grade containing some of the o,p′ isomer apparently reacting the same as pure p,p′-DDT. In dried orange and alfalfa meals having zero blanks, added DDT up to 1,000 ppm gave recoveries of the same order, 90–96 per cent. Routine use of the method on dried meal products from experimentally sprayed crops has reproducibly indicated residues of 1–9 ppm.

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Properties of a Virus Inactivator From Yeast

A virus inactivator from yeast has been reported earlier by the undersigned (*Science*, 1942, **95**, 586–587). Simple methods of isolating it and some of its properties have been described in the same publication. From the analysis of its constituent elements, the ratio of C, H, and O, and some qualitative chemical tests, it was believed that the substance is a polysaccharide. Since these results were reported, additional properties have been found and are recorded here.

The virus inactivator was hydrolyzed by heating with 5 per cent HCl or H_2SO_4 until foaming ceased (about 2 hours). The per cent reducing sugar calculated as glucose (Somogyi-Shaffer-Hartmann method) in the neutralized hydrolysate was 85 with HCl and 88 with H_2SO_4. Osazones indistinguishable in appearance from glucosazone were formed in abundance from the hydrolysate, further supporting the view that the substance is composed largely of carbohydrates.

The 12–15 per cent noncarbohydrate residue suggested the possibility that the inactivator may be a glucoside. However, the enzyme, β-glucosidase, prepared according to the procedure of Sumner and Howell (*Laboratory experiments in biological chemistry*. New York: Academic Press, 1944) from fresh almond meal, failed to hydrolyze it or to impair its activity against tobacco mosaic virus.

Longsworth scanning diagrams of a purified solution of inactivator run in a Tiselius electrophoresis cell at pH 7.5 showed but one boundary, indicating that the sample was electrophoretically homogeneous. A mixture of tobacco mosaic virus and a concentration of inactivator sufficient to render 98 per cent of the virus inactive showed two boundaries, one for excess inactivator and a second for inactive virus. A control scanning diagram of tobacco mosaic virus alone could be superimposed on the boundary of the inactive virus, showing that the net charge of the virus particle is not altered by the action of the inactivator. This fact is interpreted to indicate that a general adsorption phenomenon, in the sense that large areas of the virus particle are coated with the inactivator, is not involved; rather, the reaction is presumed to be more selective.

Electron micrographs (RCA Electron Microscope Model B) of purified tobacco mosaic virus which had been inactivated by the yeast inactivator showed no detectable evidence of disintegration or other gross change.

The above results provide further evidence that the inactivator is a polysaccharide and that inactivation is probably brought about by a reaction involving the inactivator and some group in the virus particle which is necessary for its infectivity.

A portion of this work was completed in the laboratories of the Departments of Plant Pathology and Biochemistry, New York State College of Agriculture, Cornell University, Ithaca, New York.

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Book Reviews

The new genetics in the Soviet Union. **P. S. Hudson and R. H. Richens. Cambridge, Engl.: Imperial Bureau of Plant Breeding and Genetics, 1946. Pp. 88. 6s.**

Here is a long-awaited and greatly needed study of the extraordinary developments connected with the name of the Russian agronomist, T. D. Lysenko, from which arose the now famous Genetics Controversy which rocked Soviet biology and aroused the interest of the whole scientific world. What was needed was a sober, careful description of the facts and a reasoned analysis of the interpretations which gave rise to the controversy. This difficult task has been accomplished so well by the two British authors that the importance of their book transcends the limits of this particular controversy and of genetics. It is a contribution to the methodology of scientific discourse which may be read with interest by scientists and philosophers generally. Coming as it does on the heels of the appearance of Lysenko's chief theoretical treatise (*Heredity and its variability*. Translated by Th. Dobzhansky. New York: King's Crown Press, Columbia Univ., 1946; see *Science*, 1946, **103**, 180), it will hasten and facilitate the judgment of scientists on one of the most remarkable controversies of our time.

The study is based on an examination of the original publications, most of them in Russian, in which, between 1932 and 1944, appeared the experimental evidence, theoretical discussions, and polemics of the Lysenko school and its opponents. In addition, the sources of Lysenko's ideas have been traced by reference to the works of Darwin, Naudin, Timiriazev, Burbank, Michurin, and others. These citations, together with a few from modern non-Russian sources, bring the bibliography up to some 300 titles, each with complete listing of author, title, and source in original language and English. There is good evidence that these works were carefully combed and con-

scientiously used. All important statements attributed to the authors quoted are printed both in the original language (usually Russian) and in English, and much of the critical data are translated and reproduced in tabular form so that these can be judged by those unable to read or to consult the Russian original.

