how parasitoid wasps commit "chemical espionage" by tapping the chemicals released by their host insects (and by their hosts' plant hosts) in order to locate their prey.

Integration of activities within the remarkable colonies of social insects depends on chemical communication. Even in the honey bee, the best-studied insect, we still have much to learn about the chemistry and functions of the pheromones produced by its many exocrine glands. Bark beetles use aggregation and dispersal pheromones in their mass attacks on trees, and a quite sophisticated understanding of their chemistry and ecological function is apparent in the account by Borden. Howse nicely compares the use of pheromones for alarm and defense across the social bees and wasps, ants, and termites. In general social insects either have large colonies with strong nests that they defend vigorously or have smaller colonies and weaker nests from which they readily abscond when faced with attack. A more chemical approach is taken by Morgan in his review of recruitment pheromones of social Hymenoptera. Koeniger describes how honey bees and hornets are able to recognize pupae in order to incubate them. Hölldobler reviews recent studies of individual and dominance recognition in social Hymenoptera. He speculates that primitively social insects (like sweat bees) learn the individual, genetically determined odors of each nestmate, whereas workers of advanced social insects learn colony odors that originate with the queen. Communication among workers that results in division of labor may involve ritualization of signals originally used for other purposes and "modulatory communication" that modifies the probability of reactions to diverse stimuli rather than releasing specific behavior patterns. Hölldobler also suggests that the evolution of insect sexual communication may predominantly involve mate assessment and choice, a topic pursued in considerable depth by West-Eberhard. West-Eberhard provocatively argues that there is little evidence that species-specific sexual communication evolved to prevent interspecific mating. Rather, such signals evolved through intraspecific competition among males for mates.

This volume suffers from some of the usual problems of symposia. The papers are not well integrated, and the introduction by the editor does not tie them together. Lewis does nicely identify four frontier areas in which advances can be expected in the near future (electromagnetic communication, pheromone blends, practical applications, and communication in little-studied orders of insects). In places details are presented that belong in technical journals, and at times an entomologist or a vertebrate ethologist can get lost in technical jargon. Recent findings regarding the fine structure, diversity, and function of sensilla are not well represented (except for auditory organs). Coverage is limited to intraspecific communication (except for Vinson's chapter on parasitoids), despite recent discoveries about interspecific communication, especially involving chemicals.

On the other hand, there is little duplication among chapters, and the authors are conscientious in stressing discoveries of the last ten years. A modern evolutionary perspective is maintained throughout; communication "for the good of the species" has finally been laid to rest, even in entomology. A specialist who keeps abreast of the immense, scattered primary literature will find few surprises in this volume. The rest of us should read it. No other recent book presents such a diversity of stimulating papers on insect communication.

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Mineralogy

Feldspars and Feldspathoids. Structures, Properties and Occurrences. WILLIAM L. BROWN, Ed. Reidel, Boston, 1984 (distributor, Kluwer, Hingham, Mass.). xviii, 541 pp., illus. $74. NATO ASI Series C, vol. 137. From an institute, Rennes, France, June 1983.

Feldspars are the most abundant substances in the crust of the earth and moon and are formed in environments ranging from the earth's sedimentary surface to the molten regions of the deeper crust, their principal home. Feldspar compositions form the basis for the classification of igneous rocks. Although rather simple chemically, they are wondrously diverse and complex structurally, and hidden within them are many of the clues to understanding the genesis of the continental crust. The interplay of crystallization temperature, cooling rate, presence or absence of volatiles, pressure, bulk composition, and late-stage hydrothermal modification, coupled with recalcitrant behavior as a result of large activation energies for aluminum-silicon diffusional interchange in the strongly bonded continuous silicon-aluminum-oxygen networks (containing the relatively mobile alkali and alkaline-earth atoms in the interstices), leads to a plethora of structural and textural variations. Structural state equilibrium in some feldspars is achieved with difficulty or not at all, and metastable stranded states abound in nature. Perhaps it is a pity that so much effort in solid state research goes into synthetic compounds when so much of nature's own is there to confound us.

This volume contains the invited review lectures given at a NATO institute. Two previous NATO institutes on the subject were held in Oslo in 1962 and Manchester in 1972, and the proceedings of three conferences clearly record the developments in the 20-year period. Since 1972, great advances have been made in automatic x-ray diffractometers, electron microscopes and microprobes, ion probes, and a variety of spectrographic methods. Detailed structural information is now rapidly available, and hitherto unknown microstructural and compositional details are revealed.

