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SELECTIONS, INTENTIONS, INTUITIONS, AND CHAOS: SOME CAPSULE REVIEWS

The first *JEAB* book review was a brief note by B. F. Skinner on M. Richelle's *Le Conditionnement Operant* (1967, p. 310). Since that time, about 60 more book reviews have appeared (the exact count depends on whether some marginal cases are counted as reviews or as special articles). Only a small proportion of the books that are appropriate for *JEAB* are reviewed, in large part because a completed review depends not only on the pairing of a book with an appropriate reviewer but also on identifying a reviewer whose other commitments do not compete too strongly with completion of the potential book review.

A few examples of books that may be of interest to the *JEAB* audience but reviews of which have not yet been written are: M. Davison and D. McCarthy's *The Matching Law: A Research Review* (1987, Hillsdale, NJ: Erlbaum); E. S. Savage-Rumbaugh's *Ape Language: From Conditioned Response to Symbol* (1986, New York: Columbia University Press); V. L. Lee's *Beyond Behaviorism* (1988, Hillsdale, NJ: Erlbaum); T. R. Zentall and B. G. Galef, Jr.'s *Social Learning: Psychological and Biological Perspectives* (1988, Hillsdale, NJ: Erlbaum); F. E. Yates' *Self-Organizing Systems: The Emergence of Order* (1986, New York: Plenum); and the new two-volume edition of S. S. Stevens' *Handbook of Experimental Psychology* (1988, New York: Wiley). This editorial attempts to reduce the imbalance between potential and actual reviews with some comments on a few other recent books that seem relevant to the field of behavior analysis. These comments do not preclude full reviews of these books at a later date; in fact, as in the past, suggestions of possible reviewers for these or other books are welcome.

Skinner, B. F. (1989). *Recent Issues in the Analysis of Behavior.* Columbus, OH: Merrill.

Collections of B. F. Skinner's papers began with *Cumulative Record* (Appleton-Century-Crofts, 1959), which was enlarged in 1961 and further expanded in the third edition that appeared 1972. But the actual cumulative record of his papers has also been extended in other volumes: *Contingencies of Reinforcement* (Appleton-Century-Crofts, 1969), *Reflections on Behaviorism and Society* (Prentice-Hall, 1978), and *Upon Further Reflection* (Prentice-Hall, 1987). This most recent selection of 12 more papers is dedicated "To all behavior analysts," and includes, among others, treatments of the etymologies of cognitive vocabularies ("The origins of cognitive thought"), of verbal behavior ("The listener"), and of the phylogeny of behavior ("Genes and behavior"). The last piece, "*The behavior of organisms* at fifty," nicely supplements the recent celebration of that book in this journal (*JEAB,* 1988, pp. 277–358).

Dawkins, R. (1986). *The Blind Watchmaker.* Harlow, England: Longman.

Because the concept of selection is relevant to both phylogeny and ontogeny, discussions of evolution are of special interest to behavior analysts. In this treatment of evolutionary contingencies, Dawkins responds to the challenge of the theologian William Paley's argument from design. If one finds a watch, one assumes a watchmaker; but if that example of organized complexity requires a maker, what about the organized complexity of living organisms? One of the ways in which Dawkins answers Paley is by describing the outcomes of a computer simulation that has many features in common with the process of ontogenic shaping. His account also includes a useful discussion of the high likelihood of low-probability events when the probabilities are sampled over sufficiently long periods of time (e.g., if the odds that lightning will produce a particular organic molecule are a million to one, it is a virtual certainty that the molecule will be created if thousands of lightning strokes occur per year for a million years). This is the book to which students who have trouble with the idea of evolution should be referred.

Edelman, G. M. (1987). *Neural Darwinism: The Theory of Neuronal Group Selection.* New York: Basic Books.

The title gives much of the reason why this book should be of interest to behavior analysts. It is a selectionist rather than an associationist account of the development and function of the nervous system and of its role in behavior. Furthermore, the nervous system in this account is not a conceptual one; rather, it is based in detail on what is currently known about the properties of neurons and the ways in which connections among them are created and maintained. Edelman presents three characteristics as the requirements of any effective selectionist system: "(1) a source of diversification leading to variants, (2) a means of effective encounter with or sampling of an independent environment that is not initially categorized in any absolute or predetermined fashion, and (3) a means of differential amplification over some period of time of those variants in a population that have greater adaptive value" (p. 17). Parallels with response emission, consequences, and the reinforcing effect of those consequences are not hard to find, even though Edelman seems to have little sympathy with behavior-analytic approaches. Some readers may be disappointed that Edelman's account emphasizes perceptual phenomena in organization of input, to the neglect of issues of response classes in organization of output. Nevertheless, the account often leads to congenial conclusions. For example, his proposed selectionist neural system allows categorical discriminations among stimulus classes to develop, but the organism does not need to form representations of the stimulus classes for this to happen.

