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## Memory

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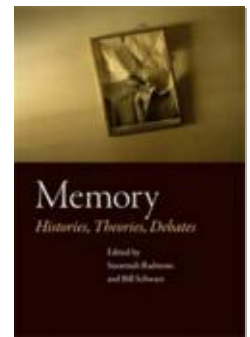
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## 14. Memory and Cognition

*John Sutton, Celia B. Harris, and Amanda J. Barnier*

In his contribution to the first issue of *Memory Studies*, Jeffrey Olick notes that despite “the mutual affirmations of psychologists who want more emphasis on the social and sociologists who want more emphasis on the cognitive,” in fact “actual cross-disciplinary research . . . has been much rarer than affirmations about its necessity and desirability.”<sup>1</sup> The peculiar, contingent disciplinary divisions that structure our academic institutions create and enable many powerful intellectual cultures, but memory researchers are unusually aware that uneasy faultlines and glaring gulfs lie in the uncertain zones between them. The processes of memory are simultaneously natural and cultural. But our difficulties in imagining even fragments of a genuinely integrated framework for understanding diverse memory-related phenomena do not arise from a simple “two-cultures” problem: it’s not as if there are substantially unified visions of memory *within* either the sciences or the humanities.

It might look from the outside, in particular, as if there is a single increasingly consensual scientific approach to memory, encompassing neuroscience, psychology, and (perhaps) philosophy of mind. But, of course, closer immersion reveals a patchwork of more-or-less distantly related subdisciplines, each with their own dynamics and disputes, each uneasily connected to neighboring disciplines and practices and to a raft of related non-memory domains. The vast institutional, practical, and tacit apparatus of “normal science” within specific subdisciplinary cultures remains productive despite (or even because of) the absence of explicit bridges or interarticulations of methods, concepts, and theories with those next door. This situation has two consequences for interdisciplinary endeavors. It is extraordinarily difficult for humanities theorists to find the right scientific and psychological theories on which to draw and with which to seek articulations. Second, there is no real danger from “reductionism”: actual inter-level explanatory strategies in the

sciences of memory will be compatible with great explanatory pluralism and will tend to make the activities and processes of remembering look more complicated, rather than less.<sup>2</sup>

In such a pluralist spirit, then, this chapter draws on just a few of these traditions in cognitive, clinical, developmental, social, and personality psychology, in the cognitive sciences and cognitive anthropology, in phenomenology and philosophy of mind, and in social ontology to trace one idiosyncratic path through contemporary approaches to memory and cognition. Our choice of topics is driven by a desire to suggest that diverse “cognitive” approaches have much to offer memory researchers in the humanities and social sciences. The recent history of the sciences of memory offers a sharp contrast and corrective to the stereotyped image of cognitive science as a scientific quest to model all the mind’s complexities on the dull mechanism of our current digital computers. The scope of cognition broadens, as we seek to demonstrate, to include emotion and motivation, embodiment and movement, and to address factors below conscious awareness and control as well as beyond the individual. The activities of remembering that matter in everyday life often involve the interaction and coordination of memory-related processes at many different levels and timescales: neural, cognitive, affective, bodily, social, material, and cultural.

Alongside excellent and original works of broad appeal that synthesize ideas from the cognitive and psychological subdisciplines of memory,<sup>3</sup> other recent writers have issued persuasive calls for integrative theory-construction.<sup>4</sup> Rather than attempting exhaustive coverage, we aim to provide informative references to support a distinctive, picaresque track through the study of such processes of coordination. We begin with an idealized account of distinctions between forms or systems of memory and of their core functions and then home in on one troubled faultline by looking at the limits of awareness in memory and at recent ideas about inhibition and repression. We sketch some new directions in the interdisciplinary study of social memory phenomena and conclude by briefly raising some questions about the roles of memory in embodied skills.

### **The Ecology of Memory**

Most chapters in this volume focus on the many occasions when we remember experiences and events from our own past, together or alone. This form of memory, variously labeled “personal memory” by many philosophers and “autobiographical memory” by many psychologists, is only one among a range of tasks that human memory performs. Additionally, remembering our past calls on a whole range of related capacities, such as motivation, language, and emotion, as well as the basic ability to store and retrieve information. Remembering can also occur without a person consciously recalling a particular

past event: memory is used to know facts, to learn skills that become automatic over time, and to remember to do things in the future.

The attempt to distinguish between different types of memory has a long history.<sup>5</sup> As Steven Rose notes in his chapter on neurology in this volume, the modern neurocognitive taxonomy developed gradually following the study of the brain-injured patient HM, who became unable to form new memories following a lesion of his medial temporal lobe.<sup>6</sup> Despite HM's extensive amnesia, he was able to acquire new skills (such as mirror drawing), even though he could not remember learning them. This led researchers to a primary distinction between declarative memory, where information is consciously recalled and can be articulated, and non-declarative memory, which cannot be easily articulated but is expressed through the acquisition of learned behaviors or skills. Because of the focus on learned behavior, non-declarative memory is sometimes called procedural memory, or "remembering how." We focus further on procedural memory in the last section of this chapter.

