

## What Are Memories For? Functions of Recall in Cognition and Culture

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What is memory for? The easy and spontaneous answer is that “memory is for storing information about the past,” “memory helps us preserve past events,” and variations on that theme. But what is the point of *that*? Why should any organism have that kind of a capacity? What good is it? Surprisingly, this is not a topic that has received much attention from specialists of memory. There are, of course, many models and accounts of memory in psychology, but they generally focus on the internal workings of the organ, as it were, rather than its function in relation to the rest of human behavior. So it makes sense to ask, what does memory actually do? If we follow an organism around and try to understand its behavior, can we say that some of that behavior is influenced by memory? When? How? Perhaps, as we form a better idea of what memory does, we will be able to make more informed guesses about what memory is for and how it came to be.

### MEMORY IS FOR THE PRESENT – SO WHY MEMORIES?

Obviously, we have memory because of evolution, because of the kinds of organisms we are, as a consequence of our evolutionary history. Now the past does not affect an organism, except through its consequences for present circumstances. So if we consider memory as a biological function, we are led to consider that memory is certainly not about the past but about present and future behavior. Memory has a biological function to the extent that it serves to organize current behavior.

Why would efficient behavior require any connection to the past? To answer this question, it helps to step back from what we know of memory and consider cognitive design in terms of biological engineering. Behavior should be appropriate, given the relevant features of the environment. Storing information about the past may be of use to organisms that (a) live

in environments stable enough that past situations carry information about present ones; and (b) cannot directly grasp, through perceptual processes, all the relevant features of their present environment. If all a paramecium needs is information about the salinity gradient of its environment, then it needs perception but not memory, both because salinity can be directly sensed and because the environment is constantly changing. We and most other animals are more complex organisms, depending on richer information about our environments, and the relative stability of these environments means that the past carries potential information about the present.

This makes good evolutionary sense of some of our memory systems. Psychologists generally distinguish between semantic, episodic, and procedural memory stores. Having *semantic* memory, in the usual sense of stable, declarative, and accessible knowledge of the environment, allows us to extract relevant information about current situations from past state of affairs. Whatever is stable across time is in our semantic memory. In the same way, various forms of *procedural* memory (skills, expectations, priming) have a straightforward biological function. They provide fast, appropriate responses modeled by past encounters – frequent and distant in the case of skills, unique and recent in the case of priming.

In this scheme of things, it is more difficult to explain why any organisms should have *episodic* memories, or what we most commonly refer to as simply “memories” – information about unique, specific situations that they encountered in the past. What is the point of that? The answer may seem straightforward enough – we recall the past so we can learn from it – but the existence of semantic and procedural forms of memory shows that episodic memories are not really of much help. The different forms of learning observed in natural organisms, from operant and classical conditioning, to associations, to more complex forms of information-processing, all reflect the influence of past situations on present cognition – but not via memories of particular episodes. If anything, it would seem that organisms learn about the past mostly to the extent that they can extract from past situations what is *not* unique about them, and what will be relevant in the future. So why do we have this interesting, and to human minds extraordinarily important, capacity to store unique episodes?

#### EPISODIC MEMORY AND TIME TRAVEL

Episodic memory was originally defined as knowledge of the “what, when, where” of a scene, as opposed to information that could be extracted from either a single or multiple situations without reference to these individual

situations (Tulving, 1983). The technical distinction between “episodic” and “semantic” stores captured (but also modified) a familiar if not altogether precise assumption that there is a difference between “memories” in the ordinary sense on the one hand and knowledge or skills on the other.

However, this definition in terms of what-where-when soon proved less than satisfactory. It turns out that we often have information about what-where-when for situations that we did not actually experience; conversely, many autobiographical memories lack at least some of that information. Temporal markers in particular are known to be rather poor cues in autobiographical memory (Brewer, 1988; Robinson, 1976; Wagenaar, 1986). More important, the early definition of episodic memory did not capture one of its essential features, at least in humans, namely, our capacity to *reexperience* past situations. As episodic memory often consists of imaginatively revisiting the original scene; it can be described as “mental time-travel” (Suddendorf & Corballis, 1997; Tulving, 2001).

The terms “what-where-when memory” and “mental time-travel” (henceforth WWW and MTT) correspond to distinct phenomena, accessing information about a great many unique details of past experiences on the one hand and constructing a simulation of the affective as well as sensory-perceptual experience itself on the other.

Imagery and affective tenor are essential to the specific phenomenology of recollection and trigger a powerful indication that the scene really occurred as mnemonic reconstruction depicts it, that is it is what psychologists call a “remember,” and not just a “know” memory (Roediger, Wheeler, & Rajaram, 1993; Tulving, 1985). The assumption may be misleading, as we know from research on memory illusions, but is nonetheless almost inescapable. If the memory of it feels like reliving the scene, then we think we really experienced *that* scene (Johnson & Raye, 1981; Ross, Buehler, & Karr, 1998).

