Book Reviews

Information Processing

Coding Processes in Human Memory. Proceedings of a workshop, Woods Hole, Mass., Aug. 1971. ARTHUR W. MELTON and EDWIN MARTIN, Eds. Winston, Washington, D.C., 1972 (distributor, Wiley, New York). xvi, 448 pp., illus. $12.95. Experimental Psychology Series.

Coding is a nebulous term that has been used to describe virtually every phenomenon of human memory, and a superficial perusal of the chapters in Melton and Martin's book leads to an impression of immense heterogeneity. In fact, however, the contributions to this volume have a surprising degree of coherence. To see that this is so, one needs to consider a number of recent tendencies in research on memory.

The two theoretical trends of relevance to coding processes are the examination of "control processes" and the gradual tracing of the large number of informational dimensions that the memorial system automatically abstracts from environmental input. When stimulation is first presented to the senses, it is automatically acted upon by the system in a series of stages. At each stage, features are abstracted and used for subsequent stages of abstraction. Thus a word presented visually may be encoded in features first representing areas of dark and light, then lines, angles, spaces, and so on, then letters, then letter groups, then words, then types of words coded linguistically and semantically, then synonyms and associates, then the overall context or situation in which the word appears. All or most of this process of abstraction occurs automatically in accord with the current structure of the processing system. The features that are abstracted are placed in the short-term memory store, where they may be used by the subject in accord with the task requirements. It is at this point that the subject exerts selective control over the coding process. He may selectively rehearse various aspects of the encoded information and retrieve additional information from long-term memory to add to the features already abstracted. Eventually some portion of this information in short-term memory is transferred to, and stored in, long-term memory, and the coding process is complete.

As described in this outline, there are two relatively independent components to coding: the automatic sensory abstraction system, which provides features to short-term memory, and the control processes which the subject uses to embellish, select, and alter these features in short-term memory. The chapters in the present volume can be readily sorted into those dealing with one or the other of these views of "coding." For example, Posner and Warren emphasize the automatic coding in the early stages of processing; Bower discusses the effects of uncontrolled shifts in codes for context; Wickens emphasizes the numerous dimensions of sensory encoding; Liberman, Mattingly, and Turvey discuss the encoding and decoding of speech stimuli; and Garner and Attneave discuss dimensions and dimensionality of encoding. In these cases, the emphasis is on the early automatic phases of coding. These chapters help establish the automaticity of these stages, and to an even greater degree establish the wide range of dimensions along which stimulation is encoded. The traditional view in which a memory trace consists of an associative bond between two words, and nothing more, is clearly a relic of the past. Rather we are turning to a view of a memory trace as a whole context, or a scenario, or a complex organization. The implications of this view are just beginning to be explored.

Examples of chapters dealing with control of coding are Underwood's chapter, arguing (strangely) against multiple encoding dimensions, Richardson's and Martin's chapters emphasizing stimulus feature selection, Johnson's chapter on organization, Bjork's study of causes of directed forgetting, and Hunt and Love's discussion of a memory "expert." Although much evidence exists that coding control can have immense effects on learning (as seen for example in numerous paperbacks giving techniques to "improve" your memory), and although we are beginning to learn what kinds of coding control are possible, we still have only very simplistic theories concerning the mechanisms by which these control processes produce their effects. Indeed many authors in this volume take pains to point out that their views are only first steps toward an eventual theory of coding.

A number of the chapters are summaries of previous work and representations of previous theories, but there are also some interesting new, creative views. Perhaps the most innovative and detailed view is offered by Estes, who suggests that order information forms the basis for retention in short-term memory, and that loss of item information is a causative effect of the loss of order information. There are also some theoretical disagreements, emphasized by the chapter arrangements. For example, Underwood's chapter minimizing the number of codes processed precedes Posner and Warren's chapter taking the opposite point of view; Martin's chapter emphasizing stimulus selection precedes Bower's chapter explaining the same effects by a theory of automatic context variability.

This book is clearly aimed toward researchers in the fields of memory, learning, and information processing. It cannot be recommended for casual reading for nonspecialists. The book contains much new and speculative material and so will be superseded in a few years as the research ideas are expanded and the theories elaborated. Nevertheless the contents represent an important period of transition in memory research. The contributions are generally of high quality, and the book is an important and necessary acquisition for workers in the field.

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Cyclicity in Man

Biological Rhythms and Human Performance. W. P. COLQUHOUN, Ed. Academic Press, New York, 1971. x, 284 pp., illus. $14.50.

Perhaps the most obvious statement we can make about life is that it is cyclical. Being born, living, and dying are phases of an ultimate long-term life cycle that is broken up into shorter daily cycles of working, eating, and