(the acidophilic autotroph that grows at >85°C), which was twice rejected by the *Journal of Bacteriology* and finally published by *Archiv für Mikrobiologie*. In these days when one is accustomed to reading the results of scientific research only in the format of severely edited journal papers, the book is refreshing and instructive. There are parts of some chapters that drag, perhaps because the results of published research are described in too much detail. The detail does, however, make the book a useful reference.

Biologists who read the book may be amazed to find that only 12 years ago there existed so extensive a habitat still essentially unexplored. Brock has been both a pioneer and a scientific exploiter of that habitat, and his discoveries of entirely new organisms and their attributes have created a rich lode for scores of other investigators.

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Flowering Plants

The Biology and Chemistry of the Compositae. Papers from a symposium, Reading, England, July 1975. V. H. HEYWOOD, J. B. HARBORNE, and B. L. TURNER, Eds. Academic Press, New York, 1977. In two volumes, illus. xiv pp. + pp. 1-620 and xivv pp. + pp. 621-1190. Each volume, $53.75.

The appearance of the first major review of the flowering plant family Compositae (Asteraceae) in over a century is an event of general importance since this family, with some 1300 genera and 22,000 species, comprises about 10 percent of all flowering plants. Although it is poorly represented in the lowland tropics, it often constitutes a prominent part of the vegetation elsewhere, and the species of the family are frequent on all continents.

Considering the size of the family, the 42 chapters in the book appear to do a reasonable job of pulling together the available information. Some of the chapters—notably the beautifully illustrated paper by Skvarla and his co-workers on palynology—also present a great deal of original information, and the book lays the foundation for a synoptic review of the genera of the family.

The role of relationships with insects in the evolution of the capitulum is discussed with respect to attacks by insects on achenes (Burtt) and insects involved in pollination systems (Leppik). Burtt also provides useful insight into the evolutionary diversification of the capitulum in one of the most interesting chapters of the book.

Compositae have been particularly well studied chemically. Information on about 10 percent of the species is available and indicates that the group is very distinctive. Compositae contain many substances that are toxic or show significant physiological activity. Hegnauer reviews the results of chemical studies since 1964. Of particular interest are the sesquiterpene lactones, with over 100 structures characterized (Herz). Many of these often bitter-tasting, colorless, lipophilic compounds cause contact dermatitis in humans. Composite polyacetylenes are likewise well distributed (Sørensen) and systematically interesting, especially in view of their occurrence in Umbelliferae, Araliaceae, and a few other families. "The combined occurrence of sesquiterpene lactones, acetylenic compounds and inulin-type fructans is almost as characteristic of the Compositae as their headlike inflorescences" (Hegnauer, p. 284). The flavonoids appear to be less distinctive, yet they are highly diverse and richly deserving of further study.

There are no generally accepted examples of Compositae in the fossil record prior to the Miocene. On the basis of matching outlines, a number of such examples were reported up to about 1920, but none has been confirmed. (For example, W. L. Crepet and T. F. Stuessy, *Brittonia* **30**, 483 [1978], have recently shown that one critical Oligocene fossil may easily not be a composite.) As the results of Skvarla and his co-workers amply demonstrate, "composite-like" pollen may belong to any of several families, stratigraphic problems aside. An unfortunate emphasis on early, unconfirmed literature reports has caused Turner to attempt in his paper to push the age of the family back beyond the earliest records for any existing family of flowering plants. As Leppik points out, the very degree and kind of floral organization in Compositae are a phenomenon of the mid-Tertiary. The only existing evidence that the family might be older than the Oligocene lies in its distinctiveness, especially with respect to cytochrome c, but much more investigation and evaluation are needed, as several authors point out.

Many uncritical statements about age and geography are made in the book. For example, links between Africa and Australia are discussed by Turner and by Sørensen as if they are related to events occurring well before the probable time of origin of the angiosperms. These authors ignore the fact that only 20 million years ago Australia was, as it had been for at least 60 million years, enurely covered with temperate evergreen rain forest—hardly a likely place for the occurrence, much less diversification, of desert and scrubland Compositae.

The relationships of Compositae have long been of great interest. Stebbins, in a review of developmental and comparative anatomy in the family, concludes that little evidence exists for links with any other family but calls for palynological and biochemical evidence to resolve the matter. Such evidence is presented in other chapters of the book. Detailed similarities in the pollen seem clearly to indicate a close relationship with Calyceraceae and a more distant but clear relationship with Valerianaceae, Dipsacaceae, Brunoniaceae, Goodeniaceae, and Umbelliferae. Chemical evidence summarized in the book by Mabry and Bohlmann also indicates a direct relationship with Umbelliferae and a link with Campanulaceae (very different in pollen) but suggests that Calyceraceae, which contain seco-iridoids, are totally unrelated to these families. Evidence reviewed by various authors suggests that there is no relationship between Rubiaceae and Compositae or between Dipsacaceae and Compositae. The exact relationships of Calyceraceae appear to need further attention. One of the most impressive achievements of this book is the clear demonstration of a link between Compositae and Umbelliferae, which was postulated by Hegnauer in 1966 and later reflected in the general classification system of R. F. Thorne.