Within declarative memory, psychologists make the further distinction between episodic memory, or memory for specific, personal events, and semantic memory, or memory for facts. Episodic memory has been described as "mental time travel" by theorists who stress the phenomenological reliving of a past event:<sup>7</sup> it is argued by some to be a uniquely human faculty.<sup>8</sup> The label "episodic memory" is also closely related to "autobiographical memory," although theorists taxonomize differently here.<sup>9</sup> Semantic memory has been described as "symbolic knowledge of the world."<sup>10</sup> That is, the label "semantic memory" encompasses all the information that we store about the world, and has been described as accompanied by a feeling of "knowing" rather than "remembering." In the form of schemas or other dynamic knowledge structures, semantic memory can also have significant influence on the details of the way we remember our own past.

Many questions remain about the nature, medium, and format of representations within the declarative and non-declarative memory systems, and indeed whether it is necessary to postulate representations at all.<sup>11</sup> It is also unclear what's entailed in considering these as distinct systems at all and whether such a division enhances our understanding of memory.<sup>12</sup> While some memory theorists propose a "multiple systems approach" to understanding memory, others argue for a "components of process" approach,<sup>13</sup> where one system can flexibly perform apparently different processes.

### *How Memory Works: Basic Cognitive Models*

As well as creating a taxonomy of memory types, cognitive psychologists examined what human memory does, using an information processing approach. According to this framework, human memory has three major tasks to perform. First, it must receive incoming information, a process termed "encoding." Then, it must retain the information over time in some way, a process termed "storage." Finally, it must be able to access the

information at some future time, a process termed “retrieval.” Using this information processing perspective, Richard Atkinson and Richard Shiffrin developed an influential model of memory to capture the relationship between these processes (see Figure 1).<sup>14</sup> Through many modifications, as the broader information processing paradigm has itself mutated, this “modal model” has provided the basis for contemporary cognitive models of memory.

According to the modal model of memory, external events and information are “perceived” or experienced by the senses and reside in great detail and richness, yet only very briefly, in sensory memory. The duration of this brief period varies from one sensory system to another, but is probably no more than three or four seconds for any of them. After this, most of the information in sensory memory is lost. However, information that we pay attention to or that captures our attention is transferred to short-term memory. So the control process that determines which information survives is attention.

Short-term memory is sometimes equated with consciousness because it is what we are thinking about at any given moment in time. In comparison with the large (although only momentary) storage capacity of sensory memory, the storage capacity of short-term memory is small, around seven items, and without active rehearsal, short-term memory lasts for about fifteen to twenty seconds. During its brief existence in short-term memory, some of the information may be immediately recalled or converted into behavior (for instance, dialing a telephone number you’ve just been given by directory assistance). Alternatively, some of the information may be rehearsed and encoded; that is, put into a

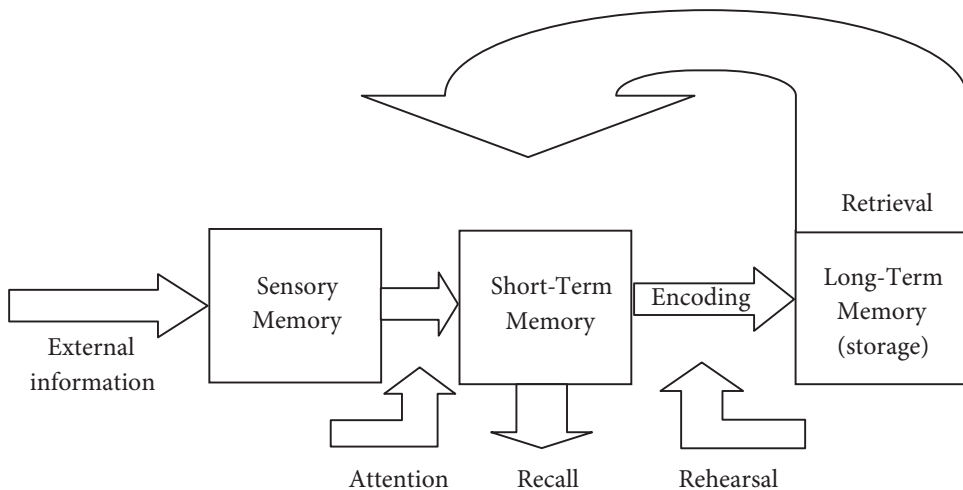


FIGURE 1. The modal model of memory, as described in Richard C. Atkinson and Richard M. Shiffrin, “Human Memory: A Proposed System and Its Control Processes,” in *The Psychology of Learning and Motivation*, ed. Kenneth W. Spence and Janet T. Spence (New York: Academic Press, 1968), 89-195.

form that allows for storage in long-term memory. More recently, as researchers have identified the complexity of the tasks required of short-term memory, a replacement construct termed “working memory” has developed, which acknowledges the multiple processes involved in performing the tasks described.<sup>15</sup> Working memory holds information “online,” for instance when we remember the words from the beginning of a sentence in order to understand the end, or when we perform arithmetic in our head. Perhaps we sometimes also exploit the information-processing capacities of our immediate environment to expand the powers of our working memory.<sup>16</sup>

Information that reaches long-term memory may stay there permanently, organized by reference to its meaning rather than randomly, and available for retrieval as needed. Such retrieval is accomplished by bringing materials back to working memory (from which they can be recalled, or turned into behavior). The general label “long-term memory” covers the taxonomy described above, encompassing both declarative and procedural memory, and both episodic and semantic memory.

