ed. One will learn a great deal about the Inkas from this volume, which is long overdue in Andean studies.

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Mechanisms of Learning

Perceptual and Associative Learning. GEOFFREY HALL. Clarendon (Oxford University Press), New York, 1991. xii, 300 pp., illus. $45. Oxford Psychology Series, 18.

In the traditional view of associative learning in humans and other animals, stimuli become associated either because one stimulus reliably precedes and thus signals the occurrence of the other or because the stimuli occur at (approximately) the same time. In the traditional view of perceptual learning, by contrast, stimuli become more distinct or differentiated through repetition. Not surprisingly, these two approaches have often been proposed to account for different phenomena.

In *Perceptual and Associative Learning* Geoffrey Hall successfully bridges the disparate literatures that represent these two approaches. He begins by demonstrating that in even the simplest forms of learning traditional associative-learning principles have problems accounting for certain results. For example, the repeated simultaneous presentation of two stimuli (such as a tone and a light) may result in a change in behavior (such as less orienting to the stimulus compound). After only a few presentations of the stimulus pair one finds considerable generalization of the behavioral change to its individual components. With an increasing number of presentations, however, this generalization actually decreases. This process, called stimulus configuring, demonstrates that gestalt-like perceptual properties (that is, the compound is treated as more than the sum of its components) can develop with repeated presentations of the compound.

Hall presents associative and perceptual accounts of such examples and then evaluates the empirical support for each. Although one may surmise from his extensive research experience with associative-learning phenomena that Hall has a vested interest in such an approach, he presents refreshingly objective and integrative interpretations of the data. Hall appears comfortable concluding that an alternative theory to his own provides a more satisfactory account of the data or that the data may support more than one theory equally well.

In this book, the clearest and most thorough integration of associative and perceptual learning models is accomplished in the two chapters concerned with learned distinctiveness. If stimuli are treated differently during pretraining, they are presumed to acquire distinctiveness, which should facilitate their association with different responses later, whereas if they are treated similarly, they are presumed to acquire equivalence, which should retard the development of such associations. According to perceptual learning theory, prior experience with stimuli allows for attention to task-relevant similarities and differences between them. According to associative theories, on the other hand, the prior association of stimuli with different outcomes (for example, food versus water) results in central (brain) representations that are more distinctive than those produced by the original stimuli and thus there is less generalization between the stimuli.

More recently, associative theories have been modified to include parameters that allow for changes in the degree of associability of certain properties of a stimulus, depending on prior experience. Hall provides a fair evaluation of these expanded theories and concludes that, although it may not now be possible to specify the functioning of the associability parameter, any successful theory must include such a parameter.

Hall's strategy is to continue to modify the "standard associative model" to allow it to encompass phenomena that have often been explained in perceptual learning terms. For example, he proposes that if the concept of stimulus element (traditionally meant to include such physical attributes as size, shape, intensity, duration, and wavelength) is broadened to include the property of novelty/familiarity, a modified version of the associative model can account for many more data. According to this modified view, all novel stimuli have the common property of novelty, but if a given stimulus is repeatedly presented, early presentations (when it is novel) will be represented differently from later presentations (when it is familiar). Such a mechanism makes it possible to account for (among other things) the finding that pigeons can learn to perform well on a task in which each of a large number of stimuli is presented twice but responding is reinforced only on the first presentation (that is, when the stimulus is novel).

With regard to these modifications of the theory, it seems quite reasonable to conclude, as Hall does, that "some may object that what has emerged is no longer a purely associative theory but one that incorporates non-associative, perceptual mechanisms, but this is surely to be seen not as a shortcoming but as a worthwhile achievement."

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