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# *Preface*

It would be hard to imagine a component of human cognition more fundamental than memory. Without a functioning memory, other cognitive functions—such as perception, learning, reasoning, problem solving, and language—would be impossible. For good reason, then, memory and its role in other cognitive functions have long been of interest to researchers and scholars. The past several decades, however, have seen a veritable explosion of research on human memory. During this period, the study of memory has been approached from many directions by behavioral and brain scientists employing a variety of methods to investigate normal and abnormal memory phenomena in animals, children, adults, and the elderly. The convergence and interaction of these efforts have been remarkably fruitful, resulting in new and improved paradigms and methodologies, instructive empirical findings, promising theoretical developments, and potentially important applications to real-world contexts, such as law, education, and therapy. In short, these efforts have elevated our empirical and theoretical understanding of human memory to a new level.

The principal goal of this handbook was to convey the present state of our knowledge about human memory, and, happily, we were able to convince a distinguished group of researchers to summarize that knowledge. A second goal was to arrange the contents of the volume in a way that would make it useful not only as a resource for researchers and scholars, but also as a textbook for students. Toward that end, we have organized and sequenced

the chapters in a fashion intended to provide a coherent picture of the field. Two overview chapters are followed by chapters on sensory storage and short-term memory, which are, in turn, followed by two chapters on different aspects of how we store information in long-term memory. Those chapters are followed by two chapters on how we access—or fail to access—information that exists in our long-term memories, and three chapters on how we monitor and control such storage and retrieval processes. The final four chapters comprise two chapters that review how our memory capacities and characteristics vary as a function of individual differences and aging, and two chapters that examine the implications of memory research for two real-world domains of strong current interest: witness interrogation and testimony and the long-term retention of skills and knowledge. For students new to the study of memory, the chapters are perhaps best read in order, although each can be read as a self-contained unit. To provide additional cohesion among chapters, we have also inserted frequent references within any given chapter to related content and discussions in other chapters.

The first overview chapter, “Structures, Processes, and the Flow of Information,” by Harold Pashler and Mark Carrier, presents a framework for viewing different memory structures and the processes that regulate the flow of information between those structures. This chapter represents an updating of the information-processing approach, a theoretical perspective that has dominated the study of memory during much of the past several decades. The second overview chapter, “Conscious and Unconscious Forms of Memory,” by Colleen Kelley and Stephen Lindsay, discusses the distinction between explicit and implicit memory; that is, between the influences of past episodes on our current perceptions, thoughts, and behavior that are and are not, respectively, accompanied by an awareness of the source of those influences.

The second section of this volume, “Transient Memories,” consists of two chapters: Chapter 3, “Sensory and Perceptual Storage: Data and Theory,” by Dominic Massaro and Geoffrey Loftus, and Chapter 4, “Short-Term/Working Memory,” by James Nairne. In Chapter 3, Massaro and Loftus review the empirical and theoretical research that form the basis for our past and present conceptions of visual and auditory sensory stores, and they summarize the findings they believe provide evidence for multiple types of perceptual memories as distinct from sensory stores. Nairne, in Chapter 4, reviews the current characterizations of short-term or “working” memories, and the role such active but limited-capacity memories might play in the overall functioning of human memory.

The third section, “Storing Information in Long-Term Memory,” contains two chapters: Chapter 5, “Imagery and Visual–Spatial Representations,” by Lynn Cooper and Jessica Lang, and Chapter 6, “Autobiographi-

cal Memory” by Martin Conway. In Chapter 5, Cooper and Lang examine the state of research on visual–spatial representations in memory and the mechanisms by which these representations mediate performance, with a focus on imagery, object recognition, and memory for spatial layouts or cognitive maps. Conway, in Chapter 6, discusses recent research on autobiographical memory, addressing such questions as how autobiographical knowledge is represented in and retrieved from long-term memory; what happens when autobiographical memory becomes impaired, for example, as in amnesia; and what the relation of autobiographical memories is to the (sense of) self.

The fourth section, “Accessing Information in Long-Term Memory,” includes Chapter 7, “Retrieval Processes,” by Henry Roediger and Melissa Guynn, and Chapter 8, “Interference and Inhibition in Memory Retrieval,” by Michael Anderson and James Neely. In Chapter 7, Roediger and Guynn adopt the view that remembering is best understood as a product of information from two sources: memory traces and retrieval cues. They then argue that the effectiveness of a retrieval cue is governed by two potent factors: (a) the extent to which the operations induced at the time memory is tested match those used in the initial encoding of that information or event, and (b) the extent to which a given cue is distinctive rather than “overloaded,” that is, associated to a number of traces in memory. In Chapter 8, Anderson and Neely summarize both classical and contemporary evidence that implicates interference and inhibitory processes as the cause of forgetting (retrieval failure) in long-term memory.

The fifth section, “Monitoring and Controlling Our Memories,” contains three chapters: Chapter 9, “Distributing and Managing the Conditions of Encoding and Practice,” by Frank Dempster; Chapter 10, “Mnemonic Methods to Enhance Storage and Retrieval,” by Francis Bellezza; and Chapter 11, “Metacognitive Processes,” by Janet Metcalfe. In Chapter 9, Dempster examines the influence on memory of how and when information is studied or practiced, with an emphasis on the implications of such findings for optimizing learning and memory in educational settings. Bellezza, in Chapter 10, characterizes mnemonic techniques as the strategic manipulation of available knowledge to aid in the acquisition of new knowledge, and in the process he exposes many popular misconceptions about the nature and effectiveness of mnemonic devices and mnemonic learning. Metcalfe, in Chapter 11, analyzes the role of metacognitive processes in several domains of human cognition (problem solving, learning and skill acquisition, and judgment and decision making), highlighting the critical nature of metacognitive processes in cognition with a review of metacognitive impairments found in frontal-lobe patients.

The sixth section, “Differences across Individuals,” contains two chapters: Chapter 12, “Individual Differences in Memory,” by Douglas Bors and

Colin MacLeod, and Chapter 13, “Memory and Aging,” by Leah Light. Bors and MacLeod, in Chapter 12, examine the basic findings on individual differences in memory abilities, with the goal of indicating how variations across individuals might inform theories of human memory. Light, in Chapter 13, presents a comprehensive survey of the nature of age-related changes in memory and evaluates the sufficiency of the alternate accounts that have been put forward to explain such changes.

The final section, “Memory for Real-World Events and Information,” contains two chapters designed to illustrate the implications of modern research on memory for a variety of real-world contexts. Chapter 14, “Retrieval Processes and Witness Memory,” by Carla Chandler and Ronald Fisher, focuses on a domain where understanding the capabilities and frailties of human memory is critical: witness memory in legal settings. Chapter 15, “The Long-Term Retention of Training and Instruction,” by Alice Healy and Grant Sinclair, focuses on the long-term retention of knowledge and skills. Healy and Sinclair, drawing on what we know about human memory, include in their analysis a set of guidelines to optimize the conditions of training and instruction.

To the extent that this handbook, as we hope and expect, becomes an important resource for students of human memory, the primary credit belongs, of course, to our contributors, those distinguished investigators who created the chapters that compose this volume. We appreciate their effort and cooperation, and we admire their scholarship and expertise. As editors, we found their chapters provocative and instructive. Should you, as a reader of this volume, have the same reaction, we—and they—will be very pleased.

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