The Act of Remembering

Toward an Understanding of How We Recall the Past

Edited by John H. Mace

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The Act of Remembering

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Editorial Offices
350 Main Street, Malden, MA 02148–5020, USA
9600 Garsington Road, Oxford, OX4 2DQ, UK
The Atrium, Southern Gate, Chichester, West Sussex, PO19 8SQ, UK

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Preface

This volume represents the first occasion when a group of memory researchers have come together for the single purpose of addressing the problem of remembering the past, or in other words, autobiographical memory retrieval. The chapters contained herein examine involuntary and voluntary retrieval, the functions and development of autobiographical remembering, inhibitory process in autobiographical remembering, and abnormal recall processes, particularly those found in certain clinical syndromes, such as PTSD. Each chapter looks at a particular aspect of the problem of remembering, with some offering entirely novel views, and some introducing or advancing approaches for autobiographical remembering that have been successfully applied in other research domains. Regardless of the focus, the central aim of the volume is to move the science of remembering forward.

John H. Mace

List of Contributors

Nicole Alea, Department of Behavioural Sciences, University of the West Indies, St. Augustine, Trinidad and Tobago

Bernard J. Baars, The Neurosciences Institute, San Diego, CA, USA

Christopher T. Ball, Psychology Department, College of William & Mary, Williamsburg, VA, USA

Patricia J. Bauer, Department of Psychology, Emory University, Atlanta, GA, USA

Karl-Heinz T. Bäuml, Department of Experimental Psychology, Regensburg University, Regensburg, Germany

Eni S. Becker, Department of Clinical Psychology, Behavioural Science Institute, Radboud University Nijmegen, Nijmegen, the Netherlands

Susan Bluck, Department of Psychology, University of Florida, Gainesville, FL, USA

Martin A. Conway, Institute of Psychological Sciences, The Leeds Memory Group, University of Leeds, Leeds, UK

Burcu Demiray, Department of Psychology, University of Florida, Gainesville, FL, USA

Robyn Fivush, Department of Psychology, Emory University, Atlanta, GA, USA

Stan Franklin, Department of Computer Science and Institute for Intelligent Systems, University of Memphis, Memphis, TN, USA

Emily A. Holmes, Department of Psychiatry, Warneford Hospital, University of Oxford, Oxford, UK

Julie Krans, Department of Clinical Psychology, Behavioural Science Institute, Radboud University Nijmegen, Nijmegen, the Netherlands

Catherine Loveday, Department of Psychology, University of Westminster, London, UK

John H. Mace, Psychology Department, Eastern Illinois University, Charleston, IL, USA

Michelle L. Moulds, Department of Psychology, University of New South Wales, Sydney, Australia

Gérard Näring, Department of Clinical Psychology, Behavioural Science Institute, Radboud University Nijmegen, Nijmegen, the Netherlands

Bernhard Pastötter, Department of Experimental Psychology, Regensburg University, Regensburg, Germany

Heather J. Rice, Department of Psychology, Washington University in St. Louis, St. Louis, MO, USA

Alan Richardson-Klavehn, Departments of Neurology and Stereotactic Neurosurgery, Otto von Guericke University, Magdeburg, Germany

Jennifer M. Talarico, Department of Psychology, Lafayette College, Easton, PA, USA

Johan Verwoerd, Division of Clinical and Developmental Psychology, University of Groningen, Groningen, Netherlands

Ineke Wessel, Division of Clinical and Developmental Psychology, University of Groningen, Groningen, Netherlands

Alishia D. Williams, Department of Psychology, University of New South Wales, Sydney, Australia

Marcella L. Woud, Department of Clinical Psychology, Behavioural Science Institute, Radboud University Nijmegen, Nijmegen, the Netherlands

Part I

Introduction

1

The Act of Remembering the Past

An Overview

John H. Mace

One could argue that the quest to understand remembering (autobiographical memory retrieval) is central to the quest to understand autobiographical memory. One could also argue that understanding the processes of autobiographical recall might also be important to an understanding of more general cognition. For example, it is fairly easy to see how constructing a thought or solving a problem may involve many of the same mental (and perhaps neural) operations as reconstructing a past experience. While the importance of retrieval to memory and cognition has been noted by numerous other writers (too numerous to list), autobiographical memory retrieval may have a greater place in this larger aspect of the quest, given the complexity of information that has to be assembled in order to experience a memory of the past, including the knowledge, awareness, or feeling that one is "re-experiencing" a past event (Tulving, 1985).