#### AUTOBIOGRAPHICAL MEMORY FROM PHENOMENOLOGICAL RECORDS

Conway and colleagues proposed a synthetic model to summarize the connections between knowledge of self-related facts and episodic recollection (Conway, 2001; Conway & Pleydell-Pearce, 2000). Self-memory knowledge consists of a hierarchy of representations, including at the topmost level a version of one’s *life-story*, a general narrative that combines several, lower-level *lifetime periods*. These correspond to such extended periods as “when I was a school” or “when we lived in Italy.” Each of these periods is characterized by a set of relevant *general events*, for example, “taking the school bus,”

“show and tell,” or “having my morning *cappuccino*.” The general event representations are themselves linked to episodic memories proper, that is, records of short specific experiences that Conway calls *phenomenological records*.

Phenomenological records have the following properties: (1) They retain summary records of *sensory-perceptual-conceptual-affective* processing derived from working memory; (2) they represent *short time slices*, typically limited to the contents of consciousness as one specific goal was being pursued; (3) these contents are represented roughly in *order of occurrence*; (4) the records are only retained in a durable form if they become *linked to knowledge* of one's own life (autobiographical facts); (5) they are *recollectively experienced* when accessed; (6) they provide *specificity* to representations of general autobiographical events; (7) their *neural correlates* may be separate from other autobiographical knowledge networks (Conway & Pleydell-Pearce, 2000). The combination of semantic memory and phenomenological records would suggest that “memories” of one's own experience come in a great variety of shapes, from the most specific – the raw record of experience, as it were – to the most abstract – the association of a mere fragment of experience with a lot of knowledge (Schacter et al., this volume).

This capacity for autobiographical memory is served by a variety of orchestrated but distinct cognitive systems. Rubin (2006), for instance, notes that recollection certainly involves modality-specific stores – memory for specific visual, auditory, and linguistic information – as well as a capacity for visual imagery (Watson & Rubin, 1996). Beyond these external sources of information, three specific capacities in particular are engaged in autobiographical recall: (1) *self-reflection* – an ability to have thoughts about one's own experiences as meta-representations (so experienced past is an experience but not a hallucination); (2) a sense of *personal agency and ownership*, which connects current thoughts and intentions to a unified self; (3) an ability to represent a *continuous self* enduring through time (Klein, German, Cosmides, & Gabriel, 2004). Impairment of any of these capacities results in dramatically altered autobiographical memory. For instance, autistic patients whose meta-representational abilities are impaired have poor autobiographical memories. The same goes for those schizophrenic patients with a disrupted sense of ownership (e.g., delusions of thought-control) (Ellevåg, Kerbs, Malley, Seeley, & Goldberg, 2003). Autobiographical memory is also poor in subjects like young children whose sense of enduring temporality is rudimentary (Klein et al., 2004).

To sum up, having episodic memories consists of constructing a plausible, seemingly veridical though vicarious form of experience from the faint

cloth of records of consciousness, within the frames supplied by knowledge of one's past. The result is an imaginative engagement with the past – but what are the effects of such engagement?

#### MEMORIES FOR THE SELF

One main answer, from the psychological literature, is that memories constitute the self (Rubin, 1996) – a representation of distinctive personhood through particular facts “owned” by the person (Klein, 2001). This is actually a classical philosophical assumption found, for instance, in John Locke's statement that a human being is a person only to the extent that they can relate to their own, distinctive past (Locke, [1697]1975). This would imply that very young children, who seem to lack integrated autobiographical memory, are not full selves in this sense; and that amnesic patients have lost one of the essential components of the self.

The empirical evidence, however broadly consistent with this view, also gives it a particular twist, in that the capacities that support selfhood are in fact necessary for autobiographical memory. Recall of both facts and episodes from one's personal past are essential to one particular component of the self, what Ulric Neisser called a “narrative” self (Neisser, 1993), in contrast to other components, for instance, the sense of ownership of one's bodies and actions, the “ecological” self that is impaired in alien-hand or other control delusions (Boyer, Robbins, & Jack, 2005; Frith, 2005). Also, recall of phenomenal experience is useless if it is not integrated in self-knowledge (Conway & Pleydell-Pearce, 2000). This is manifest in both the development and impairments of episodic memory.

