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SCIENCE IN THE U.S.S.R.

SOVIET BIOLOGY[1]

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AT the time of the tenth anniversary of the October Revolution in 1927, I was in Moscow; I awakened each morning in the little glass-sided cupola on top of the palatial and elegant mansion which had now become the Institute of Experimental Biology. My first impression was one of familiarity, of at-homeness, for this was a genetics laboratory, filled with the sights and smells associated with the little fly, Drosophila, which breeds in its thousands in the milk bottles of fermenting food which line all the genetics laboratories in the world. But in the farther distance, through the windows, were the spires of Moscow, and these and the physical world they represented were utterly strange and new to me.

This alternation of strangeness and familiarity must have struck many American visitors to Russia, and it persists when we try to examine the scientific achievements of the Soviet Union or indeed of any country not our own. For any modern science is in some sense the same wherever we find it, a part of one interconnected whole resting on common basic principles, with a common past and a common future, and it is artificial and deceptive to try to break it into separate national entities. And yet, just as the history of science consists in part of the achievements of individuals, so also it rests on the contributions of groups of persons with common purposes and common methods, and oftentimes the character of these groups is determined by the physical, economic and social milieu. It was unquestionable that the society behind Soviet biology was very different from that found in Europe and America, and this, together with the temperament, traditions and outlook of the Soviet scien-

[1] Address at the Science Panel of the Congress Celebrating the Tenth Anniversary of American-Soviet Friendship, New York, November 7, 1943. The complete proceedings of the Science Congress including the Medical Session will be published at a later date by the National Council of American-Soviet Friendship.

tists lent a distinctly Russian flavor to their joint work. There was too a kind of revolutionary tinge about their manner of approach to some of the problems of biology. Whereas Westerners were inclined to go in through the traditional front door, our Soviet colleagues seemed at times to break in through the back door or even to come up through the floor.

Thus it comes about that it is possible to speak of "Soviet" biological research and to single out for comment a few of its characteristics. I should like it understood that I do this from a very limited knowledge of Soviet biology which covers a vast field and that I can speak with confidence only about work which is closely related to my own field.

The qualities in Soviet biological research which have struck me most are first, from the purely scientific side, its vitality and activity, and the atmosphere of eagerness, modernity and novelty which has surrounded it. To the outsider looking in it has had aspects of youth and originality which have never attached, for example, to the scientific renaissance which was taking place at about the same time in Japan. In the second place, one Westerner at least has noted the peculiar and almost paradoxical combination of philosophical and theoretical impetus with which practical purposes are pursued. On the organizational side, the peculiarity of Soviet biology is of course that it is centrally planned and administered, chiefly through the Academy of Sciences, that its purpose is not only to discover new knowledge but to penetrate the whole life of the community. It is thus of very great scope both with regard to the numbers of persons engaged in it and in its institutional and geographic connections.

The great vitality of Soviet biology is nowhere better evidenced than in my own field of genetics and its close relative, cytology. Here there is no doubt that the most important contributions have been coming from the U. S. A. and U.S.S.R., and in the number of workers, of institutes and in quality of work these two countries are comparable. Genetics has been recognized in Russia as one of the disciplines underlying agriculture and medicine and has received a large measure of support. Professor Koltzoff, director of the Institute of Experimental Biology in Moscow, told me of how he traveled to Leningrad during the famine of 1920 with Lenin and some other members of the Central Executive. Lenin was to urge upon the responsible committee the diversion of some of the funds set aside for famine relief to the construction of a research institute for seed selection and plant breeding. "The famine to prevent," said Lenin, "is the next one and the time to begin is now." He carried his point and there was built with emergency funds the great Institute of Applied Botany which under the direction of Nikolai Vavilov became the center of the greatest plant breeding and seed selection service in the world. Vavilov himself became the world authority on the history of crop plants.

In 1921 also the American geneticist, H. J. Muller, took to Moscow strains of the vinegar fly *Drosophila* and there grew up the greatest center of theoretical research in this field outside of the United States. Although the impetus came from America, the Soviet workers soon took their own line, and there was founded under Tschetverikoff the important new field of population genetics for the study of the distribution of new hereditary characters in nature. In the hands of Dubinin, Timofeef-Ressovsky and Dobzhansky, the latter now in the United States, this developed into the most important new experimental approach to the problems of evolution. Out of Soviet genetics have come also new ideas of chromosome structure, of the origin of mutations and new ideas on the arrangement and relations of the hereditary particles, the genes, by very many workers. By 1940 Moscow had in fact become one of the most important centers of work of this kind.

The comparative scope of genetical work in the U.S.S.R. and the esteem in which it is held is illustrated by the fact that in this third year of Russia's participation in the war, she is still the largest foreign subscriber to the chief American scientific journal in this field. More copies go to the U.S.S.R. than to all other foreign countries. Moreover, a standard American text-book which appears in the United States in editions of 2,000 copies is printed in the U.S.S.R. in editions of 15,000.

