, various groups in the scientific community severely criticized Lysenko's work and sought to have his policies marginalized. It was only the heightened tensions of the Cold War and Stalin's personal intervention that turned the tide. Lysenko's theories and policies were finally given official sanction at a 1948 meeting

of the Lenin Academy of Agricultural Science. By this time many of his opponents had been silenced through arrests or imprisonment.

The one deficit in this otherwise fine book is the lack of integration between the scientific and political backgrounds. Earlier treatments of the Lysenko episode emphasized the political to the virtual exclusion of the scientific, but Roll-Hansen goes in the opposite direction. His choice of focus adds important new information and analysis, but it is not clear, for example, in the few pages devoted to events leading up to the 1948 congress, what role Stalin and the Central Committee of the Communist Party actually played, or how the tide turned so rapidly in favour of Lysenko.

Roll-Hansen has made a major contribution to our understanding of the Lysenko case. His book is a significant addition to the literature on Russian biology, genetics and agriculture. ■ Garland E. Allen is in the Department of Biology, Washington University, St. Louis, Missouri 63130, USA.

The bigger picture

Art and Science

by Siân Ede

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Ingeborg Reichle

Is science the new art? With this provocative question, Siân Ede, arts director of the UK branch of the Calouste Gulbenkian Foundation, draws us into her latest work, *Art and Science*. In this intelligent and stimulating book,

Ede examines the diverse responses of contemporary artists when they are faced with recent scientific and technological advances. She likewise looks at contemporary science, where the search for truth and beauty, and the production of compelling images, seem to suggest an almost artistic endeavour.

Ede contrasts selected works of contemporary art with recent scientific developments to demonstrate that art today not only serves



Alexis Rockman's painting *The Farm* questions the future of genetic engineering.

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