have all the charts gathered together into one bound volume.

The introductory section is profusely illustrated and generally well done. It includes informative discussions of lunar physics, the history of lunar cartography, mapping techniques, the lunar landscape, and techniques of lunar flight. The origin of many geologic surface features is discussed, and part of a geologic map is shown, but the description is confused by the inclusion of some rarely used Russian stratigraphic names.

The atlas is a fine reproduction of the earth-based lunar map series and is therefore very useful. It would have been even more useful if Apollo landing site maps had been included. The introductory background information is most interesting and well illustrated, although the section on geological interpretation could have benefited from a heavier editorial hand.

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Environment and Evolution

Annual Review of Ecology and Systematics. Vol. 1. RICHARD F. JOHNSTON, PETER W. FRANK, and CHARLES D. MICHENER, Eds. Annual Reviews, Palo Alto, Calif., 1970. x, 406 pp., illus. $10.

It is a cliché that a systematist should also be an ecologist, or, conversely, that an ecologist should be also well versed in systematics. So it seems that the editors and the members of the editorial committee hardly need to justify their decision to publish this new series, the choice of its title, or the range of topics included in it.

In evaluating this first volume, one must remember two *raisons d'être* of review articles. The first is to enable researchers (and teachers) to absorb easily a vast amount of information that has not previously been organized in a logical fashion, or, if it has, that needs to be brought up to date. This sort of review is useful primarily in fast advancing fields, where, though the specialist is usually capable of glimpsing the forest, the generalist sees only the trees. Typically also this sort of review resembles a miniature textbook; in other words, it is rather dull but it ought to guide the uninitiated into an unfamiliar terrain by giving him numerous and unbiased bibliographical references. The second type of review is that which attempts to arrange a body of facts and ideas—be they few or many—around a novel theme in such a way as to open up vistas to specialists as well as to other workers. Typically this kind of review is less informative but more speculative, perhaps even boldly so, and makes good reading even if some of the hypotheses it contains may be only as lasting as sand castles.

Of the 15 papers in the book 7 fall in the first category and 5 in the second. Five of the "type 1" reviews should prove useful to their intended readers: Hull's impartial analysis of the dispute between the evolutionary, the phenetic, and the phylogenetic taxonomists; Crovello's guidelines to the study of character variation; Bourlière and Hadley's summary of the descriptive work being done on productivity of African savannas; Brown and Orians's methodical survey of the ways in which mobile animals space themselves out in relation to the availability of resources; and Clemens's overview of the mammalian lineages that appeared and diversified during the Mesozoic.

I found all five of the "type 2" essays thought-provoking, although they are uneven in freshness of outlook. Lewontin examines the levels at which natural selection acts (molecules, organelles, cells, gametes, individuals, and higher levels such as kin and population). He makes the point that selection may be at work in opposed ways at two or more levels, and emphasizes the correlation between purely ecological and genetical aspects of selection: little new here for the seasoned ecologist or systematist. Writing on pollination mechanisms in angiosperms, Stebbins is dogmatic in approach and sweeping in his conclusions, but he remains stimulating. He suggests several avenues for further studies, among them the significance of pollination of primitive angiosperms by beetles. To me, the most interesting papers of the book were those of Brock, of Enright, and of Harper, Lovell, and Moore. Brock's descriptions of high-temperature habitats cover some of the most intriguing aspects of these environments, including their origins, their evolutionary effects on living things, and the possibility that hot springs may be comparable to islands. In an original essay Enright tackles the problem of endogenous rhythms from an evolutionary angle in an effort to uncover the selective advantages of certain rhythms (circadian, tidal, lunar, annual) in ecological terms. Harper, Lovell, and Moore explore the variability in seed size and shape, then review the genetic basis for the observed patterns, before speculating on the possible adaptive properties of various seed sizes and shapes.

I wonder seriously whether the five papers not mentioned above ought to have been published at all (either they are not review papers, or they cover topics that needed no review, or they fail in their intended goals). Moreover, I believe that some of the other articles could more appropriately have been published in already existing, more general, journals and books that accept reviews, such as *Biological Reviews*, the *Quarterly Review of Biology*, *Advances in Ecological Research*, or *Evolutionary Biology*.

At this stage in the ecological and systematic game we possibly do need a medium for comprehensive reviews intended specifically for this joint audience. But for such a book to be really useful, the topics to be reviewed should be selected with utmost care to avoid duplication with material covered in other series, the manner of reviewing a given topic should be assessed before the author starts writing, and the articles retained for publication should meet a truly high standard. If future issues of *Annual Review of Ecology and Systematics* have fewer pages but a proportionately greater amount of worthwhile material than the first, then researchers in ecology and systematics might have at their disposal a valuable *instrument de travail.*

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Evaporites

Salt Deposits. Their Origin and Composition. O. BRAITSCH. Translated from the German edition (1962) by P. J. Burek and A. E. M. Nairn, in consultation with A. G. Herrmann and R. Evans. Springer-Verlag, New York, 1971. xiv, 300 pp., illus. $19.80. Minerals, Rocks and Inorganic Materials, vol. 4.