Dennett, D. C. (1987). *The Intentional Stance.* Cambridge, MA: The MIT Press.

The concept of intentionality has played a prominent role in recent philosophical challenges to behavior analysis. Yet the realm of intentionality corresponds to that of discriminative control by social stimuli. One individual makes judgments of the intentions of another on the basis of subtle discriminations involving that other's past and current behavior. Such discriminations presumably have an extensive phylogenic history (e.g., attention to the behavior of prey is a dimension along which predators are likely to be selected, just as attention to the behavior of predators is a dimension along which prey are likely to be selected); and, following from such selection, discriminations of social behavior may become so important that they override other types of discriminations (e.g., a major problem in studies designed to explore the language competence of primates is that of getting these highly social organisms to attend to inanimate apparatuses instead of the comings and goings of the human experimenters). Dennett's book provides a detailed philosophical account of intentionality, and those concerned with the viability of an alternative vocabulary formulated in terms of complex social discriminations would do well to explore the limits of that approach in the context of his analysis.

Dreyfus, H. L., & Dreyfus, S. E. (1986). *Mind over Machine: The Power of Human Intuition and Expertise in the Era of the Computer.* New York: Macmillan.

Dreyfus and Dreyfus are concerned with limits on the capacity of computers to simulate human judgments. They warn of problems that are likely to arise when attempts are made to substitute computer expert systems, which are necessarily rule-governed systems, for human expertise. In the course of their account, they present a typology of human mastery skills that includes five stages. The advance over the first three stages, from novice to advanced beginner to competence, involves the learning of new discriminations and performance rules. The subsequent advance to proficiency occurs as intuitive judgments mix with rules, and finally expertise develops as performance becomes less dependent on the rules. Their examples include chess, medicine, and other areas for which computer expert systems have been designed. The special interest for behavior analysis is that their distinctions between the functions of rules and of intuitions are much like those between rule-governed and contingency-shaped behavior, except that their priorities are inverted. For Dreyfus and Dreyfus, rule-governed behavior comes first, and the intuitive or contingency-shaped behavior eventually grows out of it. Experimental attention to the concerns that Dreyfus and Dreyfus raise, however, may lead to accounts in terms of three classes of skilled behavior, the first of which they do not consider: a variety of contingency-shaped behavior that has never depended on verbal rules, corresponding to the variety of contingency-shaped behavior that is ordinarily

treated in behavior analysis (as in the behavior of nonhuman organisms); rule-governed behavior, in which verbal antecedents override the effects of nonverbal contingencies (but the vocabulary of rules functions very differently in their account than it does in behavior analysis); and, finally, expert performance, in which the continuing contact with the environment attenuates the control by the verbal antecedents and allows behavior to be sensitive to subtle changes in contingencies (in what might be regarded as a second and different kind of contingency-shaped behavior that behavior analysis has yet to explore).

Gleick, J. (1987). *Chaos: Making a New Science.* New York: Viking.

The surprising property of nonlinear systems is that very small changes in initial value can have enormous effects on later states of the system. Meteorologists have contributed to the mathematical developments that are discussed in this book by demonstrating that the butterfly effect is a real phenomenon. The weather is one example of a nonlinear system, and for this reason the flapping of a butterfly's wings in one part of the world can indeed determine the passage of a storm system over some other part of the world a few weeks later. The problem created by such effects is that, whether or not one wishes to regard them as determined, nonlinear systems cannot be measured finely enough to make them predictable. Behavior is a nonlinear system also, and the mathematical phenomena subsumed under the rubric of chaotic systems imply very powerful constraints on its prediction or control. On the one hand, this is a book to be enjoyed at several levels: It provides an entertaining account of the behavior of mathematicians, and its displays of the Mandelbrot set and related phenomena have dramatic visual impact. But on the other, the implications for behavior analysis give one pause. The constraints on prediction and control are more serious than those implied by Heisenberg's uncertainty principle. This makes interpretation far more important, and in many behavioral applications it will often be all that is feasible. Meanwhile, how long will it be before mathematically inclined behavior analysts begin to derive strange attractors from data on pigeon interresponse times?

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