The chapters contained in this book advance the quest to understand remembering, as they tackle many of the problems that face the science of remembering. In this first chapter, I briefly review the concept of autobiographical memory and, as this is the first chapter of a collective of works, I devote most of it to highlighting many of the major questions raised by the various authors.

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Autobiographical Memory in Brief

Although the recognition of autobiographical memory (in one form or another) has a long scholarly history in psychology and philosophy (see an excellent history in Brewer, 1986), the formal study of it is relatively recent, growing out of Tulving's (1972) introduction of the episodic/semantic memory distinction, and Neisser's (1978) plea to memory researchers to take up the study of ecologically valid forms of memory (or real-world memory phenomena). Although the terms episodic memory and autobiographical memory are often used synonymously, autobiographical memory takes in a wider range of personal knowledge forms than was originally conceived in the early views of episodic memory.

For example, autobiographical memories encompass discrete forms of abstract knowledge about the self (e.g., "knowing that I lived in Philadelphia growing up"), general or summary (i.e., repeated events) forms of personal knowledge (e.g., "my trip to London in 2005," "Sunday walks in Central Park"), and, of course, memories for discrete, specific experiences (e.g., "seeing the mummies at the British Museum during my London trip," a quintessential episodic memory; see early treatments in Barsalou, 1988; Brewer, 1986). Conway (1996, 2006) has proposed that these different forms of personal knowledge are organized in a networked fashion in a memory system that he calls the *self memory system*. In the self memory system, different forms of autobiographical knowledge are layered hierarchically, such that the most abstract forms of knowledge are at the top layer (i.e., *themes* and *lifetime periods*, such as the knowledge that one grew up in Philadelphia), with the layers of knowledge becoming relatively less abstract (or increasingly more sensory/perceptual in detail) as one moves down the hierarchy, from general forms of memories (i.e., *general events*, such as the trip to London) to specific memories (i.e., *episodic memories*, see Figure 4.1 in Conway & Loveday, chapter 4, this volume, and also discussions on theories of an additional transient episodic memory system in Conway, 2005; chapter 4, this volume; and Bluck, Alea, & Demiray, chapter 12, this volume). Whether one agrees with Conway's view or not, it seems clear that autobiographical memory takes in a number of different personal knowledge forms.

Overview of Book

In chapter 2, Ball rounds off the introductory section of this book by providing us with a comprehensive review of the various methods used to study autobiographical memory and retrieval. His review starts off with the era of Ebbinghaus, traces developments of the twentieth century, and finally culminates with the most recent developments, including methods as diverse

as qualitative diary protocols and the latest imaging techniques (e.g., fMRI). The remaining chapters are separated into three main sections. I review each of these in turn.

Involuntary and voluntary remembering

The second section of this book is devoted entirely to a major subtheme which runs throughout the entire volume: involuntary remembering (spontaneous recollection of the past) and voluntary remembering (deliberate recollection of the past). Clearly an important question for any theory of retrieval to tackle, the chapters in this section exemplify the more elaborate set of questions that the involuntary/voluntary distinction in autobiographical memory has created. The treatments range from the problems of categorization (in both forms of recall), the generative retrieval model of voluntary recall, dissociations between involuntary and voluntary remembering, the larger role of consciousness in the control of retrieval, to models of involuntary and voluntary recall which derive their inspiration from more traditional laboratory approaches examining the implicit/explicit memory distinction.

In chapter 3, Mace grapples with phenomenological categorization, claiming that three categories of involuntary remembering exist (Mace, 2007b). As he argues, the three divisions of involuntary remembering might be caused by different sets of encoding or retrieval circumstances (e.g., occurring only after a traumatic experience, in one, or owing to different types of spreading activation processes in the others). However, the main thrust of the chapter is a comparison of involuntary remembering to voluntary remembering. Here, the phenomenological characteristics of involuntary and voluntary memories are compared, but mostly the focus is on similarities and differences in involuntary and voluntary retrieval. The chapter concludes with an examination of the main contrast, the involuntary/voluntary distinction, with Mace offering another categorization schema, one which places remembering phenomena along different points of a voluntary-involuntary continuum that deemphasizes or limits the role of volition. This aspect of the chapter challenges the idea that voluntary remembering can be treated as a monolithic form of recall and it also deals with the dicey concept of volition.

