

the use of *n*-butanol in the presence of urea was recommended.

Until recently the cell membrane of animal cells has not been studied extensively although its biochemical importance has never been questioned. Emmelot described his recent work on isolated plasma membranes from liver. He concludes that it consists of a triple-layered element containing sialic acid in its outer leaflet. An unexpected bonus for the study of mitochondrial proteins has come from the work of Roitt and his colleagues in their study of primary biliary cirrhosis. Their results suggest that the antibody present in the sera of such patients react with an antigen localized in the inner mitochondrial membrane of the liver cells. If the biochemical nature of this antigen can be identified it may help our understanding of mitochondrial function.

The final section on techniques contains some useful accounts of isoelectric focusing by Svensson, continuous preparative electrophoresis by Hannig, and multimembrane electrodecantation by Fleetwood and Milne. These accounts conclude a most useful and well edited volume in this series.

P. N. CAMPBELL

## SOIL BACTERIOLOGY

### The Ecology of Soil Bacteria

An International Symposium. Edited by T. R. G. Cray and D. Parkinson. Pp. xv + 681. (Liverpool University Press: Liverpool, 1968.) 150s.

THIS volume consists of the thirty-four papers read at what was probably the largest gathering of soil bacteriologists in history, the International Conference on Ecology of Soil Bacteria held at Liverpool University in 1965. The theme of the conference was separate treatment of the soil environment, of physiological properties of soil bacteria, and their taxonomic nature, followed by integrated studies of growth and interactions of the bacteria in their environment. It was divided into six sections, each followed by a discussion. The first four are concerned respectively with the soil environment, with methods, with physiology and with taxonomy of soil bacteria, five papers being devoted to each section. The soil environment is seen in terms of its physical and chemical nature, as influenced by fungi and animals, and to some extent as a whole in the somewhat fragmented paper on the agricultural environment. Methods relate to isolation of soil bacteria and estimation of their activity in soil. The physiological section begins with a paper on the basis of persistence in non-spore-forming bacteria, is followed by one illustrating the range of metabolites synthesized by soil bacteria and three on diverse substrates utilized—hydrogen, cellulose and herbicides. The taxonomic section is followed by a small section headed bacteria occurring in the root region, although one concerns mycolytic bacteria. This section, together with the last and largest one of ten papers on the growth of bacteria in soil, contains the more ecological aspects.

The final section is introduced by a paper by F. E. Clark. Most of the paper is about experimental studies showing the marked effects that even quite small variations in environmental conditions may have on the concerted activities of bacteria in soil as expressed by carbon or nitrogen mineralization or by nitrification. From this Clark stresses that any energy source in soil must be presented under an almost limitless number of conditions, and he concludes that thousands of ecological niches must exist in the soil. Experimental analysis of niches is not developed by further contributors. Only two papers contain anything that can be said to be experimental ecology, for example, Holding and Jeffreys' examination of the differential effects of compounds which alter availability of metallic ions on groups of soil bacteria grown in culture and present in the native flora of soils,

and that of Brown *et al.* on introducing specific bacteria into soils. Several contributors assessed distributions of bacteria in natural soils: van Schreven and Harmsen summarized many years of study in the Netherlands on changes in populations of major groups of bacteria resulting during reclamation of land from under water, Goodfellow *et al.* examined distribution of (other) groupings in two horizons of a pine forest soil, and Mishustin and Mirsoeva assessed the distribution of species of *Bacillus* in Soviet soils. Crosse reviewed the present state of knowledge concerning relationships between plant pathogenic bacteria and soil, Skinner reviewed the anaerobes, Chasc *et al.* the activities of the nitrifiers with special reference to forest, orchard and grassland soils, and Zavarzin reported on recent Russian work on manganese oxidizing bacteria.

Out of thirty-four papers a maximum of thirteen relate in some manner to ecological matters and some of these are marginal, unless ecology and biology are understood to be interchangeable terms. Interaction between organisms is an essential part of ecology, but almost nothing is found on this aspect. The title *The Ecology of Soil Bacteria* adequately described the purpose of the conference, but it does not satisfactorily describe the contents of the volume. What the volume does contain are "Recent Developments in the Field of Soil Bacteriology". Its scope is well summarized by Dr Starkey in his concluding chapter—despite the ecological title of the latter. Many of the papers are written by the world's leading authorities and they make the volume a valuable contribution to the science of soil bacteriology.

HENRY TRIBE

## CURIOUS PLANTS

### British Sedges

A Handbook to the Species of *Carex* found Growing in the British Isles. By A. C. Jermy and T. G. Tutin. With illustrations by Gretel W. Dalby, Joanna C. Webb and Sheila Bownas. Pp. 199. (Botanical Society of the British Isles: London, 1968.) 17s. 6d.

THE sedges are a curious group of plants. Unlike their close relatives, the grasses, they have been little used by man. The differences between species of *Carex* are, besides, less obvious than those between grasses. These facts perhaps account for the single genus *Carex* with about a thousand species, of which about seventy-five are native to Britain. In much the same form as Hubbard's *Grasses*, Jermy and Tutin have now produced an admirable aid to the identification of the British species of *Carex*. Most species are given a page of description facing a page of drawings. The descriptions include notes on characters by which the species may be distinguished from those others with which confusion may most likely occur. The descriptions also include ecological notes. The drawings, by three artists, are likely to be one of the most useful features of the book. Besides illustrating the whole plant and details of floral structure and ligule, they give sketches of cross-sections of leaf and stem. These last would be made more useful if there were some indication of the range of variability to be expected; there are some tantalizing general observations on this subject in an earlier part of the book, in sections containing a general description of *Carex* structure, ecology and classification.

There are two keys. The first, using principally floral characters, follows the same general lines as that made by Professor Tutin for *The Flora of the British Isles*. The second uses only vegetative characters, and will surely be of the greatest value to ecologists, who are all too often forced at present to record merely *Carex* sp. The scope of this key has been widened to include "Sedge-like Cyperaceae". It would probably be difficult to avoid the use of colour as a character in this type of key, but some experience will be needed before the shades of red and