### *Functions of Memory*

Despite the widespread adoption of this basic computational view of memory, recent theory and research recognize that memory is more complicated than this model might suggest, especially memory of personal experiences or emotional material. The memory system is crucial in allowing us to navigate our world by providing a means by which we can learn and modify our behavior. One major function of memory is to accurately encode, store, and retrieve different kinds of information. However, memory has broader functions, such as maintaining our sense of self, regulating emotion, motivating and directing future action, and helping us to promote and maintain relationships with others.<sup>17</sup> It is because of these broader functions that memory becomes more complicated. We do not just encode, store, and retrieve whatever information we encounter; rather, each of these processes is performed selectively depending on our motivations, goals, and expectations.

This acknowledgement of the role of motivation in memory is not new. In 1932, Frederic Bartlett emphasized that one function of remembering, particularly in a social context, is to share our impressions with others. Thus, people are likely to construct and embellish upon their memories rather than generate a strictly accurate representation of what happened: “A story told *to* auditors is never quite the same as a story told *for* readers. Even when the matter is identical, the manner is different.”<sup>18</sup> That is, memory is largely constructed: it is constructed from a range of sources, including what is stored and what is accessible, personal motivations, social motivations, and situational demands.

Since Bartlett’s time a number of theorists and researchers have emphasized the close relationship between what is remembered from people’s lives and their identity. Such an emphasis raises difficult questions about truth in memory, including whether truth is an

appropriate ideal for memory and whether construction necessarily entails distortion. Alongside its pragmatic functions (storing information) and interpersonal functions (maintaining relationships), declarative memory makes claims on the world. In general, in remembering we seek to track the truth: in contrast to our imaginings and stories and myths, we are often uneasy or dismayed when our take on the past is challenged or overturned.<sup>19</sup> Yet because reality and experience have complex structures, and because the requirements on remembering vary dramatically across contexts, truth in memory is neither a simple nor a single thing. The choice of precision or grain of detail in recall, for example, can matter as much as brute correspondence with reality. For this reason, the constructive nature of personal remembering in particular is not, as it is sometimes portrayed, a barrier to truth. If human memory is more like a compost heap than a storehouse of discrete cells,<sup>20</sup> then its intrinsic dynamics drive our productive capacities to select and to generalize appropriately. The brain's plasticity in "storage," its pervasive openness to influence, remains more adaptive than sinful even if it occasionally leads us astray.<sup>21</sup>

#### *Identity Functions of Memory: The Self-Memory System Model*

We will now discuss one major current theory of autobiographical memory, in which motivation is central: on this view, cognition and affect are tightly interwoven in the mundane operations of memory. We return to the implications of a constructivist approach to memory in the section "Between Individual Memory and Collective Memory," below. In Martin Conway's Self-Memory System model (SMS), people's knowledge about their lives has three broad levels of specificity: lifetime periods (e.g., when I was in high school), general events (e.g., going to class), and event-specific knowledge (e.g., a final exam). Hence autobiographical knowledge is hierarchical, organized in the knowledge base with increasing specificity. A specific autobiographical memory is generated by a stable pattern of activation over all three of these knowledge bases. In Conway's model, "feelings of remembering" arise because of activation at the most specific level of the hierarchy: sensory-perceptual details. The construction of the particular pattern of activation that results in an autobiographical memory is constrained by control processes that coordinate access to the knowledge base and modulate output from it.<sup>22</sup>

According to the SMS, control processes are the unconscious processes that generate mental models from cognitions, affects, and behaviors in order to attain goals.<sup>23</sup> These control processes are termed the working self. Cognition is goal-driven, and success or failure in goal attainment is experienced as emotion. The working self can facilitate or inhibit retrieval of certain memories depending on current goals. Autobiographical memories consistent with self-goals can be accessed quickly and with little effort via direct retrieval.

In the SMS, the influence of goals occurs at encoding, storage, and retrieval to affect the content and accessibility of autobiographical memories.<sup>24</sup> Conway and Christopher Pleydell-Pearce distinguish between two types of retrieval.<sup>25</sup> The first, *direct retrieval*, occurs as a spontaneous response to a particular cue. Direct retrieval is not under the influence of control processes. The second type, *generative retrieval*, is a complex three-stage process guided by the working self. In generative retrieval, the working self generates retrieval models that are used to direct the search process. These models provide constraints on the type of information that can come into consciousness. The goals of the working self in the given context determine the product of generative retrieval.

Conway identifies two principles underlying autobiographical memory.<sup>26</sup> The first is *coherence*, referring to the need to maintain an integrated and consistent sense of one's life experiences. The second basic principle of memory is *correspondence*, referring to the need for episodic memory to correspond with reality. The SMS acknowledges that both these principles are important in autobiographical memory, but for different reasons and possibly in different circumstances. Correspondence allows the working self to keep track of progress in goal attainment to avoid unnecessary repetition of tasks. Autobiographical memory must therefore bear at least some resemblance to reality. However, the working self makes memories that are consistent with goals and beliefs highly accessible, while memories that conflict with the self are distorted or inhibited. According to Conway, Jefferson Singer, and Angela Tagini, correspondence is likely to be more important in the short term, since it allows the working self to keep track of actions that have been completed in the pursuit of goals. However, coherence is likely to be more important in the long term, since it allows the generation of different versions of "self-in-the-past" and "self-in-the-present."<sup>27</sup>