In chapter 4, Conway and Loveday review the generative model of voluntary recall (e.g., Conway, 2005). In their review of the model, they, too, appear to argue for a diminution of the role of volition in voluntary recall, arguing that many parts of the process are likely to be involuntary. And, while their chapter reviews the generative retrieval model, it also adds some important case data to the discussion (i.e., the case of patient CR). CR is a middle-aged woman with significant and widespread damage to the right side

of her brain. While she shows many of the obvious memory disorders of an anterograde amnesic (i.e., an inability to recall the past after short periods of time), unlike most amnesics this appears to be limited to voluntary recall. So, upon questioning or self-prompting, she is unable to generate a memory of the past; however, when given very explicit cues (e.g., pictures of a past event), she is able to remember, much in the same way that one spontaneously recalls the past. Conway and Loveday use this case to make a convincing argument that CR has intact involuntary recall processes while having impaired voluntary recall processes. This is an important observation because CR's syndrome (1) supports the notion of generative retrieval; (2) supports the notion that voluntary remembering contains separate voluntary and involuntary components; and (3) strengthens the involuntary/voluntary distinction, while at the same time helping to delineate certain processes within this schema.

Talarico and Mace (chapter 5) review an interesting set of problems arising from the data produced by involuntary and voluntary memory sequencing phenomena, event cuing (a laboratory-based procedure where subjects deliberately recall memories in a sequence) and involuntary memory chaining (a naturally occurring phenomenon where involuntary memories are produced in a sequence, one of the three proposed categories of involuntary remembering). In brief, these two recall processes produce two somewhat different sets of data, each having different implications for the organization of memories in the autobiographical memory system. Talarico and Mace explore the possibility that the difference occurs as a result of biases in the laboratory procedure, thereby making the involuntary memory phenomenon the more reliable indicator. They also explore the possibility that the different patterns of results may instead be an indicator of some real differences underlying involuntary and voluntary retrieval, ones which may further our understanding of these processes.

Franklin and Baars (chapter 6) argue that spontaneous (involuntary) remembering in everyday life is a normal (functional) part of everyday cognition. Like the stream of consciousness and other forms of spontaneous cognition, they argue that rather than being merely accidental, that everyday involuntary memories play an important functional role in orientating one towards the future, solving problems, and so forth (a view which is consistent with directions being taken in involuntary memory research, e.g., Berntsen & Jacobson, 2008; Mace & Atkinson, 2009). However, their main message concerns the relationship between spontaneous memories and consciousness. Using a central tenet of Baars' (1988) global workspace theory (GWT) of conscious, the C-U-C triad, they explain how spontaneous memories (and other spontaneous processes, e.g., spontaneous problem solving) can emerge from a memory system and how this may be further explained with a computational model that has been built on GWT (LIDA-GWT).

Richardson-Klavehn's contribution (chapter 7) does not address autobiographical memory retrieval per se, it, instead, addresses retrieval on word-list memory tasks (namely the word-stem completion task). Among the topics addressed are explicit (conscious or episodic) memory retrieval and implicit (unconscious or non-episodic) memory retrieval. Within this broader context, he delineates involuntary and voluntary retrieval processes, pointing out some of the problems surrounding the use of these terms in the word-list memory arena. One problem that has arisen in that arena is the tendency for some approaches to conflate retrieval processes (involuntary and voluntary) with memory types (explicit and implicit). Richardson-Klavehn points out how such approaches have been unable to accommodate the involuntary/voluntary distinction in conscious memory, defining the concept of involuntary conscious memory (or spontaneous recollection) out of existence. Addressing the heart of this problem, Richardson-Klavehn introduces a novel retrieval architecture which can account for all variety and complexities of retrieval on word-stem tasks. This model could be important to autobiographical memory researchers, as in many ways they are facing similar problems in attempting to explain varied and complex forms of autobiographical memory retrieval. Thus in whole or in part, Richardson-Klavehn's approach to the problem of retrieval may prove useful to the science of autobiographical remembering.

Broader theoretical considerations of autobiographical remembering

Apart from the more central focus on involuntary and voluntary recall in the first main section, the second main section includes chapters which focus on broader aspects of remembering, though involuntary and voluntary remembering are also considered in some of these chapters, in some cases centrally. The topics include using the perennial notion of spreading activation to understand autobiographical remembering, understanding the important role that retrieval inhibition plays in autobiographical remembering, the importance of visual imagery, and the difficult to track but highly important questions of development and functions, respectively, of remembering.