The current volume is more coherent than the earlier two. The 1962 volume contained 40 largely unrelated contributions that for the most part presented research results; the 1972 volume had 32 papers also for the most part of the type published in journals, including some of the early work that used transmission electron microscopy to study feldspars. The 14 review papers in the present volume, although not all-inclusive, do cover the field in a reasonably satisfactory way. The reports of research that were presented at the conference will be, or have been, published elsewhere. The first two chapters (on feldspar structures, by P. H. Ribbe, and phase relations of plagioclase feldspars, by J. V. Smith) are reworked and updated versions of papers by the same authors in *Feldspar Mineralogy*, volume 2 (1983; the second volume of the second edition of the series Reviews in Mineralogy), and in general the volume under review supplements and extends the valuable earlier volume. The chapters vary in style and coverage from those concerning the broad application of microtextural (transmission electron microscopic) analysis of alkali feldspars in interpreting the thermal history of rocks (I. Parsons and W. L. Brown) to those of interest to a limited audience concerned with the niceties of feldspar crystal chemistry and structure as revealed by thermal and mechanical behavior (thermal expansion of alkali feldspars, by H. Kroll, and mechanical properties of feldspars, by M. Gandais and C. Willaime). One of the

chapters, on massif anorthosites (J.-C. Duchesne), although informative, seems out of place in this volume, for there is no obvious mineralogic or crystallographic aspect of the feldspars that can currently be genetically tied to anorthosites. Three papers on feldspathoids (by S. Merlino, C. M. B. Henderson, and A. D. Edgar) provide the best coverage of this subject that is available and round out the volume nicely. The conference organizers, the authors, and the editor have produced a valuable addition to an important field of mineralogy.

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Paleolimnology

Lake Sediments and Environmental History. Studies in Palaeolimnology and Palaeoecology in Honour of Winifred Tutin. ELIZABETH Y. HAWORTH and JOHN W. G. LUND, Eds. University of Minnesota Press, Minneapolis, 1984. xviii, 411 pp., illus. $55.

Over the last decade the subject of paleolimnology has rapidly gained popularity with the scientific community. Despite this surge of interest, there are surprisingly few volumes of collected papers dealing with the subject. The publication of *Lake Sediments and Environmental History* admirably fills the void.

The book opens with a warm introduction by John W. G. Lund outlining the career of Winifred Tutin, to whom the volume is dedicated. The contributed papers were collected to reflect the research interests of Tutin, which are wide-ranging, and the 14 chapters that make up the volume cover most topics that are of interest to paleolimnologists and palynologists. The contributions include geochemical studies, such as a comprehensive review by D. R. Engstrom and H. E. Wright, Jr., of the applicability of inorganic geochemistry to paleoecological reconstructions and a paper by P. A. Cranwell summarizing his stratigraphic analyses of triterpenoids from lake sediments. The problems associated with establishing a reliable chronostratigraphy are addressed in three chapters. Chapters by F. Oldfield and P. G. Appleby and by J. D. Eakins *et al.* deal with radiometric techniques, and one by R. Thompson provides a global review of paleomagnetism. The remainder of the volume mainly deals with fossil algae and pollen, including considerations of microfossil recruitment and sediment focusing. These studies are based largely on sites from the United Kingdom, but the data are usually discussed in a more global context. The study of fossil pigments receives only cursory treatment, and the analysis of animal microfossils is not considered.

A chapter by E. S. Deevey, Jr., on stress, strain, and stability in lacustrine ecosystems is especially thought-provoking. Borrowing terms from macroeconomic theory, Deevey examines the structure, function, and holistic nature of lake systems. A careful reading of the chapter should convince most skeptics that paleolimnological studies are not simply historical documentations but also allow for an "explanatory description and prediction of a system's trajectory in time." The chapter will undoubtedly become required reading for many graduate seminars.

Overall, the book represents an important contribution to the study of environmental history, providing an interesting collection of reviews and case studies of use to nonspecialists as well as to practicing paleolimnologists. A detailed table of contents, lists of illustrations and tables, and a subject index enhance the volume's usefulness as a reference.

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