

of some of the illustrations, which are lacking in clarity and definition, the quality of reproduction is admirable.

"Dairy Microbiology" is indeed a veritable omnibus and very little material that is cognate has been overlooked, but its comprehensiveness seems sometimes to have been achieved at the expense of attention to detail. The need of the student to assimilate facts while only currently developing his critical faculties evokes the responsibility of authors to present him with something approaching the bare minimum consistent with accuracy and completeness. In some places detail is lacking, while other sections of "Dairy Microbiology" are rather overloaded with data. The style and presentation of material are frequently naïve and elementary though admirably clear and straightforward, but at times assume considerable erudition on the part of the reader in disciplines other than microbiology. Despite irritating mixtures of passive and imperative tenses in descriptions of techniques, there are few inaccuracies and inconsistencies and the book cannot be criticized on matters of fact. References, with titles, are a welcome feature, even be there few to publications appearing after 1954, the book having been published in the United States late in 1957.

The subject-matter is not confined to American practice, but systems and techniques foreign to the United States receive in most cases scant mention; there is, however, one outstanding instance where this is not so—the excellent and all-embracing chapter on the microbiology of cheese. Even here, though, the mechanization of Cheddar cheese manufacture is not covered, perhaps because of its so recent inception. There are, too, other important developments in dairy microbiology that are not mentioned, probably for the same reason, which, however good in itself, must still have the effect of dating the book: they include immersion cleaning as such, and calcium-free bacteriophage-resistant media for the propagation of starter cultures.

Perhaps the most disappointing feature of "Dairy Microbiology" is its homogeneity. Too many cooks usually spoil the broth, one imagines, by the addition of too many conflicting ingredients. In this instance, however, the authors have failed to inject into it any flavour of their own particular views or opinions, or indeed any strong flavour at all. This is particularly unfortunate since the list of individuals is indeed impressive, and many of their views are known to be both enlightened and stimulating. Although lacking any form of philosophy or impact, and leaving no profound impression other than of enormous compilation, "Dairy Microbiology" is, in that latter capacity, excellent value at so modest a price.

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APPARATUS AND APPLICATIONS OF MASS SPECTROSCOPY

Mass Spectroscopy

By Prof. Henry E. Duckworth. (Cambridge Monographs on Physics.) Pp. xvi+206. (Cambridge: At the University Press, 1958.) 35s. net.

THE branch of physics christened mass spectroscopy by Aston has experienced a remarkable growth. The types of instruments for ion analysis have increased in number and in performance, while their applications have extended into astronomy,

biology, chemistry, engineering, geology and branches of physics other than nuclear. Prof. H. E. Duckworth has written a very concise account of the principles of positive-ion optics, the generation and detection of positive ions, and of spectrometers of all kinds used in the analysis of ions. The second half of the book summarizes the application of mass spectroscopy in physics, chemical physics and geophysics. In addition, there is briefer mention of other uses, such as gas analysis, stable isotopic tracer work and various applications in chemistry. The book concludes with a table of isotopic abundances and masses determined by mass spectrometric methods. The mass values for A less than 40 were measured by Nier and his collaborators, while greater mass values were based on the author's own research work.

The book is remarkably free from errors of a scientific kind, but some appear. Prof. Duckworth, in discussing spectrometers which provide first-order double-focusing for all masses plus second-order direction-focusing for one mass, specifically omits the common Mattauch and Herzog design of spectrometer which has the second-order focusing feature. Although some of the advantages of the vibrating-reed electrometer are specified, a most important advantage, the fact that there is no grid current, dependent on voltage, in parallel with the input current, is omitted. In discussing direction-focusing mass spectrometers with sector fields the statement is made that the resolution is independent of the angle of deflexion. This independence obtains only for symmetrical instruments. On p. 131 the ($^6\text{Li} + n$) reaction products are given incorrectly.

Almost every section of every chapter of Prof. Duckworth's monograph attributes the first study or first use of something to one or another person, and these assignments are in the main the same as those which have appeared in earlier books. There are, however, oversights and errors which might be corrected. For example (p. 13), the focusing properties of sector fields and Barber's rule were clearly illustrated by Aston in 1919. Aston (1919) also suggested focusing by a spherical condenser before Brüche and Henneberg (1935). Although Smythe, Rumbaugh and West (1934) first devised the general formula for obtaining higher-order direction-focusing in homogeneous magnetic fields, they are not mentioned in section 2.6. The emission of positive ions from heated salts and hot filaments is generally attributed to Gehrcke and Reichenheim (1906, 1907) as in section 3.2, but J. J. Thomson (1899) credits Elster and Geitel (1889) with the discovery that positive ions were emitted from hot filaments. C. J. Davisson (1912) credits the discovery of emission of positive electricity from heated salts to J. C. Beattie (1899). O. W. Richardson (1908, 1910) and his students, Hulbirt and Davisson (1912), carried out the first definitive research on identifying positive ions from hot salts and hot filaments. They thus clarified a difficult existing situation in which thermal ionization of residual gas atoms had been held responsible for the currents observed from uncoated filaments. This work, which antedated that of Dempster, is not mentioned.

Prof. Duckworth has written a concise but comprehensive book on mass spectroscopy which should prove valuable to anyone engaged in the analysis of ions. The large reference bibliography with individual page references to the text, and the index, both of which were obviously prepared with great care, enhance the value of the book.

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