Contrary to the simple assumption that having a past directly creates a self, the developmental literature suggests that having a sense of self is a precondition for entertaining episodic memories as autobiographical. Even though we as adults can remember few, if any, episodes before the age of five, there is considerable evidence that children from the age of two maintain a considerable store of episodic memories (see, for instance, Fivush, 1997). These memories, however, are not strictly speaking *autobiographical*, as (a) they are not associated with a clear sense of distinctive personal experience (young children may represent the event as something that happened, not necessarily as something that happened to *them*) and (b) the episodes are not integrated in a causal story that would lead to one's present experience, as they are in adults (Nelson, 1988). Nelson and colleagues' systematic studies of spontaneous and cued recall show that distinct aspects of self-representation come online at different stages of development, and

each of these stages is characterized by a different way of representing one's own past experience (Nelson, 2003; Nelson & Fivush, 2004). A distinction between actually experienced and imagined events predates a sense that recalled experiences are located in the past. This is true of one's own, unique past, and one's access to that past is also unique (Nelson & Fivush, 2004). Early episodic recall in children lacks the certainty that makes memory seemingly real – in psychological terms, a developed capacity for reality monitoring (Sluzenski, Newcombe, & Ottinger, 2004), a point vividly illustrated by this dialogue between father and daughter in Shakespeare's *The Tempest*:

PROSPERO

[...] Canst thou remember  
A time before we came unto this cell?  
I do not think thou canst, for then thou wast not  
Out three years old.

MIRANDA

Certainly, sir, I can. [...]
 'Tis far off  
And rather like a dream than an assurance  
That my remembrance warrants.

Indeed, one of the components that selfhood creates is the “assurance” that memory “warrants,” that the facts are indeed records of own experience rather than of dreams or fantasies. This dependence of autobiographical memories on self-representations is certainly relevant to the familiar phenomenon of childhood amnesia, a failure to retrieve all but a few of the episodes encoded before age four or five (Rubin, 2000).

Autobiographical memories, then, depend on what Conway (1996) called a “self-system” of current goals and semantic knowledge of the self. This is clear not just in the developmental facts reviewed so far but in cultural differences as well. People in different places construe the connections between self and others in slightly different ways. They also retrieve autobiographical memories that support these implicit assumptions about selfhood. For instance, the U.S. versus East Asia difference in terms of “independent” versus “interdependent” ways of construing the self (Markus & Kitayama, 1991) is correlated with important differences in the age of first memories (later by about six months in Asia) as well as their content (more generic, with more characters, in Asia) (Ji, Schwarz, & Nisbett, 2000; Leichtman, Wang, & Pillemer, 2003; Wang & Conway, 2004). The differences in both

self-image and memory may be mediated by early, culturally variable practices of child-adult dialogue about own experience (Wang, 2001). Even in terms of large-scale narrative, it would seem that autobiographical memory is driven by normative considerations, among them by a sense of what the normal cultural “life-script” is, what events punctuate it, in what order and with what results (Berntsen & Rubin, 2004; Berntsen & Bohn, this volume).

As far as impairment is concerned, here too the evidence would point to a major revision of the Lockean picture. We may expect that losing access to one’s past is, in some real sense, losing access to one’s self or at least to a major component of it. However, apart from exceedingly rare cases of fugue states with complete and durable retrograde amnesia, this is not what the clinical evidence suggests. On the contrary, patients do know that they have a past, and that it is connected to their personal identity. They also have access to some summary description of their own personality traits, before and after their accident (Klein, Cosmides, & Costabile, 2003; Klein, Cosmides, Costabile, & Mei, 2002a). Contrary to the classical picture, the loss of most episodic memories, even accompanied by anterograde amnesia (failure to form new memories), does not quite result in the complete loss of identity – see the famous cases of patients HM (Corkin, 2002) and KC (Rosenbaum et al., 2005). This, too, would support the notion that a large part of the sense of self, including the narrative self, is maintained by *semantic* knowledge of the past, as a frame within which recalled episodes are intelligible and provide an intuition of reality (Conway, 1996; Williams & Conway, this volume).

#### MEMORIES FOR SOCIAL GROUPS

What do shared memories do for social groups? Here too we find that empirical evidence to some extent challenges a common and seemingly innocuous assumption – that memories sustain a distinctive *identity*, which is what social groups need, maintain, and transmit to further generations. This is one of the main themes in what David Blight called the “memory boom” (this volume), the renewed interest of historians, anthropologists, and the general public in the collective construction of a common past. Increasingly, historians have focused on the development of memories for historical events, in the many ways in which the past is constructed, retrieved, or distorted as part of various identity projects (see, for instance, Blight, 2002, on the American Civil War) and in particular on the ways in which people associate particular places with particular visions of the historical past (see Nora,

1984, 1986; Winter, 1995, this volume). This interest in memory as an active, goal-driven process among social groups reminds one of a similar view of individual memory originally proposed by Bartlett (1932).

There is, of course, a lot of evidence for an interest-driven appropriation of the past (see, for instance, Blatz & Ross, this volume). Also, we know that ethnic or national groups are “imagined communities” as well as real ones, normative as well as descriptive (Anderson, 1983), and that nationalism creates nations rather than the other way around. That is, the specific form of the modern nation, with a common language and polity and the (often largely spurious) claim of common descent and cultural norms, owes a lot to the need to create a viable state with a common administration and educational system (Gellner, 1983). Indeed, the period of strongest emphasis on the creation of *national* states in the nineteenth century was also that of unprecedented and deliberate *invention* of “ancestral” national traditions (Hobsbawm & Ranger, 1983). A great deal of ingenuity went into the transformation of various folktales, historical memories, and cultural norms into “ethically constitutive stories,” narratives that provide national histories with emotional and moral impact (Smith, 2003a). The instrumentalist vision seems to follow naturally from all this.