Mace (chapter 8) examines autobiographical remembering from a spreading activation perspective. Building on a handful of different studies, he argues that the autobiographical memory system appears to be subject to different types of within and between memory systems forms of spreading activation. And, while some spreading activation processes may occur unconsciously, he also argues that some can be observed to occur in the space of consciousness (e.g., the involuntary memory chaining mentioned above). He also argues that spreading activation may account for much

of everyday involuntary remembering, including involuntary remembering during voluntary remembering. And, like in semantic memory, spreading activation in the autobiographical memory system appears to subject autobiographical remembering to priming effects. He further argues that all of these processes are likely to be functional to the process of autobiographical remembering.

Pastötter and Bäuml (chapter 9) examine retrieval inhibition in autobiographical remembering. They review a fairly extensive literature on retrieval inhibition, and while most of the findings there have been generated from word-list memory paradigms, they perform the important task of drawing inferences from them with the purpose of connecting them to inhibition in autobiographical memory recall. They, too, cover voluntary and involuntary recall processes, noting, for example, that similar distinctions appear to exist in the inhibition of retrieval as it appears that memory production can be inhibited either involuntarily or voluntarily. Apart from some of the main issues surrounding the study of retrieval inhibition (e.g., the manner in which it may be carried out), their chapter also reminds us of the importance of inhibition to the understanding of autobiographical remembering and other forms of retrieval. For example, involuntary inhibition may be at work when one is trying to recall a past experience, if for no other reason than to keep irrelevent information from coming to mind. And, in some sense, inhibitory processes may be "on" and "filtering" all the time, otherwise one may be constantly bombarded by memories in everyday life (Conway & Pleydell-Pearce, 2000).

Rice (chapter 10) reviews the role of memory perspective (i.e., field, one's original viewpoint, or observer, a third-party viewpoint) and imagery in autobiographical memory retrieval. One of the important questions that she addresses is how visual imagery, most particularly perspective-based imagery, may be a determinative factor in the autobiographical memory retrieval process. Whether visual imagery or perspective per se have a causal role or not, her review reminds us of the complexity of information contained in an autobiographical memory, and the potential complexity of the retrieval processes that need to construct and bring this information to mind. Apart from this main issue, Rice also reviews how abnormal remembering in clinical syndromes (e.g., PTSD or social phobia) appears to distort visual perspective, as individuals with certain disorders tend to recall memories surrounding their condition from a third-party viewpoint.

Fivush and Bauer (chapter 11) take on the yeoman's task of tracking and explaining the development of autobiographical remembering early in the life cycle. Among other considerations, they examine neural development, as well as the role of the social and cultural factors in the development of autobiographical remembering skills. Pointing out that the development of autobiographical remembering does not terminate in childhood, they also

remind us that there are other important changes taking place along the path of the lifespan (e.g., adolescence and middle age).

While three other chapters in this volume in part examine the functional considerations of remembering (chapters 3, 6, & 8, but mainly with respect to involuntary remembering), Bluck, Alea, and Demiray (chapter 12) devote their entire chapter to this cause. Looking at the problem more globally, they examine autobiographical remembering within the context of its three hypothesized functions (i.e., directive, self, and social functions; Baddeley, 1988). A central focus of their chapter is an examination of how the self memory system's (SMS, e.g., Conway, 2005) views on retrieval handle the question of function. Their take home message is that the SMS needs to do more – in particular, focus on person-environment interactions, which they view as key. While they offer this advice primarily to the SMS view, it should be noted that other approaches (present and future) may want to consider their advice.

Abnormal remembering

The last main section contains three chapters which address remembering (mostly involuntary forms) in clinical syndromes. The question of involuntary remembering in clinical syndromes (e.g., post-traumatic stress disorder) has a relatively longer history there than it has in the study of everyday normal remembering. Research in this area has developed in many ways: it has helped us to better understand the syndromes and the nature of abnormal remembering, and it has helped to inform understanding of normal remembering. The authors in this section show us how this area of inquiry continues to branch in several ways (e.g., bringing working memory into the discussion, and extending the question of abnormal involuntary remembering to depression).

Krans, Woud, Näring, Becker, and Holmes (chapter 13) review involuntary traumatic remembering in PTSD, including a comprehensive review of the different theoretical accounts of this type of remembering. Their review features a promising new information processing account recently put forward by Holmes and Bourne (2008), which argues that differential encoding (a focus more on perceptual rather than conceptual features) during the time of a traumatic event may be responsible for the development of traumatic involuntary memories. Verwoerd and Wessel (chapter 14) add another dimension to the discussion by focusing on the role of executive control (or working memory) in the production of traumatic memories in PTSD. They argue that a subset of trauma survivors develop traumatic intrusive memories because they had pre-morbid deficiencies in executive control. Williams and Moulds (chapter 15) look at involuntary remembering in depression. Their chapter reviews more recent observations that negative

intrusive memories form a common part of the depressive syndrome, and that these memories share features in common with the traumatic memories of PTSD.