Thus, one major feature of the SMS is its emphasis on the goal-directed nature of autobiographical remembering and forgetting. Conway proposes that the self and autobiographical memory interact reciprocally: the self constrains what is remembered, and memory constrains possible selves.<sup>28</sup> Thus, autobiographical memory is inherently selective. What is remembered from our lives is determined by our current working self, the image of ourselves we are motivated to have at any given time. Autobiographical memories that are consistent with the goals and values of our current working self are prioritized for remembering, while memories that conflict with our working self are more likely to be forgotten.<sup>29</sup> Self-identity goals influence which events from our lives are recalled and the way in which these events are recalled.<sup>30</sup>

### *Extending Basic Cognitive Models*

This brief overview summarizes the way cognitive psychologists approach human memory. Of course, such psychological models are limited in important ways: they are idealized simplifications of incredibly complex, socially-embedded, cognitive-affective



processes, and there is by no means consensus about most of the issues covered. However, this principled, empirical approach has great value. In maintaining experimental rigor, we can lay the groundwork for an understanding of the way memory works. Supported by empirical findings, we can extend these robust and reliable models to examine more advanced questions about memory.<sup>31</sup> In the sections that follow, we demonstrate the way these basic understandings of the types and processes of memory can be extended and developed to guide research and to enhance our understanding of memory in the laboratory, in the clinic, and in the world.

### **Awareness and Inhibition**

The distinctions and processes delineated by psychologists that we have discussed above are useful when examining controversial issues in the study of memory. We can extend the basic information-processing model to examine the interplay between memory and consciousness, and we can use Conway's motivational approach to memory to ask why certain memories are available to consciousness and others are not at any given time. In this section we examine the complex and controversial issue of whether certain memories can be intentionally forgotten or at least intentionally blocked from conscious retrieval from long-term memory. We draw together a range of approaches to this issue, including the theoretical debate surrounding repression, clinical case studies of psychogenic amnesia, and experimental laboratory paradigms that measure the intentional forgetting of memories.

One way psychologists understand the relationship between memory and consciousness is to differentiate between "explicit" and "implicit" memory. These terms are similar to the declarative/non-declarative distinction we have described already, but the distinction between explicit and implicit is not conceptually identical. Explicit memory can be consciously accessed, while implicit memory refers to the influence of past experience on behavior in the absence of conscious recollection. Implicit memory may encompass procedural memory, or memory for skills, but also may include a range of other phenomena where memory is expressed in behavior even when it is not accessed consciously. For example, one index of implicit memory is that participants in studies are faster to complete a word stem that they have seen in a previous trial than a novel word; this effect occurs for amnesic patients as well, indicating that implicit memory is independent of explicit memory.<sup>32</sup>

#### *What Is Repression?*

The concept of repression is controversial in psychology, and consensus regarding the term is hard to find. The earliest use of the term was to refer to the inhibition of ideas by

other ideas;<sup>33</sup> that is, repression was defined as a way of managing cognitive load by focusing on relevant information at the expense of irrelevant information. When Freud adopted the term, he described it as a defensive form of memory inhibition, in which memories that cause psychological distress are excluded from awareness. Freud also argued that, while these repressed memories cannot be consciously recalled, the effects of these traumatic memories emerge indirectly by causing psychopathological symptoms. In contemporary terminology, this definition implies that repressed memories are implicit; while they cannot be consciously recalled, they continue to influence behavior. Later theorists, such as Anna Freud, refined Freud's definition by stipulating that repression was necessarily an unconscious process, while deliberate or conscious avoidance of memories was termed "suppression." However, in one ambitious recent synthesis, Matthew Erdelyi argues that there is no clear difference between repression and suppression, that consciousness is not so clearly an either/or criteria, and that it is more useful to follow Freud in defining repression as "rejecting and keeping something out of consciousness," by whatever mechanism. Erdelyi defines repression simply as "a consciousness-lowering process,"<sup>34</sup> that is, any process that reduces the accessibility of unwanted information. This equating of repression and suppression is controversial, and there is little consensus in the literature.<sup>35</sup>

#### *Repression in the Clinic: The Role of Trauma*

Much of the evidence for repression has come from clinical cases. Disruptions of autobiographical memory are present in a range of clinical disorders, such as post-traumatic stress disorder and functional amnesia. In such disorders, forgetting is experienced as out of control, and explicit memory is impaired for particular events or whole lifetime periods. However, implicit memory is usually intact. For instance, Lionel Sasson Lyon described a case of a woman with psychogenic fugue—a loss of all sense of her identity and of her personal memories—who was amnesic for her identity and all personal information. However, when given a phone and asked to dial whatever number came to mind, she called her mother.<sup>36</sup> Thus there is case study evidence that people can have explicit amnesia for life events even while still demonstrating implicit memory for those events. While the presence of autobiographical forgetting in clinical disorders has been well documented, the underlying mechanisms remain unclear. Of particular importance in clinical cases is the role of trauma in triggering such amnesia. However, it remains unclear whether cases like these are examples of an automatic response to trauma or whether they are the result of more motivated attempts by the individual to suppress negative memories.

So how do the features of clinical amnesias compare to the features of repressed memory? Or can clinical amnesias be better accounted for by normal forgetting processes?