There is danger, though, that phrasing collective remembering in terms of constructive memory may lead to a simplistic, instrumentalist vision of shared historical narratives. Following this, people, and especially people in groups, simply adhere to the most convenient, identity-boosting, or morally satisfactory view of the historical past that is available. Indeed, collective remembering is not *just* the outcome of deliberate construction (Wertsch, this volume). The ways in which particular episodes become part of shared histories are far from simple. As Pennebaker and colleagues demonstrated on a variety of events and social contexts, the appropriation of an event requires complex *individual* processes whereby people locate historical events in relation to their own life stories (Pennebaker, Páez, & Rimé, 1997, this volume). Also, the ways people think of themselves as parts of groups is strongly constrained by individual cognition, in particular by people’s essentialist assumptions about communities. Tacit assumptions about ethnicity are often derived from spontaneous, early-developed (and largely false) assumptions about living kinds. Young children, like most adults, assume that all members of an animal species possess some non-apparent, inherited, and causally efficacious “essence.” Cats are what they are – and what makes them different from dogs – because they inherited some essential “catness” that makes them grow and behave the way they do (Hirschfeld & Gelman, 1999). There are many signs that this biological



essentialism is activated in the representation of ethnic and “racial” groups (Gil-White, 2001; Rothbart & Taylor, 1990). The transfer of assumptions is only partial – people generally do not assume that members of distinct ethnic groups could not mate, or that their innards are different – but biological essentialism explains why claims to ethnic commonality are so easily “naturalized” and combined with claims of common descent. This also explains why even modern nationalism worked best in places where people, *pace* Gellner, already had some essentialist notion of their ethnicity before they tried to turn it into a nation (Smith, 1987).

#### COLLECTIVE PAST AND INDIVIDUAL COALITIONS

Precisely because memory is constructive, a causal account of social identities should include – indeed, give pride of place to – individual processes of representation of the past. This is a far cry from the ordinary, spontaneously antipsychological assumptions of both cultural anthropology and history. For a long time, cultural anthropologists and some historians have followed the recommendations of Emile Durkheim and other founders of modern sociology to ignore human psychology altogether and treat cultural facts, for example, American race concepts or Melanesian cargo cults, only at the level of the group (see, for instance, Durkheim, 1947; Hertz, 1960). The work of Maurice Halbwachs, to some extent, extended the Durkheimian vision to the problem of how memory contributes to the transmission of culture (Halbwachs, 1925; Halbwachs & Coser, 1992). Halbwachs’s work is familiar to anthropologists and historians mainly because of the notion of “collective memory.” This is generally taken to mean that societies or other human groups, just like individuals, do maintain memories, that is, encode events in particular ways and retrieve them to serve particular goals. It is not entirely clear, however, whether Halbwachs saw this as more than a convenient metaphor to describe the way people in groups construct a shared representation of their past (Wertsch, 2002, this volume). Although he insisted that the notion of “collective memory” was not metaphorical (see, e.g., chapter 5 of Halbwachs, 1925), his own usage was precisely just that. Also, Halbwachs often described the particular ways in which *individual* memories combined to create the illusion of a shared, unique memory, a phenomenon very close to what modern authors would describe in less misleading terms as *distributed* memory (Hutchins, 1995).

In most debates about the constitution of a collective past, it generally has been assumed that *groups* were the agents – that social groups did collectively choose and fashion some image of the relevant past. But, as Rogers

Brubaker pointed out, that is precisely what we should question (Brubaker, 2004). The notion that groups are agents is a claim that we should analyze and explain – not one that we should take as the straightforward expression of a fact of the matter, even less as a sound analytical principle. Once we have discarded Durkheim's illusions and Halbwachs's metaphors, we are faced again with the difficult questions, why people in groups cooperate in such a way as to create a common identity, and why specific memories should play an important role in that process.

