shelter of the hunters of the last ice age of Europe. Further technological achievement was manifest in plant and animal domestication of the Neolithic villages. At this point, Freud, who has lurked in the wings, takes center stage. Owing to her importance in farming and fertility, woman assumes control. She is the cultivator, the symbol of life and growth, and the container, as are the pots she makes. Indeed, sex becomes highly enjoyable. Ethnographic evidence, unfortunately, indicates that in most independent farm villages where crops exceed hunting in importance, men rather than women are the tillers and assume the authority roles.

The Neolithic village was idyllic compared to the subsequent era of the megamachine, which robbed men of their creativity, independence, and dignity, dehumanizing them under the rule of all-powerful divine kings. This machine, we are told, has eluded archeologists because it is invisible—a social arrangement that got monumental structures built and maximum food and other goods produced without a comparable advance in technology. This astonished reviewer fails to distinguish the megamachine from the state, which we have recognized and speculated about for some years.

In fact, the archeological record leaves little doubt that the beginnings of the state were based on specialized production and sometimes irrigation under the peaceful control of a priesthood. Mumford's assertion that the first kings and their warriors were carryovers from the glacial-age hunters involves a time gap between about 10,000 and 4,000 B.C. and a change of environment from arctic Europe to the moderate, semi-arid Near East.

The first megamachine began to break down by about 600 B.C., and the divine kings were replaced by "axial" religions centering around prophets, from Buddha to Mohammed, who appealed to the common man. But technological progress, though no longer manifest in monumental architecture, was not suspended. The Greeks contributed scientific knowledge if not always their technological applications. Later, the Christian orders of monks, followed by craft guilds, continued to make innovations. Until the second megamachine that developed after the 16th century, basic inventions were made by small societies or states.

The so-called industrial revolution was simply the capture of production and distribution by concentrated power. With conscious scientific research, the second megamachine acquired such capabilities that it could indulge in mass destruction through use of bombs and napalm (pp. 12–13), and the president of the United States could by means of a faked emergency "wield such power and politically sanctify his cumulative errors of judgment . . . [as to justify] his inhumane acts in Vietnam" (p. 178).

The thesis of this book has inescapable moral and political implications for the contemporary world. If 2 million years of cultural evolution resulted from man's mind rather than from the imperatives of technology, man is presumably able to devise a better society. But we are not told how this may be done. If, on the other hand, economic, social, and political institutions are inevitable responses to mass production and distribution, to what extent can the human mind, or reason, reverse or deflect the trends? Can small, independent utopian communities, something like the Greek cities, the Neolithic villages, or the monasteries, be created within the context of the second megamachine?

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The Geography of a Vast and Varied Realm

Arid Lands. A Geographical Appraisal. E. S. HILLS, Ed. Methuen, London; Barnes and Noble, New York, 1967. 479 pp., illus. $13.50.

It is doubtful that a reader interested in any aspect of the world's dry lands will fail to find new and interesting information somewhere in this volume. Conversely, he is equally certain to encounter sections and perhaps chapters that are at best trivial or irrelevant. I find it difficult to decide whether the successes and failures stem from the contributions themselves or from the fullnesses and gaps in my own background. Would, for example, E. B. Edney's discussion of the physiologic and morphologic adaptations to dry environments by animals in several phyla seem as fascinating as it does to me were I less innocent of the subject matter? This subjectively posed question leads to a more general one. Is it possible to write a generally satisfying and comprehensive geography of so vast and varied a realm as the two-fifths of the earth's land surface in which moisture shortage places obvious limits on the development of life?

For more than a decade UNESCO maintained an active Arid Zone Program, and its work is being continued under another title. Through sponsoring research and surveys, conferences, and publications it endeavored to enlarge and disseminate knowledge of arid environments so that such regions could contribute to greater human welfare. The 17 contributors to this volume represent many disciplines, but all had some connection with the Arid Zone Program and most draw heavily on its publications for their material. There is no shortage of specialized expertise. The dominant theme of most contributions is that of learning about all aspects of arid environments in order to be able to expand and maintain their productivity and thus support more humans at higher living standards. A healthful realism is generally present. Discussion of opportunities for development is at least balanced by recognition of special problems that confront man in arid lands: waterlogging and salinization of irrigated soils, the fragility of ecologic complexes in dry lands and the irreversibility of certain sequences of degradation, the extra burdens of isolation and water costs that must be borne by all economic activities in arid regions. One can gratefully record that this is no tract promising salvation to some of the world's poorest people if only the right button, labeled technology and a modern economic approach, is pressed.

The publishers clearly hope that this handsomely illustrated volume will be widely adopted as a text for courses entitled "Geography of Arid Lands," but as a geography of the arid lands the book must be rated as unsuccessful. The diversity of the region to be dealt with overwhelmed every contributor, even though the topics many wrote on were quite sharply circumscribed. Some attempted to restrict themselves to generally valid statements, and even the blandest of these need qualification. An example (paraphrased) that recurs repeatedly: "The most important problem for man is the scarcity of water except in certain irrigated localities where waterlogging occurs and drainage works are needed." Other authors were willing to give anecdotal examples from the regions with which they are

most familiar, recognizing fully their limited applicability. When offered without pretense such data have great intrinsic interest. X. de Planhol, in discussing traditional craft industries in the Sahara and the Middle East, is notably successful in exciting the reader's interest and in presenting well-grounded speculations as to origins and projections of future trends. Still another approach is exemplified by T. N. Jewitt's discussion of desert soils. It is a fine short course on soil genesis and morphology; but it tells little about which soils occur where and to what areal extent.

