# Book Reviews

## Mental Geography

**Image and Environment.** Cognitive Mapping and Spatial Behavior. ROGER M. DOWNS and DAVID STEA, Eds. Aldine, Chicago, 1973. xxiii, 440 pp., illus. $15.

"Can geography be mixed up with psychology?" This question, which the geographer Peter Gould has taken from a book on the Italian character to preface his own seminal paper on mental maps, is answered in an emphatic affirmative at the conclusion of his paper—as well it might be. For not only the two papers that Gould has contributed to this anthology, but the entire volume, provide ample testimony that these two disciplines can and do get "mixed up" with one another, and that the mixture can result in a heady brew indeed. Through this most attractive book, coedited with unusual care as well as perspicacity by a geographer (Downs) and a psychologist (Stea), we find ourselves at the frontier of a new and exciting intellectual domain, that of the individual's conception of his geographic environment.

Although slightly less than half the contributors to this volume are geographers, it is fair to state that it is the geography profession, rather than that of psychology, which has provided the impetus for this outpouring of creative effort aimed at delineating the nature of the geographic world as seen by the mind's eye—that is, the individual's conception of space and place, of distance and direction, on the basis of which he presumably orients and moves about in his world, and responds to locales and areas that may be altogether removed from his direct experience. It is not difficult to understand the interest, and indeed fascination, that such problems have come to hold for a new breed of geographers, who have designated themselves as "behavioral," having traded in their cartographical skills and techniques for the rather more elusive world of mental maps. It is, however, important to recognize the consequences of the geographers' mode of approach to these phenomena. Let us examine some of them.

First, we are dealing here with the environment primarily at a macro- rather than a micro-level. The unit may be as small as the neighborhood, as studied by Terence Lee, or as large as a country, as in Kevin Cox and Georgia Zannaras's and Gould's studies of mental maps of the United States, or even encompass the entire world, as in Thomas Saarinen's research. It does not, however, get down to the scale of a room, or even a house, and partly for that reason lacks any link to the substantial body of experimental psychological research on spatial behavior in animals and humans. To be sure, Edwin Tolman's paper "Cognitive maps in rats and men" (1948) is dutifully included among the reprinted papers in this volume, but one suspects that its status as the putative father of the geographer's mental-mapping movement owes more to its title than to the problems it was addressed to.

Of rather greater import is the general mode of approach to research characterizing the empirical work on mental mapping. Here again we discern the imprint of the geographer more than that of the experimental psychology of cognition. Most of the studies reported, though frequently placed in theoretical contexts, remain either at a purely descriptive level in their treatment of empirical data or involve applications of models, both a priori and a posteriori, to the phenomena studied, by resort to diverse techniques ranging from curve fitting to similarity scaling and factor analysis. In contrast, there is but a single instance of a study in which specific hypotheses concerning the role of specified variables are tested. There is nothing inherently objectionable, of course, about descriptive or modeling types of research, but the net result is that we learn relatively little about the psychological processes that govern the formation of mental maps. The fact that mental maps, at the scale that they are studied, are generally the resultant of a process of integration of successively experienced environments over time surely has important consequences for their structural character, but little recognition is given to this or similar questions of process. Problems of function fare little better, except in Stephan Kaplan's insightful analysis of the value and usefulness of mental maps.

For the same reason, the psychologist looking for links to the contemporary study of imagery, which has in recent years been given a new lease on life on the psychological scene (*1*), would be disappointed. The fact is that, for the most part, the term "image" as used in this book represents a concept heavily laden with connotations of structure, much as in the psychologist's concept of the schema, which is in fact referred to at various points, though not nearly so systematically as one would wish. In this case, the responsibility for this purely semantic difficulty rests neither with the psychologist nor with the geographer, but rather with an economist, Kenneth Boulding, whose little book *The Image* (*2*) is the true godfather of the mental-map concept. To be sure, Boulding used the term in a vastly broader sense, to refer to the most diverse phenomena of social science, analyzing them in terms of underlying structural concepts, that is, of relationships among elements. Indeed, in a short foreword to the present volume Boulding appears almost surprised to find his all too sketchily composed thoughts rediscovered and pressed into service by geographers. But of its relevance to this field there can be little doubt.

We should note, further, some important limitations of the mental-mapping approach. One of these concerns the virtually total neglect of overt behavior in or through space. Here we are reminded of Charles Osgood's reservations concerning Tolman's cognitive model of learning: ". . . one gets the impression (while reading Tolman's work) of a disembodied rat floating along the cognitive lines of its expectations, busily plotting maps of the experiential field—all quite isolated from the corporeal, behaving muscles which move it here and there" (*3*). For humans no less than for rats, cognitive maps must ultimately be related to overt behavior; conversely, individuals may reveal their internalized geographic maps as much by their patterns of movement as by sketches on a two-dimensional surface or purely verbal means. This point is virtually lost in both the theory and method permeating this field, though one of the contributors to this volume, Ronald Briggs, at least recognizes the role of overt behavior, and movement in particular,

as major influences on mental maps.