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2

From Diaries to Brain Scans

Methodological Developments in the Investigation of Autobiographical Memory

Christopher T. Ball

Hermann Ebbinghaus embarked on the first experimental analysis of human memory during the late 1800s that culminated in the publication of his classic text "Memory: A contribution to experimental psychology" in 1885 (translated into English in 1913). Ebbinghaus was determined to develop a research methodology for studying memory that rivaled the experimental rigor achieved by researchers in the natural sciences. His research relied for the most part on using nonsense syllables as memory stimuli. These three letter consonant-vowel-consonant combinations were chosen by Ebbinghaus because they did not appear in his native language, and consequently, he felt the nonsense syllables constituted "pure" memory stimuli. During the 1900s, memory researchers substituted nonsense syllable lists with word lists after databases became available that allowed researchers to control for confounding factors like the frequency of prior experience with a word.

The verbal learning approach has remained very popular since, but during the 1970s some cognitive psychologists began to raise concerns regarding this overreliance on memory stimuli that has little relevance to everyday, personal memories (Cohen 2008). These concerns became unified into the "everyday memory movement" that led to the first formal meeting of researchers interested in changing the focus of memory research in 1978. This conference was titled the "Practical Aspects of Memory Conference" (PAM), and the theme for this conference was to develop and report research programs that examined everyday memories and the practical aspects of such memory

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findings (Gruneberg, Morris, & Sykes, 1978). The everyday memory approach is now a strong and popular field of research that incorporates the study of many real-world memory topics, such as autobiographical memory, eyewitness memory, prospective memory, and memory training. Everyday memory researchers are faced with a difficult methodological balancing act. They want to investigate ecologically valid memory phenomena without completely sacrificing the experimental rigor provided by laboratory-based methodologies. The innovative and creative attempts by memory researchers to solve this balancing act over the past three decades are the basis of the current chapter, with a specific focus on the methodologies that have been developed to examine the retrieval of autobiographical memories.

Autobiographical memories are personal memories of past experiences that have self-relevance and that combine to form our life history. These complex memories represent the reconstruction of fragments of experience combined with our knowledge of such experiences and the knowledge of our self (Brewer, 1988; Conway, 1990). Williams, Conway, and Cohen (2008) suggest that autobiographical memories serve three functions: (1) *social* – communicating and sharing of past experiences with others, (2) *problem solving* – applying past experiences to new problem settings, and (3) *self* – past experiences provide a life-story that guides our self-goals. We are still at a fairly early stage in understanding the processing and storage of these memories when compared with other types of memories, but we have made substantial progress in this endeavor over the past three decades. The development of methods for studying autobiographical memory retrieval has been fundamental to these empirical and theoretical advancements, and further development is critically important for future progress (Baddeley, Eysenck, & Anderson, 2009).

There are two major methodological difficulties associated with the study of autobiographical memories. The first difficulty is often referred to as verifiability. How do we know if the participant is recalling a true autobiographical memory if the experimenter was not there at the time and if the participant may not even be able to distinguish their true retrievals from false retrievals? The second difficulty relates to the complexity and variety of autobiographical memories. Autobiographical memories can consist of things we have done, said, seen, heard, smelt, tasted, dreamt, and even thought. These memories can vary in distinctiveness and vividness, from mundane daily activities to significant life-changing events. Some memories are emotionally charged, but others have little emotional content associated with them. Autobiographical memories can be highly specific events, or experiences that extend over lengthy periods of time, or experiences that have been combined into one categorical representation. They can vary significantly in age from very recent memories with much of their sensory content accessible to much older remote memories that rely heavily on our

autobiographical knowledge for reconstruction. Autobiographical memories can be highly rehearsed experiences or experiences that are rarely recalled. In describing the methods that have been developed by researchers to examine autobiographical memory retrieval, I will highlight how researchers have cleverly overcome these two methodological difficulties in conducting their research.

