seven pages are devoted to reactions of these ethers. In the next chapter, 94 pages deal with acetals, and chapter 3 is a 30-page review of the chemistry of ortho-esters. Chapter 4, on oxonium salts, is of special interest. Meerwein, a pioneer in this field, gives an extremely lucid account of it and includes a wealth of useful practical information, often drawing on literature not easily available here, such as dissertations by his students. Meerwein's chapters provide us with reviews of fields not recently covered elsewhere.

Chapter 5, by Dittus, is a 122-page review on oxiranes. In keeping with the purpose of *Houben-Weyl*, the preparative aspect is emphasized. Thus, the chapter complements the other recent review of the field—Rosowsky's chapter in volume 19, part 1 of Weissberger's series on heterocycles. The enormous literature on oxiranes cannot possibly be covered in 122 (large) pages, but Dittus has done an admirable job with the synthetic aspects. Oxetanes are dealt with in chapter 6, also by Dittus. In 28 pages, the preparative aspects are again emphasized, and again the chapter provides a welcome complement to the review by Searles in volume 19, part 2, of the Weissberger series.

The rest of the book comes from the pen of Kröper. The two chapters cover five-membered cyclic ethers and five-membered semicyclic acetals. Recent reviews are not available for either area, and the author's 220 pages fill this gap. Ninety-six pages are devoted to the tetrahydrofurans, and they will be most useful to chemists. The writing is clear and concise, and the material is very well organized. Charts show the synthetic paths leading to many types of the compounds.

The authors and editors of this volume are to be congratulated on their work. Many who do not subscribe to the whole *Houben-Weyl* series will find it worthwhile to purchase this volume.

WALTER LWOWSKI
Sterling Chemistry Laboratory, Yale University

Symposium, British Society for Parasitology

Evolution of Parasites. Third symposium of the British Society for Parasitology (London), November 1964. Angela E. R. Taylor, Ed. Blackwell, Oxford, England; Davis, Philadelphia, 1965. viii + 133 pp. Illus. Paper, $5.

Parasitism requires such a nice adjustment between the parasite and its immediate environment, another living organism, that parasites have long been favored subjects with students of adaptation and evolution. Yet it is evident from the four discussions constituting this symposium that our knowledge of the evolution of the main groups of animal parasites is fragmentary. This is not surprising, because parasitic protozoa, nematodes, and flatworms have left little or no fossil record and because, moreover, the special physiological requirements of parasitism probably bring about many cases of convergent evolution. The fewer the facts the more room for speculation and personal opinion, and indeed the four sections of this small book seem to me to show an inverse correlation, with the least facts and most speculation in the first essay, by J. R. Baker, on the evolution of parasitic protozoa; nearly the same situation in the second, by P. F. Mattingly, on parasite-arthropod vector systems; more information and less speculation in the third, by J. Llewellyn, on parasitic platyhelminths; and still more information in the last and longest section, by W. G. Inglis, on parasitic nematodes.

In the chapter on protozoa, emphasis is placed on important parasitic groups within the subphylum Sporozoa, especially the suborder Haemosporina, and, in the class Zoomastigophorea, on the suborder Trypanosomatina. Both the Haemosporina and the Trypanosomatina include important parasites of man transmitted by insect vectors, and it is of special interest to try to determine how such a relationship could arise and whether the parasites originally infected only the vertebrate or only the insect host. Baker makes a strong case for the view that the Haemosporina arose from coccidian parasites of vertebrates, and secondarily became adapted to their insect vectors. There seems little room for doubt, however, that the early trypanosomatids were leptomonad-like flagellates inhabiting the gut of invertebrates. It is probable that parasitization of a vertebrate host arose independently in several different groups.

Mattingly's discussion of parasite-arthropod vector systems begins with the telling point that selection pressures promoting adaptation to the vector must be far more intense than in the case of the passive (vertebrate) host; any reduction in vector efficiency is likely to be fatal to the parasite. Hence no deductions concerning evolutionary origin can be based on the greater pathogenicity of parasites to their vertebrate than to their arthropod hosts. There follow brief sections on the possible evolution of blood-feeding in insects, and on the entomological aspects of the evolution of spirurate nematodes, haemosporidia, haemoflagellates, rickettsiae, and arboviruses.

In his treatment of the platyhelminths, Llewellyn accepts the view that cestodes evolved from monogeneans. As additional evidence he cites the recent discoveries of dactylogyrids as internal parasites in the esophagus of fish. It is suggested that the incorporation of an intermediate host into the life cycle may have been related to the possession of quinone-tanned egg shells. The latter subject is discussed in some detail. The evolution of digeneans, which exploit two kinds of hosts having no connection beyond coexistence in the same habitat, is treated briefly. An evolutionary tree is proposed for the parasitic platyhelminths, based on characters such as type of cleavage, presence or absence of polyembryony in molluscan hosts, ectoparasitism versus endoparasitism, and strobilization.

Inglis uses the abundant information on parasitic nematodes to discuss their speciation in terms of the evolution of groups with comparable feeding habits, rather than in terms of coevolution of parasites and hosts. He points to the numerous opportunities for competition among parasitic nematodes for available ecological niches, and concludes that speciation among these organisms has been entirely allopatric. Species flocks of nematode parasites are compared with the similar phenomenon in fish; the number of species is an indication of the number of discrete niches. A logical system is presented for the derivation of the major groups of parasitic nematodes.

This small book makes interesting reading for the experimental parasitologist as well as for those primarily interested in taxonomy and evolution. It brings together much fact and pertinent fancy, and points to many problems that require solution.

WILLIAM TRAGER
Rockefeller University, New York