According to Freud's definition, repression is the result of unbearable psychological distress and is a way of defending the ego against the consequences of such distress. Clinical cases also suggest that amnesia can be triggered by trauma, such as the death of a family member in the case of "Lumberjack,"<sup>37</sup> or by assault.<sup>38</sup> However, reported cases differ in important ways, with some patients, such as "Lumberjack," reporting wholesale amnesia for their whole identity and life history while others report amnesia for specific, traumatic events. Freud's concept of repression proposed that the target of repression can vary in specificity and that repression can even target particular aspects of certain events (such as memory for emotions during an experience), as well as whole events (similar to Conway's hierarchical model of autobiographical memory<sup>39</sup>). Finally, clinical amnesias often resolve spontaneously, meaning that they better fit the profile of repression (where the memory remains stored but subconscious) than normal forgetting processes, where amnesia for a particular event indicates that it is no longer stored. That is, in terms of process, repressed memories (and memories forgotten in cases of clinical amnesia) remain stored in long term memory, but can no longer be retrieved into short-term memory, while in normal forgetting, memories are no longer stored at all.

### *Repression in the Laboratory*

Experimental psychological research has examined shifts in memory accessibility and developed experimental paradigms that can reliably create forgetting in the laboratory. While the relevance of these paradigms to repression is hotly disputed, they constitute a useful starting point in determining whether and how people can intentionally forget unwanted information. In this section we examine two such paradigms: think/no-think and post-hypnotic amnesia. Michael Anderson and Collin Green suggest that their think/no-think (TNT) paradigm is a laboratory analogue of Freudian repression.<sup>40</sup> In this paradigm, participants study word pairs and learn to recall the second (associate) word when presented with the first (cue) word. During the critical phase, participants repeatedly avoid thinking about the associated words when presented with certain cues, and repeatedly respond to other cue words by saying the associated word. Later, they try to recall all the associated words. Research indicates that participants' recall of avoided associate words is poorer than their recall of baseline associated words (words that did not appear in the critical phase). Thus, deliberately avoiding thinking about information when presented with a reminder of it makes that information more likely to be forgotten. In the TNT paradigm, repression is equated with active, effortful suppression of unwanted information. Further, Anderson and his colleagues claim to have identified the neural systems underlying suppression in the TNT paradigm.<sup>41</sup>

However, other researchers have been unable to replicate Anderson's findings.<sup>42</sup> Further, whether such a procedure tests Freudian repression is arguable. First, in the TNT

paradigm, memory avoidance is deliberate and effortful, and so is only evidence for repression if repression is the same as suppression. Second, theories of repression suggest that repression only occurs for material that threatens the ego, that is, for deeply psychologically disturbing memories. It may not be reasonable to expect that such a system can be activated at will, simply because the experimenter instructs it, in the absence of any emotional motivation to do so. This separation of process and cause remains disputed: Anderson and Benjamin Levy argue that the mechanisms involved in repressing memories can be studied separately from the causes of engaging them,<sup>43</sup> while John Kihlstrom argues that repression cannot be studied without the use of traumatic stimulus materials,<sup>44</sup> which makes it ethically very difficult to directly manipulate repression in the laboratory.

Another experimental paradigm examining the relationship between memory and consciousness is post-hypnotic amnesia. Post-hypnotic amnesia (PHA) has been considered the laboratory parallel of clinical amnesia.<sup>45</sup> In PHA, the hypnotist suggests that after hypnosis, the participant will not be able to remember particular material or events. In hypnotizable participants, this suggestion reliably leads to dramatic memory loss similar to the memory loss that occurs in clinical disorders.<sup>46</sup> PHA shares features with the clinical amnesia cases described above. It is initiated deliberately by the participant, targeting whichever particular memories they are instructed to target, so it is goal-directed and selective and can be applied to memories of varying specificity (e.g. word lists, whole episodes, whole lifetime periods).<sup>47</sup> In clinical cases, amnesia is also goal-directed, targeting memories that are distressing. Additionally, PHA occurs without apparent effort and is reversible given the cancellation cue. Similarly, clinical amnesia is experienced as involuntary, although it can be reversed by providing retrieval cues. Finally, research has demonstrated that PHA impairs explicit memory while leaving implicit memory intact,<sup>48</sup> similarly to clinical amnesias and conceptualizations of repression. These PHA experiments indicate that human memory is cognitively equipped to perform the kind of tasks hypothesized to be involved in repression.

The experimental approach to intentional forgetting demonstrates that this approach can advance a field that has reached a theoretical stalemate. Empirical psychological principles may help to tease apart which factors of the concept of repression are crucial, such as the difference between repression and suppression, and between neutral and emotional material, because we can test the predictions that come out of the various theories. For example, Freud's theory of repression suggests that explicit memory for the target material is impaired, while implicit memory is spared. Thus, if Anderson and Green's think/no-think paradigm models repression adequately, research should show that implicit memory is spared in this paradigm. If repression is a process that occurs only for distressing material, people should find it much easier to forget negative rather than positive life events in PHA experiments. Much experimental work remains to be done, and the answers are by no means clear yet, but using these experimental paradigms, driven by models of

memory processes, to test aspects of each theoretical viewpoint gets us closer to an understanding of which factors and parameters may be important.

### **Between Individual Memory and Collective Memory**

In the section “The Ecology of Memory,” we described the consensus in cognitive psychology that personal remembering is a constructive process. What’s encoded is highly selective, shaped by our patterns of attention, interest, and expertise; what’s “stored” tends to mix and blend with related thoughts and feelings; and what’s retrieved depends on subtle features of the current mood and context. Some psychologists treat this openness in our biological memory systems as a troubling flaw: their individualist accounts of memory distortion characterize external influence on memory as primarily negative, the relentless intrusion of the social into malleable individual memory.