In this chapter, I will describe the methodologies developed by cognitive scientists to examine the retrieval of personal experiences from autobiographical memory. For the purposes of this review, I am focusing on methodologies developed primarily to study autobiographical memories rather than episodic memories. I will also not be describing the methodologies that have been developed to distinguish the retrieval of semantic autobiographical information, because it is still unclear whether such information is stored in autobiographical memory or semantic memory. In addition, this chapter will not be covering the variety of methodologies that have addressed the specific retrieval of highly emotional, traumatic experiences, as this would have deserved much more coverage than is possible in this chapter. If you are interested in these methodologies I would refer the reader to some excellent reviews of this important memory topic by McNally (2003), Schooler and Eich (2000), and Uttl and Seigenthaler (2006). The self-narrative is also a concept of interest to researchers collecting data on autobiographical memory. However, as self-narratives are not closely related to this chapter's focus on the retrieval of specific memories, this area of research will also not be addressed in the current review. Finally, computational models of memory have been developed by researchers and some of these models have aspects that are relevant to the retrieval of autobiographical memories (refer to McClelland, 2000; Meeter, Jehee, & Murre, 2007). However, a discussion of this theoretical approach and the methodologies involved will not be covered in this review.

Cognitive Psychology Approach

The first attempts to systematically examine autobiographical memory empirically were conducted by cognitive psychologists in the 1970s. These experimental psychologists follow a general methodological approach of testing specific research hypotheses by constructing experiments where independent variables are manipulated by the experimenter and dependent variables are recorded to test these hypotheses. The participants in their studies are usually college student volunteers who normally retrieve a small sample of autobiographical memories, and then provide self-report ratings of phenomenological characteristics associated with these memories and their retrieval. For example, when examining the influence of mood on

autobiographical memory retrieval, researchers manipulate mood states (e.g., playing sad or happy music) and examine memory retrieval performance. Retrieval performance can be measured by the speed of memory retrieval and by the ratings provided by the participant of the memory's emotional content.

Diaries

One of the first approaches to studying autobiographical memories that allowed researchers to verify the validity of these events was the use of diaries. Personal experiences were recorded by the participants in a diary when the event occurred, or at least, very soon after the event occurred. The diaries provided researchers with a large database of verified autobiographical memories that could be tested at a later date. Unfortunately, the duration of data collection and the length of retention period available for testing can be limited using this longitudinal approach to studying autobiographical memory. But some exceptional individual case studies involving years of diary data have provided some important insights into the storage, retrieval, and forgetting of these personal memories over time.

The earliest attempts to collect diaries of daily personal events that extended over periods of years involved singe case studies of the researcher's own experiences (Linton, 1975, 1978; Wagenaar, 1986). These researchers vigilantly and meticulously recorded daily events that happened to them. An example of a diary entry recorded by Wagenaar is provided in Figure 2.1. The experimenter collated the diary entries in a systematic way that allowed specific research questions to be tested. For example, Wagenaar was interested in the role that retrieval cues can play when remembering past experiences. He recorded four descriptive aspects of the memory: who he was with, what he was doing, where he was, and when did it happen. He also provided ratings of each event on three phenomenological dimensions: event salience, emotional involvement, and pleasantness of event (refer to Figure 2.1). When his recall of these events was tested at a later date by his research assistant, Wagenaar was provided with one descriptive cue at a time until he could correctly recall all four aspects of the event. This testing method allowed him to evaluate which retrieval cues were best for retrieving autobiographical memories. He also examined how memory retrieval related to the phenomenological characteristics of the event. It is interesting to note that one of the first research methodologies developed by memory researchers to study autobiographical memory relied on lengthy, painstaking data collection by the researcher of their own memory – much in the same way as was conducted by Ebbinghaus during his pioneering endeavors.

A major methodological concern with diary studies conducted by researchers of their own autobiographical memory is that they introduce

