

The list of references is relatively complete and very representative of the good tropical cyclone research reports published in the last 40 years. The illustrations are excellent and include many outstanding photographs of hurricanes and hurricane damage. For a first edition there are few errors.

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Mental Representations

Imagery. NED BLOCK, Ed. MIT Press, Cambridge, Mass., 1981. viii, 262 pp., illus. Cloth, \$15; paper, \$7.50. A Bradford Book.

The role of imagery in mental life has for centuries been a recurrent topic of debate. Over the past decade the controversy has become especially heated, fueled by resurgent scientific interest in human cognition. The roots of disagreement are readily apparent. Most people will attest to their awareness of percept-like mental experiences, often visual, such as an image of the Statue of Liberty. They may claim to form such images in the process of performing certain cognitive tasks, such as deciding which of the statue's hands holds a torch. But such compelling introspections run head-on into a basis for rational skepticism: the notion that people have "pictures in their heads" immediately seems either conceptually incoherent or factually absurd. The imagery controversy, which has permeated both cognitive psychology and philosophy, has been a struggle toward a reconciliation of introspection with rational analysis.

This volume includes eight papers (most of them reprinted) that discuss the nature and function of mental imagery, with an introduction by Block. Both philosophers and psychologists are represented, and the collection intersperses attempts at conceptual clarification of the imagery concept with relevant psychological research and theory. Block's introduction provides a useful overview and sets the stage for the issues that pervade the later chapters. In particular, Block points out a variety of "false issues" that can easily confuse discussions of imagery. The debate between the "pictorialists" (who claim images have depictive properties) and the "descriptivists" (who claim images are essentially propositional descriptions) is not about whether images *are* pictures, but about whether they are *like* pictures

in relevant respects. The debate largely centers, in fact, on the question of what respects should be taken as relevant. Other issues that Block identifies as misleading include the questions of whether images exist (in some sense, of course they do), whether they are epiphenomenal, whether imagery is similar to perception, and whether images are "photographic." All of these questions, misleading or not, are discussed in the chapters that follow.

The two leading proponents of the "pictorialist" position represented in the volume are Jerry Fodor (on the philosophical side) and Stephen Kosslyn (on the psychological side). As the selection by Fodor (from his 1975 book, *The Language of Thought*) makes clear, the term "pictorialist" is itself rather misleading. No one believes that people always think in picture-like images or anything of the sort. Fodor presents classical arguments refuting both the possibility that thought can be identified with imagery and the view that "looking like" is either a sufficient or a necessary condition for referring. However, on the basis of a variety of psychological evidence, he favors the modest view that "images under descriptions" constitute a type of mental representation with depictive properties that people use to perform certain cognitive tasks (such as visual matching).

Kosslyn has two chapters in the volume. The first (coauthored with Steven Pinker, George Smith, and Steven Schwartz) is primarily a review of his empirical evidence that visual images have inherently spatial properties. The second presents his theory of imagery in more detail. Kosslyn's theory, which has been embodied in a computer-simulation model, is founded on a technologically updated version of the traditional picture metaphor: visual images are viewed as analogous to displays on a cathode ray tube. Like Fodor, Kosslyn subscribes to the position that imagery is but one form of internal representation, albeit one with distinctive properties. Kosslyn claims only that images can be constructed and maintained in active memory, allowing for the possibility that long-term memory is fundamentally descriptive in its mode of representation.

Daniel Dennett and Zenon Pylyshyn play the role of "descriptivists" (or "iconophobes," to use Dennett's playful term). The first of two chapters by Dennett, which was originally published in 1969, serves mainly to illustrate the extent to which the imagery debate has subsequently been clarified. The position he attacks is clearly that of a straw man; Fodor's chapter rebuts Dennett's

major points, and Dennett himself acknowledges in a new postscript that his conclusion was "rash and overstated" (p. 59). His second contribution is a much more conservative—indeed, admirably neutral—attempt to establish a definitional framework for the scientific investigation of mental imagery.

Pylyshyn's brand of iconophobia centers on two major points. The first is a proposal that imagery, if it is based on an analog mental medium, should prove to be "cognitively impenetrable"—in essence, impervious to influences of the meaning of that which is being represented. The second is a more empirical claim, that various phenomena often taken as evidence for an analog medium (for example, apparent "mental rotation") actually reflect subjects' "tacit knowledge" of physics and perception. Kosslyn, replying to Pylyshyn's points, argues that the criterion of cognitive impenetrability has little value in the absence of a careful stage analysis of cognitive tasks. While acknowledging the danger that imagery tasks may sometimes be influenced by tacit knowledge and other demand characteristics of experiments, he reviews a variety of evidence for depictive properties of imagery that is not easily explained by such extraneous factors.

