

is not repulsed by the nucleus and has therefore great penetrating power. Fermi has shown that all the elements from 7 to 72, when bombarded with neutrons, give radioactive products, whereas only the first twenty are disintegrated by charged particles.

Isotopes with different radioactivities but alike in both charge and mass are rarely encountered among natural radioactive products but can now be produced artificially. The difference between these so-called nuclear isomers is one of energy content. Interesting examples are given by the bombardment of indium by fast neutrons. The rather complex results, which are not all radioactive products, are illustrated diagrammatically. The nucleus, which is at first excited to a higher energy-level by impact with the accelerated neutron, may return to the ground state by losing γ -radiation; but more frequently β -radiation is observed instead, the emitted electron being orbital and not nuclear. Theories of extra-nuclear electronic structure are discussed historically, and it is shown that the use of the four quantum numbers leads to a probable distribution of electrons.

X-ray diffraction has probably been the most powerful single physical method devised for the ultimate analysis of matter. It has laid bare the structures not only of the diamond, graphite and alloys, but also of textile fibres and other complex molecules, and it has clarified our views on valency. Robertson has achieved remarkable success in plotting electron densities as a series of contour lines with the aid of a Fourier analysis. Electrons can also be diffracted, and although they are much less penetrating than X-rays they are much more active photographically and are well suited for examining tarnish films on metals. Atomic linkages can be measured by electron diffraction; and by using the electron microscope, a description of which is given, it is possible to photograph particles which are only 30 Å. in diameter.

The chapter on conductance gives a clear account of the gradual development of the theories of ionic behaviour. The anomalies of strong electrolytes are still not completely solved, but the theory of complete ionization even in the solid state probably rests on a sure foundation, since such compounds act in a fashion entirely consonant with what is known of their fine structure.

AGRICULTURE IN URUGUAY

Investigaciones Agronómicas

Por Prof. Alberto Boerger. Tomo 1: Fundamentos de la Producción Vegetal. Pp. 758. Tomo 2: Genética; Fitotecnica Rioplatense. Pp. 1,043. Tomo 3: La Producción y el Hombre. Pp. 443. (Montevideo: A. Barreiro y Ramos S.A., 1943.) n.p.

THIS compendious work is difficult to appreciate. It is built around the investigations of the Uruguayan agricultural experiment station "La Estanzuela". The researches of this station are discussed in summary form in the text wherever they bear upon the general problems discussed; copious indexes and a full bibliography of the station's publications (commencing in 1912) are given. No complete chronicle or map of the station is supplied, and it is difficult to find a statement of its position. The book discusses many broad problems having a bearing on husbandry, including methods of investiga-

tion, laws of yield, mixed crops, autarky, and the system of Henry George; and sometimes gives unexpected information, such as a survey of the organization of plant genetical inquiry in the Argentine, Uruguay and the Brazilian province of Rio Grande do Sul.

The book supplies many climatological data, but is no general statistical digest, and only incidentally yields information about agronomic practice in Uruguay and adjoining regions. Thus, from the description of a trial of rate of sowing of linseed, the reader can deduce that the normal rate of sowing must be about 70 kgrm. of seed per hectare. Several factors affecting yield of the more important crops are thus brought to light, but no explicit information about local practice is given. The most important problem of selection before the Uruguayan wheat industry is stated to arise from the need of finding varieties not markedly affected by the date of sowing—which means, in effect, that what is wanted is wheat which will grow independently of the peculiar vagaries of the climate. It is a heartening sign that this and some other problems are reviewed regionally—with respect to the La Plata basin—and not merely nationally.

The author's interests are frankly in crop problems, and he includes many references to the relation between crops and livestock; but it may not be unfair to point out that the information about soils is less thorough than is warranted by the connexion between soils and plant growth. The deficiencies of agricultural investigation in South America seem to be those of a 'prairie' country of extensive agriculture where any established crop will grow more or less well, so that the obvious problems are on the surface; it is relevant to note that erosion is attracting attention, but that nothing much has been done about it yet except talking and writing in such general terms as those of this book.

The work may perhaps be summed up as the expression of the experience of one of the older generation of experimenters, who not only reviews the work of his own station but also includes the salient features of many problems to the solution of which the station has not contributed. If the book is regarded as a pool of some South American thought, it is legitimate to ask what streams have contributed to it and what it reflects.

Several tributes are paid to the work of R. A. Fisher and the revolution which his school of mathematical statisticians has effected in experimental technique. Fisher's methods have been extensively used in Uruguay and the Argentine by G. J. Fischer and others, and the book gives full acknowledgment to Fischer's work at least in so far as it emanates from La Estanzuela; this may outweigh the fact that no very recent European work on mathematical statistics is quoted. No later edition of Sir John Russell's "Soil Conditions and Plant Growth" is mentioned than the Spanish version of the sixth edition (1934); and Russell's review of the Woburn experiments, issued in book form in England, is quoted from a German abstract. In general, it seems that the author is better acquainted with recent Continental work than with British. The apparent tendency to ignore recent British contributions to agricultural science seems to lie deeper than a purely war-time shortage of books and other means of communication of ideas; though, if that shortage persists, the insulation of South America from British cultural and scientific ideas may become more serious.

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