Such views derive in part from a focus on the highly-charged legal context of assessing eyewitness testimony. Elizabeth Loftus writes, for example, that “misinformation has the potential for invading our memories when we talk to other people.”<sup>49</sup> Although research on suggestibility has been productive in these contexts, it does not show that social forces inevitably contaminate or corrupt. Indeed, successful remembering may often rely on interpersonal and other support. Because units of information are in general not retained distinctly at independent locations within the neural component of our memory systems,<sup>50</sup> we have learned (both culturally and individually) to integrate our relatively vulnerable and permeable biological memory with more stable external scaffolding. On its social dimension, such “relational remembering”<sup>51</sup> is particularly important for locating and renegotiating the emotional significance of the personal or shared past. Sharing and co-constructing memory, Sue Campbell argues, is our default: even those occasions when we do not talk about our pasts “have some of their meaning in relation to our natural habit of sharing the past.”<sup>52</sup> While some psychologists have ignored this social dimension of memory, there is a new trend in cognitive psychology toward measuring and manipulating social processes in remembering, and certain cognitive models and paradigms used by psychologists can readily be extended to explore social aspects of memory.<sup>53</sup>

One area of psychology that has always focused on social influences on memory is the developmental domain. The meshing of individual and interpersonal perspectives on the past is present early in memory development as children begin to attend jointly with adults to shared past experiences. Alongside the developmental work on early embodied interaction discussed in the chapter by Felicity Callard and Constantina Papoulias in this volume, more specific accounts of the development of personal memory have been developed in the powerful social interactionist tradition. In their recent synthesis, Katherine Nelson and Robyn Fivush characterize the emergence of autobiographical memory as “the outcome of a social cultural cognitive *system*, wherein different components are

being opened to experiences over time, wherein experiences vary over time and context, and wherein individual histories determine how social and cognitive sources are combined in varying ways.”<sup>54</sup> This research tradition addresses a range of individual, gender, and cultural differences in the development of thought and talk about the past: cross-cultural experimental work traces various pathways of the interaction between parental reminiscence style and a child’s developing competence in talk about the past.<sup>55</sup> The child’s social scaffolding affords not a unidirectional imbibing of emotional or self-related norms for evaluating past experience but a spiral process in which the child’s changing competence in dialogue about the past itself in turn directly shapes and flavors the ongoing dynamic co-construction of narratives.<sup>56</sup>

Spontaneous thought about the personal past, then, gradually develops out of early memory-sharing practices, as the child slowly picks up the causal connections between events in time, and within her own past, and the existence of different present perspectives on the same once-occupied time. On one account of this developmental process, the child is grasping the temporal asymmetry of experience and implicitly seeing that remembered events can, in principle at least, be integrated on a connected temporal dimension. It is a sophisticated achievement, linked to a range of related cognitive and socio-affective changes, as the child moves toward a practical understanding that she cannot change the past: the ongoing social renegotiation and reevaluation of the meaning of past actions, emotions, and events shows her that while there can be a multiplicity of rich perspectives on the past, her actions are in one sense unique and irrevocable.<sup>57</sup>

These interpersonal dimensions of memory’s emergence also mark the way that mature activities of remembering function in support of our temporally extended agency. Many social practices, such as promising and forgiving, and complex emotions, such as grief, love, and regret, depend on personal memory and on a grasp of temporal relations. Fallible but more or less reliable remembering can keep what happened in the past alive, giving it significance for ongoing relationships. Couples and groups of different kinds rework and reinterpret past events together for many purposes, relying on more or less shared expectations and mutual commitments in the way they present themselves to outsiders and enact their ongoing projects.

It’s natural in many such contexts for members of the group to operate as, and at least implicitly consider themselves as, a “plural subject” of memory, to borrow a label from Margaret Gilbert’s social ontology.<sup>58</sup> Thoughts and statements of the form “we remember . . .” can have many different context-dependent implications. Sometimes a group is merely thrown together by accident, perhaps through witnessing an incident in the same place. Other groups are long standing and share memories of events and actions that they themselves deliberately undertook as a group. The forms and media of such sharing of memories also vary significantly and can (for example) be more or less interactive. Thus social memory phenomena can be understood within a kind of multidimensional space, in which a notion of true “collective memory” might mark

not a metaphysically distinct set of sociocognitive systems that differ from “individual memory” on some single discoverable criterion, but rather a region in this space in which the cases of shared remembering under consideration score more highly on more of those relevant dimensions. Terminological confusion about “collective memory” could be due then to the multiplicity of relevant and undertheorised phenomena, not to their nonexistence: what might look like competing theoretical approaches may in fact apply to distinct but complementary aspects of the world of memory phenomena.<sup>59</sup>

Despite the difficulty of probing such complex phenomena empirically, mainstream cognitive psychologists are entirely aware that “in many circumstances in society, remembering is a social event.”<sup>60</sup> They have developed a number of relevant paradigms, including studies of collaborative recall, social contagion, and transactive memory.<sup>61</sup> Each of these paradigms assesses social influence on memory in different ways and focuses on different questions. In collaborative recall studies, the recall output of a group of three is compared with the pooled recall output of three people working alone, to directly index the impact of the group on what is remembered.<sup>62</sup> The collaborative recall paradigm is focused primarily on amount recalled: research shows that while groups remember less than the pooled sum of individuals, the group discussion does enhance subsequent individual memory.<sup>63</sup> In social contagion studies, incorrect information is suggested to the participant during discussion with a confederate.<sup>64</sup> The social contagion paradigm focuses primarily on accuracy: research shows that people come to remember items they never saw themselves that were mentioned in discussion.<sup>65</sup> In studies of transactive memory, the focus is on the influence of prior relationships, and performance on memory tests by intimates such as romantic partners is compared to the performance of pairs of strangers.<sup>66</sup> The transactive memory paradigm focuses primarily on amount recalled: research shows that couples remember more than pairs of strangers when they are allowed to adopt their own strategy, but less than strangers when they have to use a strategy assigned by the experimenter.<sup>67</sup>