Most evolutionary anthropologists and psychologists would answer the first question in terms of human "groupishness," a disposition for creating social categories in which different agents can be placed, and interacting on the basis of these categorical affiliations. This disposition is very familiar to all social psychologists, ever since the first experiments on "minimal groups" (Asch, 1955; Tajfel, 1970) in which people spontaneously created within-group solidarity and intergroup caution on the flimsiest possible basis, for example, having been randomly assigned different color labels by an experimenter. Is there a deep, evolutionary background to this phenomenon? Some models of early human social evolution lay great stress on the formation of "communities of norms," within which there was a high degree of solidarity, conformity, and punishment of defectors (Gintis, 2000; Richerson & Boyd, 2006). Other models, in contrast, emphasize the fluidity of social groups among early modern humans (Cosmides & Tooby, 1992). The question of the evolutionary origins of human cooperation and coordination, which are unique even among primates, is by no means solved in either type of model. But both imply that in situations of uncertain cooperation with nongenetically related strangers, humans needed a whole suite of specific cognitive dispositions: for reciprocal altruism (Trivers, 1971), for maintaining coalitions (Kurzban & Leary, 2001; Kurzban, Tooby, & Cosmides, 2001), for the identification of reliable, trustworthy partners (Bacharach & Gambetta, 2001; Kuran, 1998), for the detection of cheaters (Cosmides & Tooby, 1992), and for signaling one's own willingness to contribute to common goods (Frank, 1988).

Given this psychological background, why are historical memories particularly important? The best place to start is with the contrast between collective remembering and scholarly history as presented and explained by Wertsch (this volume). The differences – in terms, for instance, of goal-driven, morally laden narratives versus method-driven, supposedly dispassionate scholarship – are salient to us mostly because we are school-educated *and* participate in national identities. But note that an interest in archiving the past preceded the development of the specific *metier*

of modern historians. Indeed, the practice of chronicling the past – that is, storing memories following a particular method rather than a specific purpose – may be found, to some degree, in most societies with important social stratification and social inequality (Brown, 1988). It would be unfortunate to think that historiography as a practice only appeared with a Western interest in history (Goody, 2006). So the contrast is not so much between modern scholarly history and collective remembering as between chronicles and arguments.

As Wertsch points out, adherence to a specific version of the historical past is often a highly antagonistic phenomenon (this volume). Memories of the rape of Nanking may well owe some of their modern salience for Chinese people to the stubborn and quasi-official Japanese denial of the atrocities (Buruma & Yoshida, 2006). In a converse and perverse way, Holocaust deniers draw some of their animus and energy from the fact that the Nazi camps are extensively remembered and commemorated (Vidal-Naquet, 1992). This would suggest that the “contested past” matters precisely because it is contested. Shared narratives of the historical past are all the better when they are such that others, and especially *identified* others, could not possibly endorse them. This applies well, for instance, to the national theme of Russia as the victim of periodic, unprovoked, and treacherous attacks from foreigners, a claim that seems almost calculated to be unpalatable for the Swedes, Frenchmen, Poles, and assorted Asian nations that figure in Russian collective remembering (Wertsch, this volume). This would suggest that the construction of a collective past is perhaps a modern by-product of our coalitional psychology. What is modern about it, in contrast to the narratives of small-scale oral cultures, is a focus on actual events that engaged more than one ethnic group. What is coalitional is the emotional attraction of narratives that would offend the other participants.

#### MEMORY AS A TOOL?

Let me return to the question of adaptive function. So far, I have emphasized some of the effects of constructing memories, in both individuals (the materials of a stable self) and groups (emotionally laden identity). In both domains, I argued that we can only understand the effects of memories if we focus on cognitive capacities and dispositions *other* than memory itself – the development of self-representations in the first case and coalitional psychology in the other. If episodic recall and time-travel have all these effects, what is their original function in cognitive evolution? Since this is, in the state of our knowledge, a rather speculative question, let me review

some serious candidates and evaluate to what extent they fit the picture of memory as a part of imagination.

### Memory and Foresight

One hypothesis is that episodic memory is of crucial importance in thinking about future contingencies. Indeed, this is the main function ascribed to “mental time-travel” in Tulving’s account (Tulving, 1999, 2001). The engagement of episodic recall in the service of foresight is also predicted on the basis of functional and comparative evidence (D’Argembeau & Van der Linden, 2006). From an evolutionary standpoint, Suddendorf and Corballis argued that mental time-travel, like other memory systems, is not so much about the past as about current decision making (Suddendorf & Corballis, 1997, 2007). In this perspective, episodic recall evolved as a precious way of providing relevant information to organisms faced with complex choices. In particular, a store of accessible past situations, together with most of their experiential material, would provide organisms with a range of examples against which to compare present situations and select the most beneficial course of action. This would suggest that MTT is a recent adaptation, connected with the sudden increase in cognitive flexibility that accompanied the transition to modern *Homo sapiens* (Mithen, 2002, 2007). This is consistent with the connection between MTT and other capacities such as language, meta-representation, and controlled imagination. Indeed, Suddendorf and Corballis (2007) have recently argued that mental time-travel and foresight – imaginative construction of possible outcomes of present situations – evolved as a unique capacity, and that memory evolved as a guide to the construction of specific possible futures.