The spirit in which the Soviet scientists carried on their studies in the difficult days just after the revolution is again in evidence to-day. After the fall of Kiev I received a letter from Professor Gershenson, director of the Genetics Institute of the Ukrainian Academy of Sciences at Kiev, telling of the destruction of the institutes and the loss of the libraries. The personnel had been evacuated to two small towns, one in the Urals and one in Turkestan, and there they were continuing their work. They needed, he wrote, recent American publications and some stocks of Drosophila. We are now collecting books and journals to send to replace those destroyed by the Nazis.

There are to-day literally hundreds of trained genetical investigators in the U.S.S.R., certainly more than in any country outside of the U. S. A. They had already outstripped the Germans in this field even before the advent of Hitler put the quietus on German genetics. Soviet theoretical genetics has developed in close connection with practice, especially with agriculture and medicine, and has been continually

aware of the relationship between its own theoretical structure and the social theory on which the development of the U.S.S.R. has itself been based.

Other aspects of biological research which have shown great expansion and activity include the remarkable outburst of exploring and collecting zeal by which the animals and plants of the vast and varied autonomous republics and of China became known. This began immediately after the Revolution and has resulted in a great enrichment of the museums and in works of first-class importance by both zoologists and botanists. At the same time there began the development of institutes of experimental biology from which has issued important work in experimental morphology, on the analysis of growth, in endocrinology, in physiology and in biochemistry. In the latter field for example the discovery that the contractile protein, myosin, which is the basic component of muscle, acts as an enzyme, was of first-rate significance; while we all have increasing reason now to remember that much of the pioneer work on blood transfusion and plasma storage was done in the Soviet Union. The methods of artificial insemination, now used extensively in Europe and America, were developed almost wholly by Russian workers. It was estimated in 1941 that 50,000,000 farm animals in the Soviet Union alone had been produced by artificial insemination.

In recent years there have appeared in the Russian scientific literature new hybrid names indicating the fusion of independent scientific disciplines to focus on problems which transcend particular fields. Such is biogeochemistry, as conceived by Vernadsky and his group of the Biogeochemical Institute of the Academy of Sciences at Leningrad. Vernadsky took as his field the distribution of chemical elements due to living organisms in the biosphere and has added greatly to our knowledge of the chemistry of alluvial soils and the chemical composition of organisms.

Biological progress in the Soviet Union has not been achieved without cost and sacrifice. At a time when food was scarce they still spared some for their experimental animals and for costly scientific equipment. They took the means to build up science literally out of their necessities, not, as we have done, out of our surplus; and they had only themselves to look to, for the great foundations, which poured their funds for pure research so generously into Germany and western Europe, were never able to make the same arrangements in or for the Soviet Union. Yet in the U.S.S.R. was what in 1927 seemed to me to have been the greatest potential source of new scientific strength in the old world.

Some part of the cost was paid too in the creation of the central control of science which led to what we call red tape and the Russians "spoiling paper," and to an appearance of arbitrariness whenever decisions are made by a central authority. I have no doubt there was wailing and gnashing of teeth on the part of the individual investigators when before the war one of the great biological institutes was suddenly moved from near Leningrad to Moscow, but in view of what the Germans did to Leningrad, I can not believe that the regret of those biologists has survived to the present. These costs, together with other and greater ones, have been and are being paid, and we can now see that not only Soviet citizens but those of all countries stand to reap the benefits.

The progress of biological research in the Soviet Union has taught us a very valuable lesson. It is that control and organization of science by and for the whole community does not kill the scientific spirit or initiative nor submerge the individual scientist in a dead level of anonymity. Great individuals have arisen in Soviet biology, fine discoveries have been made and continue to be made even in the midst of war. Ivan Pavlov, one of the greatest of Russian biologists, began his scientific life under the old régime, but he lived to refute both in word and in deed the dire prophecies of those who said that great scientists and a vital and vigorous science could not survive in a socialist state.

For the sake of biological science itself, we biologists should use all our efforts to see that the barriers which separated Soviet biology and biologists from us should never again be allowed to prevent the free flow of persons and ideas, both scientific and social, on which the progress of science and of society depends.

RUSSIAN EXPLORATIONS[1]

By Sir HUBERT WILKINS

THERE have been many great Russian explorers, and the framework of Soviet Russia's exploration was laid down long before the advent of the Soviet Union.

Under the direction of the leaders and organizers of the Soviet Union the platform for exploration, as well as for many other scientific and cultural institutions, was preserved and they have been built up expertly and vigorously by Soviet scientists.

In recent years Soviet explorers have been especially active. I venture to say that in no other country has exploration and the exploitation of the results of ex-

[1] Address at the luncheon of the Congress Celebrating the Tenth Anniversary of American-Soviet Diplomatic Relations, New York, November 6, 1943.