As yet, much of this research has been conducted with relatively simple stimuli rather than more significant emotional, personal, or shared memories, and (with the exception of transactive memory), most research has been conducted with convenience groups rather than long-standing real-world groups, and the processes adopted during the discussion have often been restrictive or unnatural.<sup>68</sup> However, clear directions are increasingly apparent for extending such studies to examine the costs and benefits of sharing memories and the parameters of group influence in more realistic settings.<sup>69</sup>

Such sociocognitive studies can help to ward off the temptation to see individual memory and group memory as entirely distinct phenomena, to be studied separately in the cognitive and the social sciences respectively: that dichotomy leaves us puzzling about the analogies or parallels between the concepts applicable in each domain. Instead, memory processes in brains, minds, and groups are often interdependent, interacting and

coordinating to compile particular versions of the past from whatever incomplete or partial raw materials are available. This approach, in which personal and collective memory are not just compatible but complementary, is faithful to Maurice Halbwachs as well as to Bartlett and to Lev Vygotsky: “One may say that the individual remembers by placing himself in the perspective of the group, but one may also affirm that the memory of the group realizes and manifests itself in individual memory,” says Halbwachs.<sup>70</sup> Neither individual nor shared memory has ontological priority.

Of course, most socially distributed memory systems are not exclusively social, in that the spread of resources drawn on in complex activities of remembering may include material, symbolic, technological, and cultural artifacts, objects, and media, in addition to other people. This is how on-board biological memory is transformed, not just augmented. As Vygotsky wrote, “Even such comparatively simple operations as tying a knot or marking a stick as a reminder change the psychological structure of the memory process. They extend the operation of memory beyond the biological dimensions of the human nervous system and permit it to incorporate artificial, or self-generated, stimuli, which we call *signs*.”<sup>71</sup> Likewise, Halbwachs, in his 1939 case study of “the collective memory of musicians,” argues that “the score in this case functions exactly as a material substitute for the brain.”<sup>72</sup> Cognition in such cases can be literally distributed across brain, body, and world,<sup>73</sup> and remembering involves a range of external systems of “exograms.”<sup>74</sup> These approaches to material agency and “the cognitive life of things”<sup>75</sup> offer promising links with related work in cognitive archaeology and cognitive anthropology.<sup>76</sup>

So while some cognitive psychological models have traditionally been individualistic, there are also areas of psychology that have a long history of exploring the relationship between the individual and the social in memory. Further, the established individual models of memory can be extended to test predictions that come from philosophical approaches to distributed cognition and social memory. For example, we might expect that what a group remembers will be different from what is remembered by the individuals that make it up, that the nature of the group, the relationship between group members, and the material being remembered are all important factors in determining social influence on memory. These are empirical questions, as yet largely unexplored.

### **Habit, Skill, and Embodied Memories**

History, we have suggested, animates socially-distributed groups of many kinds and at many different time scales. Likewise, the embodied changes that ground individual memory capacities—the skin-bound components of the distributed cognitive systems we have described—operate at different rates and rhythms. Explicit personal memories are about the single and often distant incidents from which they derive, such as getting lost in the mall, or the first kiss. In contrast, when we remember how to ride a bike, riff around a



jazz standard, or hit a backhand down the line, our skill memories (sadly) can only derive from long, repeated training, from routines and practices, from many related experiences rather than one. In this section we return to the domain of procedural memory to raise very briefly some key under-examined questions about the more complex forms of habit, skill, and embodied memories. Suggesting the label “kinaesthetic memory” in these contexts, Maxine Sheets-Johnstone describes the way “a kinetic dynamics unfolds that is at once both familiar and yet quintessentially tailored kinetically to the particular situation at hand.”<sup>77</sup> Bartlett had argued along similar lines in favor of treating such constructive movement processes as the model for remembering in general:

Suppose I am making a stroke in a quick game, such as tennis or cricket. . . . When I make the stroke I do not, as a matter of fact, produce something absolutely new, and I never merely repeat something old. The stroke is literally manufactured out of the living visual and postural “schemata” of the moment and their interrelations. I may say, I may think that I reproduce exactly a series of text-book movements, but demonstrably I do not; just as, under other circumstances, I may say and think that I reproduce exactly some isolated event which I want to remember, and again demonstrably I do not.<sup>78</sup>

