

unpublished. The book serves to complete the life-history of one who has been styled a "hero and type of the intellectual energy of the eighteenth century," and whose name, in spite of his errors and his misguided loyalty to a false philosophy, is imperishably fixed in the annals of science.

T. E. THORPE.

The Actinomycetes.

Morphologie und Biologie der Strahlenpilze. (Actinomyceten.) By Prof. Rudolf Lieske. Pp. ix + 292 + Tafel 4. (Leipzig: Gebrüder Borntraeger, 1921.) 108 marks.

THIS volume by Prof. Rudolf Lieske, of the Botanical Institute at Heidelberg, on the morphology and biology of the Actinomycetes, forms a valuable addition to the literature of this subject. In a general introductory chapter there are an account of the occurrence of Actinomycetes in Nature and an annotated list of recorded species, references being given to original descriptions. This section also contains a discussion of the relation of Actinomycetes to Bacteria, Mycobacteria, Hyphomycetes, etc., the conclusion—from which many of us would dissent—being that the former are a primitive stem from which the latter have been derived.

The second section, dealing with the morphology of Actinomycetes, suffers from the lack of a thorough comparative study of growth forms under different standardised conditions. Still, Prof. Lieske approaches his subject with a more experimental and dynamic attitude of mind than that of a recent American investigator of Actinomycete morphology, and his results are correspondingly enlightened. In the study of higher organisms there has been developed a physiological anatomy; in the study of lower organisms perhaps our greatest need is a physiological morphology. When we abandon teleology and learn to interpret shape and structure in terms of physico-chemical relationships we shall begin to build a true micro-organismal morphology. The Actinomycetes would be a good group on which to commence. Prof. Lieske finds that they possess a true mycelium with typical monopodial branching, and "Luftsporen" are formed endogenously. The questions of cell nuclei and a possible primitive sexuality are left open, but it is disappointing to find "involution forms" dismissed as merely teratological growths—surely mycologists and bacteriologists have too long been content with this futile label.

The third section, dealing with the physiology

of Actinomycetes, is perhaps the best, but again suffers from a too timid and unimaginative viewpoint. There is the usual consideration of the relation of the organisms to carbon, nitrogen, etc.—all useful data; but the very important enzymic relations of Actinomycetes, their antagonistic or additive reactions with other micro-organisms and their function in the soil economy, the very interesting pigments produced—these and other vital issues are treated too summarily. The fourth section deals with animal and human diseases such as "Madura foot," "lumpy jaw," etc. There is also a useful summary of methods of staining and the preparation of specimens. The last section of eight pages concerns the Actinomycetes in their relation to higher plants, and is merely a very inadequate account of potato scab and the root nodules of the alder. The work closes with a bibliography of 378 titles, of which 322 are German, while important works such as Poncet's comprehensive monograph are omitted.

The most serious difficulty in the study of Actinomycetes is the specific determination of the organisms isolated, and here Prof. Lieske's work gives no help. It needs to be supplemented by Drechsler's beautiful drawings in the *Botanical Gazette* and Waksman's cultural data in the *Journal of Bacteriology*. The book is finely produced with 114 text illustrations and four beautifully coloured plates, and in spite of its defects is a very valuable addition indeed to the literature of this important and obscure group of organisms.

W. B. BRIERLEY.

Emin Pasha's Last Collections.

Die Tagebücher von Dr. Emin Pascha. Herausgegeben mit Unterstützung des Hamburgischen Staates und der Hamburgischen Wissenschaftlichen Stiftung von Dr. Franz Stuhlmann. Band 6, Zoologische Aufzeichnungen Emin's und seine Briefe an Dr. G. Hartlaub bearbeitet von Prof. Dr. H. Schubotz. Pp. viii + 301. (Hamburg und Braunschweig: Georg Westermann, 1921.) 200 marks.

THE volume under review gives us notes, mainly ornithological, on the last collections made by this remarkable German-Jewish explorer in the equatorial Egyptian Sudan, including the south-eastern part of the Bahr-al-ghazal region, the Latuka-Lango district, and the north-west coast of the Albert Nyanza; but the author treats also of birds and mammals which have come under his observation in the countries between the south shores of the Victoria Lake and

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