In all of this careful work the authors have maintained an objective, judicial, and respectful attitude against which the charge of prejudice cannot be sustained. For this reason the general verdict of "not proven," which they pronounce upon nearly all of the claims of the Lysenko school, will command respect both in the Soviet Union and in other countries.

It was a sound idea to begin this work of assessment by sketching some of the 19th-century views of the origin and transmission of hereditary variations, for after the recital of the speculations of Darwin and later horticulturists such as Michurin and Burbank, the reader finds nothing novel about Lysenko's ideas except the strange and unscientific language, the vehemence with which they are stated, and the vigor of his attack upon Mendelism. It even appears that the central corpus of Lysenkoism did not appear until he became associated with Prezent in 1935. Thereafter the authors generally refer to Lysenko and Prezent, attributing to the latter the chief dialectical and theoretical elaboration of Lysenko's system.

It was useful, too, to preface an examination of Lysenko's ideas by a discussion of the philosophy which animates them. Hudson and Richens' description of dialectical materialism and its application to natural science is a kind of tour de force of brevity and conciseness; and while many of the critical statements are inadequately justified, the authors have clearly stated the elements essential for understanding the dialectical basis of the work of Lysenko and Prezent and their school.

Western scientists may well be amazed by some of the methods of discourse adopted by that school, for there, in the midst of a society recently founded in revolution, the appeal to authority becomes a common device. "This erection of Darwin's work to the status of a canon and the grave distrust with which critics of its contents are regarded is one of the strangest developments of genetical science in Russia. It is impossible to avoid comparing this form of Darwinian exegesis with the extremely literal interpretation of the Bible practiced by Christian fundamentalists" (p. 25).

How Lysenko's followers used these methods is well illustrated in their attempt to discredit Mendelism, for they made of Mendelism, which has grown and changed a good deal since Mendel's time, a dogma in the image of their own rigid theory and then attacked it with the same weapons by which theirs is to be defended: appeal to authorities—Darwin, Michurin, Marx, Lenin; outlawing of heresy as antidialectical; impugning of motives of opponents and association of opponents' ideas with other repugnant views (Mendel-Morganists are bourgeois, fascist, believers in race inequality etc.); and appeal to practical usefulness. Lysenko's strength in Russia came from the fact that some exponents of Mendelism in other countries, e.g. Germany, were actually fascists, practiced race prejudice, and were not animated by a desire to have their science serve human needs. It is clear that his arguments often were not addressed to scientists in his own or other countries but to the mass of Russian peasants and workers who have responded by granting him great political power.

The main body of the book is concerned with a detailed presentation of the facts underlying Lysenko's theories under 12 headings ranging from genetics of earliness to graft hybridization, and with the interpretations applied. In every case except one it is concluded that the point is not proved or, if proved, is not new. The exception is graft hybridization, in which it is judged that "the evidence for genetic interaction between stock and scion is not compelling but suggestive. Further experiments are needed before a conclusion can be reached" (p. 51).

The interpretations of the Lysenko school are carefully examined. It is pointed out that "the whole of Lysenko's genetical system is permeated with the Darwinian notion that adaptation to environment is the key to the understanding of all biological variation. Conversely, as Lysenko and Prezent frequently point out, plants by becoming adapted to certain environmental conditions through natural selection, come, by means of this same process to have certain biological requirements in respect of the environment. Translating this concept into Lysenko's terminology, plants may be said to need or demand appropriate nutrients, this demand having arisen through natural selection. Extending this concept further, Lysenko states that this demand for certain nutrients may be further sharpened by natural selection, so that, when various nutrients are present, the plant is able to absorb and assimilate those nutrients which are biologically advantageous and to reject the rest" (p. 58). This is the essence of Lysenko's nutrient theory, the central concept of plant development from which all his genetical ideas are derived. If it sounds more reasonable in these words of Hudson and Richens than in those in which Lysenko stated it in his 1943 paper, we have only to turn over a few pages to the section on analysis to find the British authors proving that not only does the theory lack factual support but has inconsistencies within itself and is actually antidialectical. Here the critics have met Lysenko and Prezent on their own ground and have borne away the palm.

This whole section may be read as one of the best examples yet provided of the interplay of Marxian dialectic upon scientific facts. Although the authors show that this effort has not produced a "New Genetics," they also show why such experiments in methodology which have infiltrated and conquered one section of Soviet agronomy are not to be summarily dismissed or disregarded. It is surely better for science that Lysenko's claims have now been exposed and rejected after a full and sober examination.

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