The study of embodied skills naturally makes contact with the interdisciplinary work on embodiment discussed in Callard and Papoulias’s chapter in this volume: though addressing different issues, we also suggest that phenomenology and dynamical cognitive science can be natural allies rather than glaring antagonists in investigating skilled movement. We don’t draw so directly on neuroscience, but we note that the same processes of coordination and integration that we identified in discussing social memory also operate within the brain. The integrative approach to memory and cognition that we have sketched is obviously not intended to compete with our best accounts of neural processes. Because brains don’t get much done on their own and because their embodied and cultural support systems complement them in the conduct of flexible cognitive activities, certain aspects of theoretical neuropsychology can be reinvigorated by attending to the highly distinctive neural contributions to larger transient or enduring coupled systems.<sup>79</sup> Perhaps the very distinction between declarative and procedural memory, on which procedural systems and the skills they support tend to be envisaged as relatively rigid and insulated, will turn out to need recasting in light of dynamical network-oriented neuroscience.<sup>80</sup>

Some more classical approaches to the psychology of movement have postulated stored motor programs as the drivers of high-level expert performance. Rich mental representations of the domain in question—music, dance, sport, cooking, driving, and so on—mediate between perception and action: the expert’s superior performance is primarily due to superior knowledge of or memory for the task domain, knowledge that is

acquired through long deliberate practice and stored perhaps in “long-term working memory.”<sup>81</sup> The “proceduralized” rules or knowledge structures may be unconscious, perhaps in the form of “if-then” production rules, so this picture of prestructured scripts organizing movement in advance isn’t refuted by experts’ subjective lack of awareness of any search through stored options.<sup>82</sup> But cognition on the basis of procedural memory, on these classical cognitivist views, is nonetheless an analytically separable phase of processing between distinct cycles of perception and action.

This broad picture, nicely dubbed the “classical sandwich” by its ardent critic Susan Hurley,<sup>83</sup> has come under increasing pressure from phenomenology and the embodied/embedded cognitive sciences, as well as from theorists of dance, music, and sport.<sup>84</sup> It may have some grip in contexts where the object of skill is stable and can be revisited many times, such as a piece of classical music.<sup>85</sup> But in certain other highly dynamic environments, in which more thorough improvisation is required, it’s not clear that there *could* be exhaustive psychological maps of complex and changing task domains: flowing embodied abilities to track and engage with open environments may be the result more of trajectories followed than rules implemented. Any psychological principles that are used by beginners or competent performers are likely to be only partially accurate, not responsible for a full panoply of flexible interaction. In turn, experts who *do* offer accounts of the reasons for and processes behind their decisions and actions are often able to give little more than retroactive rationalizations. The default assumption within some elite communities is that it’s better to be a brilliant performer unable to articulate your gift than an introspective self-analyst. Both verbal and conscious interventions in the exercise of skill are likely to disrupt the grooved flow, so embodied absorption in the moment is the way to keep action safely insulated from the corrosions of thought. As one top cricketer wrote, “When you’re playing well you don’t think about anything.”<sup>86</sup>

Hubert Dreyfus’s phenomenology of everyday expertise applies this picture of “spontaneous, transparent coping” to a range of skill domains in which expertise (he argues) is the gradual *relinquishing* of all reliance on explicit rules.<sup>87</sup> Following Dreyfus, Elizabeth Ennen argues that the smooth and engaged bodily coping of an expert is “mindless”: she “simply responds.”<sup>88</sup> In similar vein, prominent researchers in cognitive archaeology and material culture studies argue that skilled experts find their equipment so easy to use that they simply “think through things, in action, without the need of mental representation.”<sup>89</sup> Explicit thinking and declarative memory are not involved in the exercise of genuine expertise, indeed are likely to obstruct it.

However, so sharp a separation of knowing from doing, remembering that from remembering how, is unlikely to be the whole story about embodied expertise. Many top performers continue to rely on and explicitly rehearse simple self-instructing maxims such as “watch the ball” or “let me see jazz hands,” even though these do not operate as top-down programming rules for the body to follow.<sup>90</sup> Such verbal hints or tags function as “instructional nudges,” fallibly allowing swift, context-dependent intervention at

points of entry in action sequences that have become chunked or condensed through embodied practice.<sup>91</sup> Imagery, gestures, bodily routines, or interpersonal interventions too can develop into means of activating flexible links between knowing and doing. This is not to reinstantiate a newly dualist picture of thought as an inner realm behind practical skill, but rather—as Bartlett wished—to reimagine thinking itself as an intricate and worldly active engagement with complex physical and cultural demands. Again, an array of mixed conceptual, empirical, and cultural investigations suggests itself for researchers willing to combine interdisciplinary range with arduous immersion in specific practices of remembering and acting.

. . .

We have described, across four very different regions of the curious landscapes of contemporary memory research, some potential contributions from cognitive psychology and cognitive science that open out toward research in the humanities and social sciences, rather than foreclosing such explorations with a sigh of premature mastery. Starting at the cognitive heart of the interdisciplinary enterprise, we examined the ongoing refinement of typologies of memory and its functions. From there we looked first inside or underneath, at puzzles over the limits of our control over and awareness of memory, and then outward at the integration of individual memory into interactive groups. Finally we sketched some issues about the roles of memory in the learning and performance of embodied skills. In each context, there are many legitimate choices to make concerning the appropriate trade-offs between experimental control and ecological validity. To study memory in the wild better, which is everyone's aim, our research communities need to become more pluralist while retaining the component specialist traditions: The conceptual and methodological bridges we all dream about—between the computational and the cross-cultural, or between neuropsychology and narrative theory—have to be built gradually, from both ends at once, with distinctive expertise and shared enthusiasm. We believe that in this process the cognitive sciences are likely to adapt and transform, continuing to play their central but far from lone role in the interdisciplinary study of memory.