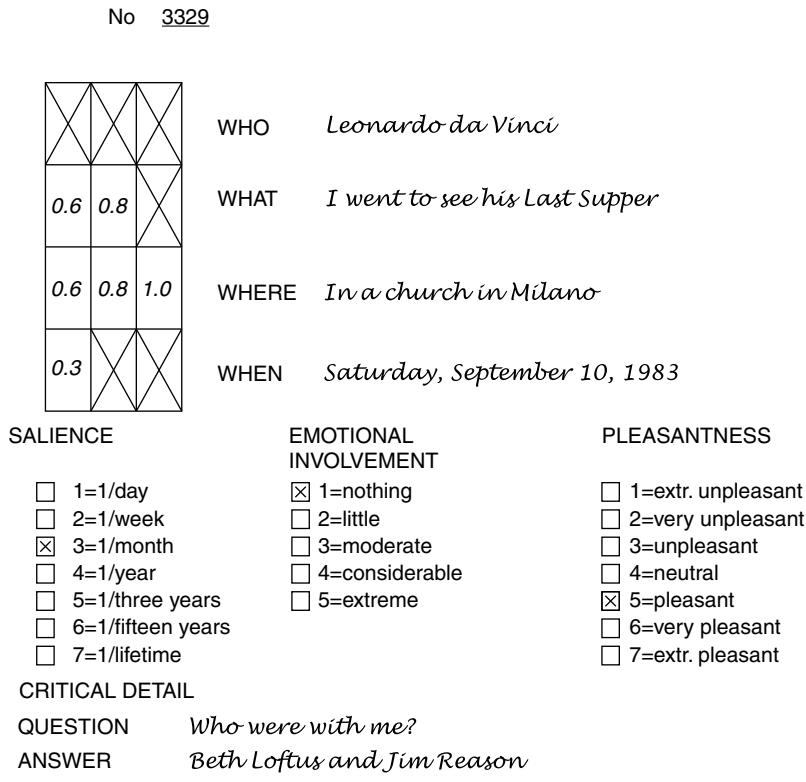

Figure 2.1 An example from Wagenaar's (1986) personal diary records.

experimenter bias to the data collection. The experimenter may collect data that reflect their own research goals or expectations. One way to overcome this problem is to conduct a case study using individuals that are blind to the goals of the research. Many people enjoy maintaining diary records over the years of their life and access to these diaries can be very informing. Catal and Fitzgerald (2004) recently tested the memories of a married couple for diary entries recorded every day by the wife for a period of 20 years. Although the findings from this study replicated many results from the experimenter-based diary studies, there were some significant differences. These differences highlight a major weakness of the case study approach to diary collection in that it is difficult to generalize findings based on a single individual. For example, Wagenaar (1986) found 'where' cues to be significantly better retrieval cues than 'who' cues. However, Catal and Fitzgerald (2004) did not find a difference in the effectiveness of these two retrieval cues. They suggested

that Wagenaar's data reflected his increased level of travel when compared to the married couple in their study.

One way to overcome this generalizing limitation is to collect diary data from a larger random sample of participants. Many studies have now been conducted that have collected diary data from a sample of participants over periods of time ranging from weeks to months. Participants usually record one distinctive event a day and supplement this recording with phenomenological ratings of the event. Thompson and colleagues have conducted many diary studies of this form over a number of years and now have hundreds of diaries in their impressive database of autobiographical memories (Thompson, Skowronski, Larsen, & Beiz, 1996). However, the time periods for data collection and memory testing are relatively short in these studies when compared to case studies. A study by Burt, Kemp, and Conway (2001) combines the merits of both approaches. They collected diary data for a year from 14 participants and then re-tested 11 of the participants 10 years later.

A general methodological weakness of diary studies is their reliance on self-selection of events by participants, as this may introduce a participant bias to the data collected. Participants are often asked to record a distinctive, memorable event each day and so the memories tested may not generalize to all autobiographical experiences. This bias was highlighted in a study by Brewer (1988). He required the participants in his diary study to carry electronic beepers with them each day. The beeper would sound off randomly at approximately 2-hour intervals to signal the participant to record what they were doing and thinking at the time. This naturalistic sampling of events overcomes the self-selection bias. Brewer found significant differences in the memory strength and the phenomenological characteristics of the event when comparing randomly sampled events with self-selected events.

The diary procedure was recently adapted to study an elusive memory phenomenon that was first defined by Ebbinhaus (1885) as involuntary memories. Involuntary memories are past experiences that come to mind spontaneously without a deliberate, conscious attempt by the individual to retrieve the experiences from memory. Involuntary memories occur without any forewarning and are very difficult to study. Up until the 1990s, the discussion of involuntary memories relied on anecdotal or fictional descriptions (Salaman, 1982; Proust, 1913–27). Berntsen (1996) pioneered the use of the diary method to collect involuntary memories. Participants in her research carried a diary with them as they went about their daily activities. They were required to immediately record in their diary any involuntary memories that occurred during the day. The participants only recorded a brief description of the memory at that time. Later that day or evening, participants added ratings of the memory characteristics (e.g., age of memory, emotional valence of experience) and retrieval context (e.g., attention state, emotional state) to this diary entry. A number of diary studies have now been

conducted to further our understanding of this evasive memory phenomenon (Berntsen, 2009).