When Braitsch published his monograph in Germany in 1962, I was delighted to find it to be a lively, personal, and surprisingly open-minded treatment of marine evaporites. Since

then it has become a standard source and perhaps the best single introduction to the field. In the United States it has remained virtually unknown. This is a pity, because ever since Van't Hoff moved from Amsterdam to Berlin in 1896 Germany has been the center of evaporite research, and Braitsch is the ideal guide to this body of work. It is good to have the translation by Burek and Nairn now, even though much has happened during the last decade. The translators, adhering strictly to the original, have produced a readable, if not elegant, version. To acknowledge the passage of time, A. G. Herrmann has added a sprinkling of references up to 1968, none of which are included in the reference list or index.

Otto Braitsch's death in an automobile accident in 1966 was a loss for all of us. During his trip through the United States in the preceding year he made many friends. His grasp of the subject was obvious, and he was delightfully flexible and free of dogma. Many of us were counting on active and fruitful collaboration. Now we are grateful that he summarized his views so convincingly.

The translation arrived in the nick of time. I believe that the next few years will bring radical changes. Like no other branch of the earth sciences, evaporite research has been dominated by chemists, foremost among them Van't Hoff. It looks as if it is now the sedimentologists' turn. A detailed analysis of the depositional environments and sedimentary structures of evaporites promises to yield more insight than further phase diagrams—for a geochemist, quite an admission.

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Surface Chemistry

Catalysis of Gas Reactions by Metals. A. J. B. ROBERTSON. Springer-Verlag, New York, and Logos, London, 1970. xii, 182 pp., illus. $9.80.

Recent years have seen the appearance of many novel experimental techniques that give definitive information about surfaces without interference by bulk atoms. Low energy electron diffraction, which reveals the structure of surfaces and adsorbed gases, and Auger electron spectroscopy, which makes possible nondestructive qualitative and quantitative chemical analyses of surfaces, are only two of these techniques. The study of heterogeneous catalysis, which is one of the most important applications of surface chemistry, will be one of the major beneficiaries of the recent advances in surface science. This book, a well-written review of many of the modern ideas and techniques of catalytic surface chemistry, will aid in the dissemination of the new information as applied to heterogeneous catalysis.

The important advances in the understanding of heterogeneous catalysis in recent years were made by establishing the correlation between the atomic structure of metal surfaces and chemisorbed gases and the reactivity of catalytic systems. Such studies utilize crystal surfaces that are prepared in ultra-high vacuum by a variety of newly developed surface cleaning techniques. The author reviews these techniques and incorporates them in his discussion of the physical-chemical properties of various types of metal catalysts. He presents a well-rounded discussion that takes into account recent advances in surface research in areas outside what has traditionally been considered the domain of heterogeneous catalysis (that is, the surface chemistry of supported metal catalysts). The historical introduction in chapter 1 is very informative and permits a better appreciation of the subject matter treated in subsequent chapters. Chapter 2 is devoted to the development of the concepts of heterogeneous catalysis that are used at present by workers in the field. The next three chapters are devoted to ultra-high vacuum studies of clean, well-defined metal surfaces. After a brief discussion of the preparation of supported metal catalysts the author turns his attention to the properties of adsorbed layers. First he discusses the modern physical methods used in studies of adsorbed gases (chapter 7). Then in the five remaining chapters, he discusses selected catalytic reactions as they are studied by measurements of macroscopic parameters (rate constants, adsorption isotherms, product yields, and so on).

This book indicates the trend that is noted by only too few workers in the field: the conversion of heterogeneous catalysis from art to a branch of applied surface science.

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Chemical Technique

Spectroscopy in Inorganic Chemistry. C. N. R. RAO and JOHN R. FERRARO, Eds. Vol. 1, xiv, 410 pp., illus., $19.50. Vol. 2, xvi, 312 pp., illus., $18. Academic Press, New York, 1970–71.

This is an excellent survey of selected aspects of the applications of spectroscopy to inorganic chemistry. There is a total of 16 articles (average length, 40 pages) by 22 authors, and the number of references runs from 31 to 298, the average being over 110. There are also author and subject indexes.

Now, what are these volumes about? Perhaps that can be best explained by listing the titles of three representative articles: "High-resolution nuclear magnetic resonance," "Electronic Raman transitions of rare earth ions and crystal field effects," and "Spectroscopy of donor-acceptor systems." The first surveys in traditional fashion a well-known field by introducing such phenomena as spin-spin splitting and the chemical shift and progressing to a review of such recent applications of NMR as to fluxional organometallic molecules, diastereoisomeric complexes, and double resonance. I chose the second title above to illustrate the very specialized nature of some of the articles; this particular article, which freely uses such concepts as scattering tensors and 3*J* symbols, would be of interest primarily to the specialist, although the section on experimental results should allow the general reader to get an idea of what the subject is about. The last-mentioned chapter is primarily a survey of a wide area of chemistry where spectroscopy (infrared, NMR, electronic, and so on) has been one of the useful probes. I found several of the articles in this class particularly illuminating, perhaps because inorganic chemists are generally problem-oriented and less interested in "spectroscopy" as a unifying theme.

There is no attempt at completeness; rather, most of the articles lean toward techniques of recent importance instead of a broad coverage of the electromagnetic spectrum. As an illustration of this point, the lone article concerning vibrational spectroscopy concerns only measurements at high pressures. While there is a chapter devoted to the principles of transition ion crystal spectra, there appears elsewhere no mention of recent work concerning such topics as magnons and magnetocircular dichroism. There are two articles on electron spin resonance, a field well reviewed