### Case-Based Reasoning and Inferential Scope

As some evolutionarily minded authors have argued, the complexity of many situations of interaction creates a computational bottleneck, such that it becomes difficult to create appropriate behavioral responses on the hoof (Boyer & Barrett, 2005). For instance, typical social interaction in a small group implies computing the different agendas, relative positions, and differential access to knowledge of  $n$  participants as well as  $n!$  social relations, a cognitively intensive task that would preempt quick and appropriate responses (Malle, 2004). In contrast, an organism equipped with a store of preconstrued, similar situations (recalled, imagined, or anticipated) may be able to bypass this computational bottleneck by directly accessing

precomputed responses to those counterfactual scenarios (Boyer, 2007). From a different perspective, in a general survey of memory systems (Klein, Cosmides, Tooby, & Chance, 2002b) and an application to memories of self and others' personalities (Klein, Cosmides, Tooby, & Chance, 2001), Klein and colleagues suggested that episodes may help constrain inferences from summary (or more generally, semantic) information.

### Social and Epistemic Vigilance

Unsurprisingly, many specific cognitive adaptations stem from the extreme complexity of social interaction in humans, relative to other primates. Any population in which most people tend to cooperate is a heaven-sent gift to cheaters and defectors. This opportunity for the evolution of free-riders is a constant threat on the stability of cooperation. So it would make great sense to store episodes of social interaction in great detail as a means to form impressions about the reliability of other agents (Cosmides & Tooby, 2000). Crucially, our impressions of others should be revisable, given their subsequent behaviors. Such revision is efficient if we can revisit past episodes and give new meaning to details that were of no consequence at the time – a routine occurrence in human memory (Hoffrage, Hertwig, & Gigerenzer, 2000). Also, other people may put us at risk by propagating false information, on the basis of which it would be unwise to act (Sperber, 2006). Gauging the reliability of different sources of information is routine business for humans (Bergstrom, Moehlmann, & Boyer, 2006; Koenig, Clément, & Harris, 2004) and in most cases requires revisiting a series of past statements made by different persons, which in turn requires detailed episodic records.

These functional aspects of episodic memory are probably part of a proper evolutionary account of the capacity – indeed, there is no reason to think that they are mutually exclusive. For now, they must remain largely speculative. This is not because all evolutionary accounts are confined to speculation. They are not, once one bothers to consider their implications in some detail and derive from them some testable predictions (Ketelaar & Ellis, 2000). That particular work remains to be done, as far as memory functions are concerned.

However, the functions listed here may not be sufficient to explain the phenomenology of episodic recall. As Conway, Rubin, and their colleagues have emphasized, one crucial aspect of recollection is its affective component and imagery – the possibility of experiencing (at least part of) the emotional impact as well as the details of the revisited scene (Conway &

Pleydell-Pearce, 2000; Rubin, Schrauf, & Greenberg, 2003). This is a constant feature of autobiographical memory and certainly a crucial difference between “what-where-when” recall on the one hand and “mental time-travel” on the other. That memory brings back the affective flavor of particular scenes is not altogether easy to explain in terms of the functional accounts described earlier. That is, all that is required to limit our inferences, to keep an eye on possible cheating and misinformation, to create a catalogue of social situations, is to maintain an extensive database of details about what happened to whom, when, and where. But it does not seem to require how past situations felt like and to reexperience their emotional impact.

#### BEYOND MEMORY: THE ADAPTIVENESS OF IMAGINATION

What is the point of having affective memories? The question may become more tractable if we keep in mind that memory is only part of a range of distinctly human cognitive capacities, having to do with *representation of what is not actually the case*. One important feature of human cognition, which on the face of it is rather puzzling, is that many of our thoughts are about objects and situations that just do not exist. That is, a great deal of thinking is about what might happen if such and such were the case (even though it is not the case), what would have happened if things had turned out differently (but they did not), what will happen once something particular occurs (but it hasn't occurred yet), and what conditions have been once obtained (but are no longer the case). Also, many of our thoughts and feelings are about people who are not physically present with us; indeed, some are dead or unborn. Finally, all human beings spend a great deal of time having thoughts and feelings about imaginary beings, from the characters of films and novels to the monsters of our childhood or the fantasies of adult life. In other words, a great deal of mental activity is about what just ain't so.

This is puzzling, or rather it should be puzzling. Why spend so much of our cognitive resources on situations and objects that are just not real? This seems doubly costly. First, some of our cognitive resources are diverted from more useful purposes. As you watch Shakespeare's play and empathize with Othello's rage or Desdemona's plight, you are not acquiring information about people with whom you will actually interact. Second, a mind that is full of representations of imaginary situations may be in danger of mistaking them for the real thing. It would seem really maladaptive to assume that real bears are as approachable as Baloo in Kipling's *The Jungle Book*.

Talking about the many ways in which the mind disconnects from reality has not been, and still isn't, at the forefront of psychologists' attention. Very few experimental psychologists or neuroscience specialists focus on domains such as pretence, counterfactuals, and our enjoyment of imaginary worlds. This is, of course, unfortunate, given that the capacity is so crucial to human cognition.