One similarly misses, in this single-minded devotion to the domain of cognition, any concern for the motivational or affective side of the problem. The thinking of Kevin Lynch, whose book *The Image of the City* (*4*) is one of the early landmarks in this field and whose influence is acknowledged throughout this volume, was refreshingly free from this limitation, for Lynch made much of the role of "imageability" in leading to a sense of satisfaction, of well-being, of affective investment in one's environment. But of that there is no trace to be found in this volume, just as the notion of "imageability" as a characteristic of particular urban forms, rather than of the cognizer, is left largely untouched, except for one comparative study of mental maps of Milan and Rome, by Donata Francescato and William Mebane.

In conclusion, let me emphasize that these several criticisms, if such they be, are criticisms of the field introduced to the world at large via this book, rather than of the editors. For their work Downs and Stea deserve nothing but praise. Their volume is an evident labor of love, such as is found all too rarely in edited works of this type. They have not only struck a most effective balance between reports of research, literature reviews, and theoretical papers, and shown admirable judgment and a sense of the dimensions of the field in their selections, but have gone to some lengths to ensure adequate representation of the major approaches and aspects of the field, in a number of cases by specifically soliciting papers on particular subjects from their authors. Their own contributions, in the form of an introductory chapter and shorter commentaries prefacing the various sections, are far from perfunctory and are in fact most helpful. One suspects, too, that the general high level of readability of the contributions owes much to their editorial efforts. Finally, their publishers have served them well on the production end. This is, in short, a volume to which those in the growing field of environment-and-behavior will turn frequently, as much from necessity as for enjoyment and profit.

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**References**

1. P. W. Sheehan, Ed., *The Function and Nature of Imagery* (Academic Press, New York, 1972); S. J. Segal, Ed., *Imagery: Current Cognitive Approaches* (Academic Press, New York, 1971).
2. K. E. Boulding, *The Image* (Univ. of Michigan Press, Ann Arbor, 1956).
3. C. E. Osgood, *Method and Theory in Experimental Psychology* (Oxford Univ. Press, New York, 1953), p. 391.
4. K. Lynch, *The Image of the City* (MIT Press, Cambridge, Mass., 1960).

## Acoustics and Fisheries

**The Detection of Fish.** DAVID CUSHING. Pergamon, New York, 1973. xiv, 200 pp., illus. $16.50. International Series of Monographs in Pure and Applied Biology: Zoology, vol. 52.

The author's primary purpose is to treat the use of echo-sounding techniques in the study of fisheries problems. Particular emphasis is given to estimation of abundance of stocks and open sea studies of fish behavior. The scope is thus somewhat narrower than the title implies, although the introductory material includes brief discussions of fish detection by means other than active echo-ranging. In the light of present fisheries technology this is probably logical, although there has been much reliance on fish detection from aircraft, and in earlier, quieter times fish could be detected passively simply by listening through the hull of one's boat. The noisiest fish, however, do not constitute the resources represented by the cod, herring, hake, and tuna which are logically the book's principal concerns.

Underwater acoustic system capabilities moved forward greatly during World War II in response to the need to find submarines in an environment that cannot be penetrated effectively by electromagnetic radiation (optical or radar systems). The resulting technology and subsequent Navy-oriented developments have been used in limited fashion over the ensuing 30 years in both biological and geological oceanography and the related applied fields of fisheries and mineral exploration. This book assembles an account of these applications and their results in the fisheries context, pulling together material previously available only in widely scattered journals.

It conveys the flavor of the sea in its descriptions of specific fisheries in various parts of the world and indirectly demonstrates some of the attributes of successful interaction among the scientists, engineers, and fishermen who work under often difficult conditions. This latter aspect appears, for example, in the requirement to work with any system of units with which a particular group is comfortable—the figures (all taken from previous papers and reports) may show lengths in meters, fathoms, nautical miles, or cables (0.1 nautical mile) while catches are given in pounds, tons, milliliters, and crans (0.182 ton). The sections on elements of underwater acoustics and data processing are not exhaustive but provide an appropriate background for understanding experiments carried out by means of echo-sounder techniques.

There is growing activity in this field, involving more sophisticated research equipment and data analysis techniques. This is sure to continue, with applied objectives expanding beyond the limited questions of optimal management of existing individual fisheries to biological indications of ocean pollution and the full range of interactions between the fisheries and their environment. In this context, this book will find its greatest use in providing beginners with a good reference foundation, consolidating most of the work done in the 1950's and 1960's.

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## Reef Research

**Biology and Geology of Coral Reefs.** O. A. JONES and R. ENDEAN, Eds. Vol. 1, Geology 1. xviii, 410 pp., illus. + maps. $28. Vol. 2, Biology 1. xxii, 480 pp., illus. $42.50. Academic Press, New York, 1973.

The past 20 years have seen a great revival of research on living and fossil coral reefs by biologists and geologists, partly stimulated, perhaps, by the seemingly sudden destructive eruptions on many living reefs of the Indo-Pacific by the previously apparently rare "crown of thorns" starfish *Acanthaster*. Three years ago saw the publication of a fat volume of papers on the reefs of the Indian Ocean, two years ago there appeared a symposium volume on corals and coral reefs, and now we have two volumes (with two more to come), dedicated appropriately to the Great Barrier Reef Committee, that set out to present "in one source as many as possible of the major advances made in