One weakness with diary studies is that the participant may become aware of the goals of this research through repeated recordings, and begin to record data that match these perceived goals. Ball and Little (2006) conducted a diary study to examine this concern with involuntary memory diaries. Their participants were only required to record one involuntary memory recording. After recording this memory, the participants provided additional information based on instructions enclosed in a sealed envelope. As a result of this procedure, the participants were blind to the type of information they would need to provide about the involuntary memory retrieval until they had experienced it. The findings of this study were consistent with previous diary research based on multiple diary entries.

Cue prompts

A method of collecting autobiographical memories that adds some of the experimental control that is missing from the diary methodology was first reported by Crovtiz and Schiffman (1974) and was based on the pioneering research of Galton. Cue prompts (e.g., words, phrases, categories) are presented to a participant who must retrieve an autobiographical memory that relates to this cue. This laboratory-based method of data collection allows the experimenter to test various research questions by manipulating aspects of the prompting process and context. In addition, this methodology is well suited to collecting a range of behavioral measures that relate to memory retrieval performance, such as retrieval time and memory ratings. The cue-prompt methodology has arguably become the most popular method for studying autobiographical memory. In addition, this method has important clinical applications for studying patients suffering from memory loss (Wenzel, 2005). I will now provide some research examples of how this methodology can be varied to test different types of research questions.

One simple and popular way of changing the cue-prompt task is to vary the category of cue-words used. This manipulation is fundamental to the Autobiographical Memory Test (AMT) developed by Williams and colleagues. The AMT has become a popular method for examining clinical disorders (e.g., depression, PTSD) and can even predict disorder occurrence, severity, and treatment success (Williams et al., 2007). The AMT uses 10 cue-words that relate to either positive or negative affect (e.g., sad, happy). Researchers than examine the number of specific personal events that are reported by participants to these cue words. Memory specificity has been found to vary as a function of clinical diagnosis, disorder severity, and duration (Williams et al., 2007). The cue prompts do not necessarily have to be verbal stimuli presented visually. Researchers have tested cues involving multiple

sensory modalities. For example, Goddard, Pring, and Felmingham (2008) presented three different types of cues in their experiment. The first prompt was a photograph or drawing of the cue; the second type of prompt was the word that described the cue; and the third type of prompt was an odor cue.

Another experimental manipulation involves changing the information that precedes the presentation of the cue prompt. Reisser, Black, and Abelson (1985) examined the hierarchical organization of autobiographical memories by presenting a phrase before the cue word (another phrase). They compared retrieval times when general activity descriptions preceded specific action phrases and vice versa. Ball and Hennessey (2009) recently presented subliminal primes before the cue words were displayed. The masked primes consisted of words associated with categories of memories, and the cue words were either related to these categories or came from unrelated categories. Haque and Conway (2001) interrupted the retrieval process after the cue word was presented by displaying the word "REPORT" at random times while the participant was retrieving a memory. The participant was required to report what was in their mind at that time. This procedure enabled the researchers to look at the cognitive steps involved in the retrieval of autobiographical memory and especially during cue-elaboration. The retrieval context can also be varied using the cue-prompt method. Suedefeld and Eich (1995) collected autobiographical memories from participants in a sensory deprived environment as they floated on a body-temperature solution in a dark chamber that was sound attenuated.

Questionnaires

A common feature of the methodologies described so far has been the research interest in the phenomenological characteristics of the memory retrieval. These characteristics are usually recorded from the participants as ratings on a scale. However, researchers have recently attempted to provide better measurement tools for these characteristics in the form of multi-item questionnaires. Rubin and colleagues developed the Autobiographical Memory Questionnaire (AMQ) to measure recognition and sensory aspects of autobiographical memories (Rubin, Schrauf, & Greenberg, 2003; Rubin & Siegler, 2004). The AMQ consists of 19 items that measure three broad aspects of the autobiographical memory and its retrieval phenomenology: (1) recollection and belief in the accuracy of the memory (e.g., "I travel back to the time when it happened"), (2) component processes (e.g., "I can see it in my mind"), and (3) reported properties of events and memories (e.g., "It is significant for my life").

Sutin and Robins (2007) recently created the Memory Experiences Questionnaire (MEQ) that consists of 63 items which measure 10 phenomenological dimensions: (1) vividness (e.g., "My memory of this event is very