Robert Schwartz provides a chapter that addresses perhaps the deepest question raised in the imagery debate—how do images represent? This question leads directly to one yet broader—what is symbolization? Schwartz points out the vagueness of the superficially plausible view that images represent by virtue of some "resemblance" to that which is being represented. He also makes it clear how difficult it is to differentiate among representational modes, suggesting there may not be one or two, but many forms of mental representation. The criteria that have been suggested to define an imaginal mode, he argues, are at best imperfectly correlated. Schwartz's cautionary critique suggests the directions in which the imagery debate is likely to continue.

This collection is somewhat narrow in its range of contributors; its focus is very much in Cambridge. In particular, it would have benefited from a paper by Roger Shepard, whose research and theoretical views surface repeatedly in various chapters. His work on mental rotation is introduced in a secondhand fashion in a chapter by Roger Brown and Richard Herrnstein drawn from their introductory psychology textbook. In a note following his introduction, Block offers an explanation for Shepard's ex-

clusion, which might have been better phrased as an apology. Nevertheless, for anyone interested in the current status of the imagery controversy, this volume offers a convenient introduction.

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Periplaneta americana

The American Cockroach. WILLIAM J. BELL and K. G. ADIYODI, Eds. Chapman and Hall, London, 1981 (U.S. distributor, Methuen, New York). xviii, 530 pp., illus. \$65.

For a small and retiring creature, the cockroach has had a large impact on the subjective quality of human life. Perhaps because it is cosmopolitan in its distribution, it, like the rat, has been transmogrified by scientists from a nasty pest into a quintessential experimental animal. An impressive amount of basic and applied research aimed at better understanding (and sometimes extermination) of the cockroach is recorded in the libraries of the world. In fact, thanks to their antiquity and adaptability, cockroaches are probably a good choice for the scientist bent on investigating any aspect of insect physiology; this book aims to be a resource for such people.

The book contains 15 chapters plus a brief introduction by L. M. Roth (which combines a clear summary of cockroach natural history with a chillingly extensive list of all the pathogenic organisms harbored by *Periplaneta americana*). A few of the chapters take a mainly cellular approach: integument (R. R. Mills); circulatory system (P. M. Fox); and fat body and metabolism (R. G. H. Downer). More of the chapters, however, are strongly organismal in their approach. Some focus on systems: nutrition (D. E. Bignell); respiration (P. L. Miller); osmoregulation (D. E. Mullins); nervous system and muscle (R. Pipa and F. Delcomyn); sense organs (G. Seelinger and T. R. Tobin); neurosecretion (S. S. Tobe and B. Stay); and reproduction (Bell and Adiyodi). Others are concerned with suprasystem functions: rhythms (D. J. Sutherland); development (R. R. Provine); pheromones and behavior (Bell); and regeneration (J. G. Kunkel). The editors seem to have put a good deal of effort into coordinating the chapters, both by cross-referencing between chapters and by copious reference to two earlier books on cockroach biology

(Guthrie and Tindall's *The Biology of the Cockroach*, 1968, and Cornwell's *The Cockroach*, vol. 1, 1968). This was probably a good way of expanding the scope of the book, although it sometimes makes the book less readable; one is continually brought up short in mid-idea by directives to pursue the point elsewhere. The breadth of the volume is impressive; it has sacrificed depth of coverage to achieve this and may prove frustrating for specialists looking for a deep view. On the other hand, it has brought together an immense and, like its subject, cosmopolitan collection of up-to-date references, and this is a valuable service.

In their preface, the editors express the hope that this volume will invite new researchers to consider the cockroach as an experimental animal. To this end, they ask their contributors to "place the cockroach in perspective with regard to its appropriateness . . . for various types of biological investigations" and, as well, to point out the unanswered questions of cockroach biology as a lure to potential investigators. Some (although perhaps not all) of the authors have risen to the challenge and have accomplished the delicate task of creating a sourcebook for both old and new ideas: a map from which readers may chart their own approaches, having before them not only the existing array of facts but also the most intriguing gaps in it.

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