Solbrig, who provides a comprehensive review of chromosomal cytology and evolution in Compositae, concludes, like most of the authors who consider individual tribes, that the common ancestor of the family had a gametic chromosome number of $n = 9$.

Although of limited interest to a nonspecialist, the tribal structure of Compositae and the proper assignment of individual genera receive the most attention in the book. Although the existence of many problems is recognized, the reassignment of the 71 genera of "Helenieae" to other groups (Turner and Powell), the acceptance of a new tribe, Liabeae, and the greatly improved organization of several tribes, especially Heliantheae, Eupatorieae, Mutisieae, and Senecioneae, represent significant achievements.

It is unfortunate that more overall editing and coordination of the volumes was not possible. Perhaps at this stage the

preservation of individual, idiosyncratic views is appropriate, but it is distracting to read in a single book that the family has 13,000 species (p. vii; a misprint?), 25,000 species (p. 27), 15,000 species (p. 111), 20,000 species (p. 143), and 22,000 species (p. 1107), the last figure based on the estimates in these volumes. A more standardized format for systematic presentations concerning different tribes would have made information easier to find and would have eliminated the problem of genera left hanging between different tribes. A consolidated list of genera (by Turner) is, however, presented in an appendix.

In summary, the book presents a very useful review of the available information on a family of plants that has more species than any group of land plants other than angiosperms. It has already served as a stimulus for further research and doubtless will continue to do so.

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Insects in the City

Perspectives in Urban Entomology. Papers from a symposium, Washington, D.C., 1976. G. W. FRANKIE and C. S. KOEHLER, Eds. Academic Press, New York, 1978. xviii, 418 pp., illus. $21.50.

It is estimated that within 22 years 80 to 90 percent of the U.S. population will reside in urban areas. Urban dwellers generally have a low tolerance for insects and arachnids whether on their ornamental plants, in their homes, or on their bodies. This low tolerance level extends to recreational areas, such as national and state parks and campgrounds. Despite their antipathy toward most arthropods, urbanites are becoming concerned about the environmental and health problems associated with conventional chemical control, including the hazards to beneficial arthropods. Many urbanites are also concerned with broad environmental problems, including the study and preservation of endangered species. Thus this volume, which deals with basic and applied entomological research in urban environments, comes at a very appropriate time.

The range of topics touched on in the 17 chapters comprising the volume is extensive—from the influence of urban development on the ecology, diversity, distribution, and abundance of insects to the management of insects by means of chemical pesticides, chemicals that modify behavior (of bark beetles), insect-resistant plants, biological control (of shade tree pests), and integrated pest management (of cockroaches, flies, and termites).

The editors make no claim that the range of topics is comprehensive. Nevertheless, it is disappointing that the book does not have a section on the current state of entomological research in domestic and commercial greenhouses; this is a well-studied subject in both Europe and North America. Despite this and some other omissions that individual readers may regret, the book gives a fine survey of recent studies pertaining to urban entomology.

The main value of the book is that it summarizes past findings, identifies current problems, and delineates, with a fresh viewpoint, developing areas of research. For example, several chapters show that urban areas present an excellent opportunity for studying the effect of habitat alteration on evolution in both plant-eating and medically important insects. Merritt and Newson's chapter develops a convincing case for considering the arthropod fauna when plans are made to develop new recreational areas. Ehler presents a thoughtful development of the idea that the small-scale, labor-intensive urban agricultural technology practiced in the United States can be used on small farms in less developed countries.

Frankie and Levenson make a fine start in combining an entomological and a sociological approach to the difficult task of defining the highly variable public attitudes toward insect problems. A noteworthy finding is that attitudes toward pests and the use of pesticides are not especially rigid and are greatly influenced by popular articles and television programs. These media offer an effective means of altering public attitudes toward pest control.

Because of the wide array of topics it deals with it is particularly unfortunate that the book has no subject, species, or author index. Aside from this deficiency the editors have done a fine job; the chapters are generally concise and clear. Many of the contributions are appropriate for the general reader, for the specialist, and for researchers in complementary fields of applied and basic biology. The book will be of considerable value for anyone interested in the biological consequences of the interaction between urbanization and insect activity.

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