

observations and collections then made in the marshes of Paraguay.

The first journey was of another sort: it was a naturalist's roving commission, and every observation in this unobserved country came as grist to the young and enthusiastic traveller. The final and mysterious disappearance of his collections after he had left the river-steamer *Bolivia* was a serious but not a crippling loss, for the vital contributions to knowledge were the field observations recorded in this book. They include a comprehensive account of the Chaco fauna in the neighbourhood of Fortin Page; but more revealing are the innumerable notes on habits, on obliterative coloration, which in its manifold aspects clearly made a deep impression on the author, on the adaptations of the animal inhabitants of the swamps, and, most striking of all, on the characteristics of the human inhabitants, an outlying and restricted branch of the redskin Tobas, the Natokoi.

These wandering and marauding people, without huts or tents or domestic animals except the dog, unable to count above seven, recognizing the moon's phases but with no idea of the number of days in a month, depending on wooden weapons, though their bows had back-strings and their arrows were feathered to rotate, represented at its simplest a primitive hunter-fisherman stage of culture. The account of their daily routine, their simple industries and social customs makes a fascinating tale which could have been revealed only to one received into the bosom of the tribe.

The author has done well in resuscitating these old diaries, so that others may share in the observations and stimulation of his Gran Chaco adventures, which long since have borne rich scientific fruit.

JAMES RITCHIE

TAXONOMY OF *PENICILLIUM*

A Manual of the *Penicillia*

By Kenneth B. Raper and Charles Thom. Pp. ix+875+10 plates. (London: Baillière, Tindall and Cox, 1949.) 91s. 6d.

SPECIES of the genus *Penicillium* are of common occurrence, wide distribution, and considerable economic importance. Naturally the taxonomy of the genus has received much attention, in spite of its great difficulty. Thom himself has been studying *Penicillia* for half a century, during which time he has gradually brought order out of chaos. His monograph of 1930, though unsatisfactory in some details, laid down broad lines of classification which have stood the test of time. It is a tribute to the soundness of his work that most of the new species described by others during the intervening years are accepted by Raper and Thom in their new manual.

The book is arranged on much the same plan as the earlier "Manual of the *Aspergilli*" (1945), with three main sections: general discussion, the manual proper, and reference material. Although it is expressly stated that the manual is not a monograph, the first two chapters include a fairly comprehensive account of the history of the genus and synonymy. Chapter 3, "Observation and Description of *Penicillia*", deals fully with the morphological characters on which classification is based. Then follows a chapter on methods of cultivation and preservation of cultures, and the section concludes with a brief but useful account of the production of penicillin,

the stress naturally being on the purely mycological aspects.

The second section of the book begins with a chapter on the use of the manual, and includes two keys to the main groups and series. The succeeding eight chapters deal respectively with the main groups within the genus, and the section concludes with a chapter on the three related genera, *Gliocladium*, *Pæcilomyces* and *Scopulariopsis*. Each chapter includes a key, or keys, to the series and individual species; full diagnoses, including descriptions of colonies on three different culture media; discussion of synonymy; and a section on occurrence and distribution, which not only gives a picture of the ubiquity of these organisms, but also provides a useful fund of information on their biochemical characteristics. There are numerous illustrations from photographs of colonies, and photomicrographs and drawings of typical fruiting organs, also ten plates in colour.

The final section of the book comprises a topical bibliography, covering most of the literature on systematics and activities of *Penicillia*; a general bibliography; check list of species and genera, accounting for all names which have been applied to *Penicillia*, and other names which are synonyms of *Penicillium* and the three related genera; and finally a list of accepted species.

The "Manual" is a magnificent piece of work, deserving of the highest praise. Everything has been done to aid the student of the genus and to simplify identifications. Thom's conception of 'group species'—fundamentally the recognition that, in any species of living organism, no two individuals are identical—has been extended to cover the majority of the 137 species recognized. In addition, closely related species are grouped into 'series', the results of this classification being embodied in a diagrammatic key (p. 120) which makes the approximate identification of any isolate a comparatively simple matter. Another excellent feature is the direct comparison of the various species belonging to a single series. Anyone familiar with Thom's monograph will notice that a number of species have now been transferred to different series or groups. In all such cases the new classification makes for a more rational grouping, and will facilitate identifications.

A few minor points require criticism. The term 'phialides' is not of Latin origin, and the singular is not 'phialis' (p. 45). The antibacterial spectrum test, as an aid to confirming identifications of some species, is useful, but no mention is made of testing culture fluids with ferric chloride, a test which is simpler to carry out and which has a wider application. Few mycologists would agree with the statement that the chlamydo-spores (or aleurio-spores) produced by *Pæcilomyces varioti* have any connexion with ascus formation in *Byssochlamys fulva*. The topical bibliography, a most useful adjunct to the taxonomic sections, is unfortunately marred by many orthographic errors, chiefly in the German titles of papers. These, however, are small blemishes in a first-class book, which is likely to remain the standard treatise on *Penicillium* for many years to come.

The format of the book maintains the high standard set by the earlier "Manual of the *Aspergilli*", and the text is commendably free from misprints. In spite of its somewhat high price the book should, and undoubtedly will, become an indispensable part of the equipment of every serious student of moulds.

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