It may seem that our fondness for imaginary stuff is just a strange and perhaps inevitable *by-product* of having a complicated mind. Computer viruses get a system to run pointless or dangerous tasks instead of doing useful work, so perhaps fiction, fantasies, and hypotheses are viruses of the mind. But the virus comparison does not do justice to the fact that our imagination capacity is, in many circumstances, highly functional. To see how that can be the case, consider our thoughts about people. We often think about people who are not around. Memories of what people did or said, as well as expectations, fears, and hopes of what they may do, are a constant theme of trains of thought and ruminations (and also the quintessential subject matter of social gossip). It may be a special feature of the human mind that we can create such representations and, more importantly, run social inferences about them. It is certainly a central capacity of human thinking; it appears early, and it is universal and distinctive of normal human minds.

There is some evidence that imaginary practice supports actual performance. For instance, many children have imaginary friends with whom they entertain stable and complex relationships as well as, in some cases, sustained conversations (Taylor, 1999). Children who do have such companions seem to develop social skills earlier. Contrary to widespread anxiety among parents, a relationship with an imaginary person does not make you oblivious of real ones but even more skilled in interacting with them (Taylor, 1999). This also may explain the universal human penchant for stories and the universal capacity to follow and enjoy fiction (Zunshine, 2006).

It makes good sense to consider memory as a member of this impressive suite of tools for representing nonexistent states of affairs. True, memory is at least in principle about what really happened, but, as I said earlier, that does not matter to present fitness. From the evolutionary standpoint, it is quite untrue, *pace* T. S. Eliot, that:

Time present and time past  
Are both perhaps present in time future  
(*Four Quartets*: "Burnt Norton")

On the contrary, past is of no moment, and memory should be seen as one of the forms of imagination. As Hobbes put it, “Imagination and memory are but one thing, which for diverse considerations hath diverse names” (*Leviathan*, II-1). The notion is central to classical theories of memory as imagination of the past and foresight as memory for future events. It receives some support from recent neuroimaging studies showing that imagining future circumstances modulates activation of the same cortical networks as remembering past episodes (Addis, Wong, & Schacter, 2007; Schacter, Addis, & Buckner, 2007). For instance, imagining future schema-driven events such as birthdays seems to recruit similar neural resources as episodic recall of past ones (particularly visuospatial imagery). There are also differences, notably engagement of regions associated with motor imagery in the future event conditions. Both future and past imagery are neurally distinct from counterfactual scenarios, such as imagining another person in similar circumstances (Szpunar, Watson, & McDermott, 2007).

#### MEMORIES AS CONSTRAINTS?

Imagination is generally construed as a form of liberation, a process whereby the mind breaks its shackles and can envisage situations and issues far beyond its evolutionary heritage (Mithen, 1996). Similar arguments have been applied to episodic recall, inasmuch as it makes the modern mind better equipped to foresee possible occurrences in an uncertain future (Suddendorf & Corballis, 2007; Tulving, 1999). Terms such as “fluidity” or “flexibility” generally convey this idea. From an evolutionary standpoint, the notion is slightly puzzling (Boyer, 2000, 2007). A more “flexible” mind is not necessarily better at any particular problem, so that the selective pressure for this kind of development seems minimal. More importantly, imagination and memory actually are as *constraining* as they are *liberating*, and that fact may be crucial to their evolution.

As I noted earlier, humans are special in that they engage in nonopportunistic or other-regarding behaviors, in which they benefit others without a direct return in terms of one's own fitness. These behaviors have long been a mystery to economists. However, a wealth of data from experimental economics had shown that other-regarding dispositions are general and stable (McCabe & Smith, 2001), and that they organize even supposedly rational markets (Smith, 2003b). Economic theory now includes various types of models for the stability of such cooperation norms (Bowles, 2003; Gintis, 2000). Modern humans developed complex social systems because of a suite of prosocial dispositions and capacities. In this as in other domains,



evolution created motivational proxies for adaptive fitness. People do not engage in prosocial behaviors because they judge those to be ultimately adaptive or even potentially beneficial – indeed, the benefits of cooperation often take a long time to become apparent. People cooperate because of intuitive, often emotion-based, preferences for prosocial behavior (Fessler, 2001; Gintis, 2000).

This is important because prosocial dispositions are in general on a collision course with our motivational systems. One of the major hurdles for cooperation is that its benefits are in the future and the sacrifices that it entails are (in general) to be made right away. Conversely, failing to cooperate may bring about negative outcomes, but (in general) that will happen in the future. One of the most general psychological principles is that later counts for less than now; in other words, people, like all other animals, engage in *time-discounting* (Rachlin, 2006). The value of future rewards is always downplayed, as it should be. Future rewards impinge on fitness only if they do occur. So their role in guiding behavior should be modulated by the probability of their occurrence, which diminishes as they recede into the future (Ainslie, 1975; Loewenstein & Elster, 1992; Loewenstein & Read, 2003).

