A Challenge to Learning Theory

Autoshaping and Conditioning Theory. C. M. LOCURTO, H. S. TERRACE, and JOHN GIBBON, Eds. Academic Press, New York, 1980. xii, 314 pp., illus. $30.

Every college freshman is taught that there are two types of learning: classical or Pavlovian conditioning and instrumental or operant conditioning. In the former the correlation of two stimuli causes the unconditioned responses to the second stimulus to occur in the presence of the first stimulus. The prototype of classical conditioning is the elicitation of salivation in dogs by a tone that has been paired with food. Instrumental or operant conditioning depends on a correlation between responses and a reinforcer; if conditioning is effective the response increases in frequency. This occurs even when the response is not truly "instrumental" in bringing about a reward but is only adventitiously correlated with it. The prototype of operant conditioning is the keypecking by pigeons reinforced with grain.

By the mid-'60's, confidence in such a two-factor learning theory was beginning to wane in the face of anomalous data from organisms other than standard laboratory subjects (such as those deriving from the Brelands' work with circus animals), reinforcers other than pigeon grain and rat pellets (Garcia's work on taste-aversion), and responses other than lever pressing (Falk's work on schedule-induced polydipsia). But where anomaly merely perplexed, contradiction finally refuted: In 1968 Brown and Jenkins demonstrated that Pavlovian contingencies (pairing a keylight with food in a standard experimental chamber) yielded faster conditioning of the pigeon's keypeck than did traditional hand-shaping procedures. As if this were not bad enough, the next year Williams and Williams demonstrated that such "autoshaping" contingencies maintained keypecking even when every keypeck cancelled reinforcement. Their paradigm ruled out explanations of the phenomenon in instrumental terms, such as adventitious conditioning. The sine qua non of instrumental behavior is its sensitivity to its consequences. Animals that continue to respond when the only consequence is the removal of a valued reinforcer assert the power of Pavlovian contingencies over instrumental ones—this in a context that until 1968 had belonged exclusively to the latter. In the subsequent years autoshaping has been demonstrated in other organisms, including fish, dogs, monkeys, and children.

The trouble with experimenta crucis is the explanatory vacuum they draw. Although a few theorists such as Bindra attempted to establish a one-factor Pavlovian theory, the positions held by operant and respondent theory had become fixed, pinioned by the data each had adopted over the decades, deflected from other data by the gerrymandering of textbook writers seeking simple stories and wide adoptions. A new type of theory, both more general (because a range of behavior is controlled by these contingencies) and more exact (because the data can support precise theorems), is needed. This book begins the shaping of that theory.

The editors of *Autoshaping and Conditioning Theory* chose leaders in this field who had distinctive contributions to make. The book, accurately billed as a "professional-level reference for graduate students and psychologists interested in learning theory, animal behavior, and biological/evolutionary influences on learning," begins with an introduction by Terrace that summarizes the literature and exposes the issues on which autoshaping impinges. There follows a scholarly chapter by Wasserman providing a comparative-evolutionary framework for the problems of response evocation in learning. Before a response can be strengthened by association, it must occur for the first time "for other reasons." Autoshaping prohibits the traditional gambit of simply positing the first response and forces theoreticians to consider the biology of the black boxes they study. Williams attempts this in his chapter on "biconditional" behavior. While his synthesis is an attractive start toward a more general theory, it does not go far; it redescribes without ruling out.

The middle chapters of the book are empirical analyses of the existing literature, sifting it for commonalities of effect and employing the paradigm to test hypotheses grown from other areas of learning theory. The book concludes with chapters that use autoshaping to address questions about animal timing and about the temporal aspects of the association process. Autoshaping is strongly affected by the duration of the intertrial interval relative to the duration of the stimulus presentation, with speed of conditioning an increasing function of that ratio. Gibbon and Balsam provide an elegant model of temporal control that accommodates that function. The chapter by Jenkins and associates is a paragon of the experimental method. A series of a dozen experiments probes the nature of the trial-spacing effect and relates the results to theories of signaling in classical conditioning. They are able to conclude that "it has yet to be shown that CS-US contingency is the fundamental property of event sequences responsible for the acquisition of signal value in classical conditioning." This is a powerful indictment of the associationist assumptions underlying Pavlovian theory. The authors provide an alternative hypothesis, not very different from that of Gibbon and Balsam, that accommodates many of the data. In the final chapter Gibbon attempts a general treatment of contingency and of trial spacing and demonstrates that even a heroic effort will not reduce one to the other. This failure has serious implications for the attempt to generalize the most important current general theory of association, the Rescorla-Wagner theory, to autoshaping.

Revolutions in science are often associated with a flowering of new skills and perspectives and with rapid concomitant advance in the discipline. This growth may be due not so much to the power of the new formulations as to the opportunity they offer both theoreticians and experimentalists to exercise their talents on a new set of problems. *Autoshaping and Conditioning Theory* is a showcase of such exercises. We find the discipline moving closer to the biological bases of behavior, a position it was a mistake ever to have left; we see the paradigm used for the extension of traditional areas of inquiry, for the development of strong models of animal timing, and most excitingly for the testing and development of theories of association that have been deprived of attention through lack of serious competition. Perhaps now the easy questions concerning autoshaping have been addressed, and further publications will become esoteric. But for the present we can enjoy the action as protagonists and their ideas jostle for position on new turf.

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