It is unlikely that a superior group of experts, in terms of topical coverage or individual specialized knowledge, can be assembled to write on arid lands. This reader is forced to conclude, however, that if a satisfying geography of a systematically defined but vast and discontinuous region is to be written it will have to be by a single author. A counterpoint of broad generalization and specific example must recur throughout the topical treatments, but they can be introduced in accordance with some plan, not as a random set of authors' predilections.

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Ichneumon Flies

A Catalogue and Reclassification of the Neotropic Ichneumonidae. HENRY TOWNES and MARJORIE TOWNES. American Entomological Institute, Ann Arbor, Mich., 1966. 371 pp. $11. Memoirs of the American Entomological Institute, No. 8.

This catalog and reclassification is a major work on one of the most important families of insects. The Ichneumonidae are not only, in number both of species and of individuals, among the most abundant terrestrial invertebrates, but also are of great economic value because they parasitize other arthropods, finding hosts especially in the multitudinous and destructive insect orders Lepidoptera and Coleoptera. This family has long been one of the least-known groups of animals, and it is only within the last few decades, and primarily through the efforts of the Townes, that progress has been made toward a workable classification of this difficult complex. Even in studying the more familiar Nearctic and Palaearctic faunas, it has until recently been necessary to consult the type specimens in order to identify most ichneumonids. With regard to such less-known regions as the Neotropic, anyone who has considered those faunas will attest that before the work of Townes the modern student was little better off than his predecessors in the days of Linnaeus, because most literature on the Latin American Ichneumonidae has consisted only of the random and generally inadequate description of isolated species.

Faced with overwhelming taxonomic and nomenclatural chaos, the Townes were obliged to examine, in museums throughout the world, almost all extant types of Neotropic ichneumonids. Thus they made authoritative synonymies and assigned the described species to their proper genera in the practical and coherent system they have elaborated during a lifetime of work on the parasitic Hymenoptera. In this way 1771 valid species were cataloged for the Neotropic realm and a secure basis was established for all future research on this fauna. Such research will be voluminous, as the Townes estimate that 90 percent of the Neotropic species remain undescribed.

This memoir also contains Henry Townes's "A Key to the Genera of Ichneumonidae Recorded from the Neotropic Region." I have used this key on large collections of Ichneumonidae from Costa Rica, Peru, Chile, and Argentina. My experience has been that it permits relatively easy identification of the majority of Central and South American genera. There remains, however, a large unclassifiable residue. This is both because many genera are presently undescribed and because Townes bases his definitions of described genera only upon their published species and, consequently, in certain cases his diagnoses will not quite fit some of the numerous unnamed forms which almost all genera still contain. I point out also that the Townes are now completing a revisional study of the ichneumonid genera of the world which will contain keys, descriptions, and illustrations of each genus. This, when it appears, will supplement and in part supersede the more abbreviated treatment given here. Meanwhile, the present key opens to study an ichneumonid fauna which previously confounded even those fortunate to work at institutions with comprehensive libraries and collections.

In the words of the Townes: "With this catalogue all of the described ichneumonids of the world are now covered except for those in Europe, Asia Minor, and Africa. . . . There are plans for cataloguing the Ethiopian species, and certain European colleagues are working on the species of the western Palaearctic. With these, the taxonomy and nomenclature of the ichneumonids will have become more precise and orderly than in any other major group of animals. . . ."

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Spectroscopy Method

Second Quantization and Atomic Spectroscopy. G. H. Dieke Memorial Lectures. BRIAN R. JUDD. Johns Hopkins Press, Baltimore, 1967. 71 pp., illus. $5.95.

The lectures which this book contains were presented to commemorate the major contributions of G. H. Dieke to the development of spectroscopy, especially with respect to the configurations of *f*-shell electrons as found in the rare earths. The advantages of second quantization are shown as an amplification of the tensor calculus developed by Racah. Second quantization is introduced with simple illustrations of the commutation of creation and annihilation operators which can be worked out by the reader and from which he can gain a real grasp of what is going on. The correspondence between matrix elements and Feynman diagrams is shown in an understandable way, another of the mysteries of the modern approach being thus dispelled. Diagrams offer an elegant method of writing matrix elements and lead, as usual, to methods of counting to see that all the relevant interactions have been included. In fact the whole idea of applying second quantization to a subject understood in its customary form is an excellent way of introducing the new methods.

The book pulls together many of the results of atomic spectroscopy, bringing out the connections between them and thereby leading to an understanding of the underlying theory. It must be borne in mind that this is a series of lectures, the details of which will be more understandable the better one knows the conventional methods. It helps if the reader is familiar with Racah's work.