So what could motivate us toward prosocial behaviors, in which we often need to prefer larger-later rewards (e.g., the establishment of good cooperation relations, a good reputation, a network of grateful friends) to smaller-sooner ones (e.g., cheating and pilfering when possible, being less than altogether generous)? Punishment and rewards are no complete solution, as they, too, will occur in the future and are therefore time-discounted. Some economists have suggested that *emotions* may play that motivational role (Frank, 2001). To the extent that prosocial plans make us feel good (and antisocial ones make us feel bad) *right now*, they may provide rewards that compensate the discount curve and make us choose larger-later, virtuous rewards against smaller-sooner, opportunistic ones. In that sense, emotions such as shame, pride, and guilt may constitute commitment devices that force us to be more prosocial than purely rational, opportunistic agents (Fessler, 2001).

This argument could also apply to affective recall. Episodic memory does activate emotional neurocognitive circuitry (Damasio et al., 2000). Moreover, this affective coloring of recollection is only partly driven by executive processes. The experience of involuntary, unpleasant, or undesired memories is a common one. Finally, an increasing body of evidence shows the crucial contribution of emotion to decision making (Ursu & Carter, 2005). In particular, emotions connected to episodes constitute self-persuasion devices (Albarracín, 2002), especially when there is no clear way

to explain away the emotion, and when it comes from one's own experience (Albarracín & Kumkale, 2003).

Memories and fantasies can play the role of a brake on impulsiveness and a boost on prosocial patience only to the extent that they are fairly accurate versions of what we did and what we will experience. They make us feel, right now, all the consequences of our actions, by way of emotional rewards. This means that memory for affect should not be revisable. Indeed, despite a large literature focusing on memory distortions (see the survey in Roediger, 1996), it is remarkable that people seem rather accurate in their evaluation of past emotions. In a series of naturalistic studies, Levine and colleagues only found evidence for very limited distortion in a small minority of subjects (Levine, 1997; Levine & Bluck, 2004). Memory for emotions, then, does not align with our current goals. This is especially striking in the common phenomenon of rumination, the unwanted but persistent activation of thoughts concerning an unpleasant past situation (Weanke & Schmid, 1996). Rumination is triggered by awareness that one failed to reach a specific goal. It becomes worse if the goal was more important to the subject; it stops if the subject finds an alternative way to reach the goal or discards it altogether (Martin & Tesser, 2006; Teasdale & Green, 2004).

So imagination and memories may well be functionally adaptive – not because they liberate us from down-to-earth, here-and-now cognition but, on the contrary, because they constrain our planning and decision making in efficient ways.

#### CONCLUSION: THE LONG MARCH TO FUNCTIONAL ACCOUNTS

So far, I have mostly discussed memories rather than memory. If there is one general lesson from the extraordinary development of our knowledge of brains and memory systems, it is that it makes little sense to talk about a general faculty of memory. Memory systems are diverse. It follows that functional accounts should be diverse too. Interestingly, very few psychologists have ventured to consider properties of memory systems in functional terms, with notable exceptions (see Anderson & Milson, 1989; Anderson & Schooler, 2000; Klein et al., 2002b; Nairne, Thompson, & Pandeirada, 2007; Tulving, 2001).

Why are functional models so few and far between? One reason is that it is not always clear how a functional account would differ from an account of what a cognitive system actually does. But there is a crucial difference. Consider, for instance, the capacities to read and write, which serve a specific

communicational function. They are supported by two other cognitive capacities (shape recognition and speech perception) that serve other, distinct functions. Our literacy capacities are derivative; they ride piggyback on functional cognitive systems that would exist, literacy or not. The only principled way to distinguish function from accidental capability is in terms of adaptive function, seeing different cognitive capacities as features of organisms that evolved under the pressure of natural selection (Cosmides & Tooby, 1994; Nairne et al., 2007). To the extent that complex design supports an increase in an organism's fitness (relative to close, equally possible designs) and is influenced by genetic inheritance, it can be described as a functional adaptation (Williams, 1966). Obviously, any such account should be evaluated against the hypothesis that the capacity has no specific, and therefore no adaptive, function, and that it is a direct by-product of other, properly functional features (Buss, Haselton, Shackelford, Bleske, & Wakefield, 1998).

In the past fifty years or so, our knowledge of how memories impinge on the individual and collective lives of humans has increased enormously, as a result of ever finer-grained behavioral protocols, neuroimaging techniques, and neuropsychological case studies, as well as the consideration of cultural transmission and acquisition and the construction of a shared past. All of this makes it possible to generate precise, predictive functional models for varieties of memory-systems in terms of cognitive adaptations. It may be time to go back to the evidence and test the implications of these various functional models, to understand why we have memories.

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