

## Cognition Unawares

**Implicit Learning and Tacit Knowledge.** An Essay on the Cognitive Unconscious. ARTHUR S. REBER. Oxford University Press, New York, 1993. xii, 188 pp., illus. \$35 or £30. Oxford Psychology Series, 19.

One of the hallmarks of the cognitive revolution in psychology was a revival of interest in consciousness. Psychologists were no longer interested merely in tracing functional relations between environmental stimuli and behavioral responses to them but sought to understand the internal mental structures and processes that mediated between stimulus and response. Shortly thereafter came a revival of interest in *nonconscious* mental life, the idea that at least some of the mental structures and processes responsible for human behavior might lie outside the scope of conscious awareness, introspection, and voluntary control. Studies involving both brain-damaged and normal subjects now make a convincing case that experience, thought, and action can be influenced by past events that we cannot consciously remember (implicit memory) and current events that we cannot consciously perceive (implicit perception).

Arthur Reber has long argued for another aspect of what has come to be known as the "cognitive unconscious": implicit learning, by which he means the acquisition of new knowledge by subjects who are not consciously intending to learn and who are not aware of what they have learned. In a pioneering experiment reported in 1967, Reber presented subjects with a set of letter strings generated according to the rule of an artificial grammar—for example, TSXS, TSSXXVPS, and PVV. After memorizing 20 such strings, the subjects were presented with a number of new items and asked to determine which ones conformed to the grammar and which did not. Performance on this task was far better than what would have resulted from chance; however, the subjects were unable to report the grammatical rules by which the legal strings were generated. Reber concludes that while they were consciously trying to memorize specific items the subjects also unconsciously induced the grammar that generated them. In his view, the learning of artificial grammars is a laboratory model of the process by which natural language is unconsciously acquired and used. What makes his view unique is that while many linguists hold that unconscious language acquisition occurs by virtue of a language-specific cognitive module, Reber argues that implicit learning is mediated by structures that are not content-specific and allow the organism to pick up a wide

variety of regularities in the environment.

Of course, Reber's conclusion does not necessarily follow from the facts as I have described them. It might be that the subjects were aware of the grammar but simply could not articulate it well; or that the subjects' judgments were based on conscious comparison of the test items to memorized exemplars; or that subjects based their decisions on the appearance in the test items of fragments that they recognized from the study set. All of these possibilities would lead to above-chance performance in the absence of the acquisition and use of unconscious rules. A major portion of this book reviews Reber's extensive program of empirical research, as well as the work of other investigators, intended to address these objections. Many of the findings are provocative and convincing, but they will probably not convince the advocates of what Reber calls the "consciousness stance": the view that consciousness has priority and that awareness and self-reflection are the central features of human cognitive function.

Even so, Reber reaffirms what he calls the "implicit stance." In his view unconscious processes are axiomatic: we cannot get along cognitively without them, and we cannot understand cognition without them. Although he admits that it is difficult to convincingly demonstrate unconscious processing in the absolute absence of conscious information, which is the strong version of the implicit stance, he comes down in favor of a softer view: that more information is available for unconscious use than is accessible to conscious introspection.

In the latter, more speculative portion of the book Reber bolsters his case by putting implicit learning into an evolutionary context. From his point of view, "Consciousness is a late arrival on the evolutionary scene. Sophisticated unconscious perceptual and

cognitive functions preceded its emergence by a considerable margin" (p. 86). Humans have it, for sure, and perhaps some other animals have it to some degree. But, arguably, not all animals have it. Yet all animals learn. From Reber's point of view, the implicit learning demonstrated in the artificial-grammar experiments is based on unconscious cognitive (and, ultimately, brain) systems that we share both with our evolutionary forebears and with other contemporary species. These systems are robust in the face of insult, injury, and disease; are largely independent of age and intellectual capacity; and admit a very narrow range of individual differences.

The study of cognition outside phenomenal awareness is now a growth industry in psychology and cognitive science. With a sophisticated, ever-enlarging understanding of cognitive processes, it is now possible to discuss unconscious mental life without making any reference to Freud (who, refreshingly, appears nowhere in this book). Although there remain some skeptics, research on unconscious cognition now focuses less on existence proofs and more on analyses of its scope and limits. In arguing forcefully for the concept of implicit learning, and in backing his arguments with provocative, well-designed research, Reber has made important contributions to the study of the cognitive unconscious. In asserting the "primacy of the implicit" (pp. 24–25) and in placing his research in the context of evolutionary biology, he has forged new connections between human and animal cognition. This is a valuable book, that should be read by everyone with an interest in the nature of unconscious mental life.

John F. Kihlstrom

Department of Psychology,  
University of Arizona,  
Tucson, AZ 85721, USA

## Growing Up in Context

**Children in Time and Place.** Developmental and Historical Insights. GLEN H. ELDER, JR., JOHN MODELL, and ROSS D. PARKE, Eds. Cambridge University Press, New York, 1993. xiv, 289 pp. \$49.95 or £35. Cambridge Studies in Social and Emotional Development.

**C**hildren in Time and Place is a book with much promise for two disciplines. In the mid-1980s the Social Sciences Research Council brought together a group of social historians and developmentalists to study childhood and

child development by working across their disciplinary boundaries. What ensued must have been exciting and challenging for participants from both fields; Michael Zuckerman, in reflecting on the process from the historian's perspective, notes the "cordiality" and the "intensity" of the gathering (p. 230), and others make reference to the intellectual stimulation that resulted from collaboration.

The contributors to *Children in Time and Place* provide us with not only some substantive results of their efforts but also a narrative of the process itself. The thrust of the volume is contained in the editors' description of one of the themes emerging