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Why do we remember? The communicative function of episodic memory

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Abstract

Short Abstract—We propose a novel account of episodic memory function based on a conceptual and empirical analysis of its role in belief formation. We provide a critique of the view that episodic memory serves future-directed imagination, and argue that the central features of this capacity can instead be explained by the role it plays in human communication. On this view, episodic memory allows us to communicatively support our interpretations of the past by gauging when we can assert epistemic authority. This capacity is ineliminable in justification of, and negotiations about, social commitments established by past interactions.

Long Abstract—Episodic memory has been analyzed in a number of different ways in both philosophy and psychology, and most controversy has centered on its self-referential, ‘autonoetic’ character. Here, we offer a comprehensive characterization of episodic memory in representational terms, and propose a novel functional account on this basis. We argue that episodic memory should be understood as a distinctive epistemic attitude taken towards an event simulation. On this view, episodic memory has a metarepresentational format and should not be equated with beliefs about the past. Instead, empirical findings suggest that the contents of human episodic memory are often constructed in the service of the explicit justification of such beliefs. Existing accounts of episodic memory function that have focused on explaining its constructive character through its role in ‘future-oriented mental time travel’ neither do justice to its capacity to ground veridical beliefs about the past nor to its representational format. We provide an account of the metarepresentational structure of episodic memory in terms of its role in communicative interaction. The generative nature of recollection allows us to represent and communicate the reasons for why we hold certain beliefs about the past. In this process, autonoesis corresponds to the capacity to determine when and how to assert epistemic authority in making claims about the past. A domain where such claims are indispensable are human social engagements. Such engagements commonly require the justification of entitlements and obligations, which is often possible only by explicit reference to specific past events.

Keywords

autonoesis; discursive commitment; episodic memory; epistemic authority; epistemic vigilance; event memory; mental time travel; metarepresentation

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Humans are obsessed with their own past. A large part of our conscious mental lives is spent with reminiscing about past experiences and sharing those experiences with others (Desalles, 2007a; Rimé et al., 1991). Psychologists have identified the basis of this obsession as originating in episodic memory. Since Endel Tulving (1972) introduced the concept, the idea that human long-term declarative memory can be partitioned into two separate systems — one semantic and one episodic — has become virtually universally accepted across the field. This agreement, however, has done little to clarify more basic questions about the function of the episodic memory system. Traditionally, most memory research has been pre-occupied with studying the capabilities of human memory rather than aiming to illuminate its function. Given the centrality and ubiquity of episodic memory in our lives, it is surprising that the question of the ‘proper function’ (Millikan, 1984) of episodic memory has received attention only in recent years (Boyer, 2008, 2009; Conway, 2005; Cosmides & Tooby, 2000; Klein et al., 2002; Michaelian, 2016; Schacter, Guerin, & St. Jacques, 2011; Suddendorf & Corballis, 1997; 2007).

In the present article, we will argue that common accounts of episodic memory function have serious shortcomings, and propose an alternative functional analysis. To do this, we will first have to explain what constitutes our object of investigation. Despite the central role it plays in the study of human memory, the concept of episodic memory is surprisingly hard to pin down. Thus, in Section 1, we will give and defend a precise characterization of episodic memory. In Section 2, we will scrutinize the most popular account of episodic memory function: the idea that our capacity to remember the past functions in the service of our capacity to imagine the future. Finally, in Section 3, we propose an alternative account that views episodic memory as a mechanism supporting human communication specifically tailored to certain forms of cooperative social interactions.

On this view, episodic memory turns out to be crucial to the human capacity to communicate about past events. While it is commonly acknowledged that episodic memory is both ontogenetically (Nelson, 1993; Nelson & Fivush, 2004) and phylogenetically (Suddendorf, Addis & Corballis, 2009; Desalles, 2007b) connected to our capacity to communicate about the past, the exact nature of this connection is usually left underspecified. We will propose that episodic memory is essential to managing our discursive commitments by demarcating the range of beliefs about which we can claim epistemic authority. The capacity to manage such commitments in turn contributes to the stabilization of human communication: by taking responsibility for the truth of an assertion (which comes at potential costs) speakers can provide reasons for listeners to believe them. Most importantly, this account can make sense of why episodic memory should be self-referential—a question that has been left unresolved in the literature so far. Moreover, this account can make sense of a range of empirical phenomena that are not obviously reconcilable with competing explanations.

Overall, our strategy will be to reason from form to function: from the design-features of the episodic memory system identified at the outset, we will infer the cognitive tasks this system has likely been selected to solve. Nonetheless, our account will not make any claims as to the actual evolutionary history of episodic memory, and will only address the mature system as it operates in human adults. While our account carries implications for what one should

expect the development of episodic memory to look like and how far it should be shared between humans and other animals, these questions will not be our focus here.

1 What is episodic memory?

The term ‘episodic memory’ has entered into the repertoire of cognitive psychology some time ago, and is often presented as roughly corresponding in function to the use of the word ‘remembering’ (Tulving, 1985; Gardiner, 2001). The fact that we seem to have no trouble identifying instances of remembering in everyday life, however, obscures many cognitive and conceptual subtleties in relation to episodic memory. The term is often used in slightly different ways by authors with differing theoretical inclinations.¹

Human memory is typically partitioned into separate systems along two axes (Squire, 1992a): declarative/procedural and long-term/short-term. Within this taxonomy, there are two separate declarative, long-term memory systems: semantic memory and episodic memory. Hence, the effort to understand episodic memory has traditionally focused on identifying those of its features that distinguish it from semantic memory.

Tulving (1972) originally defined episodic memory as memory for personally experienced past events. Episodic memory, on this conception, was thought to uniquely include information about what happened, when and where (so-called WWW information). However, this kind of information can be represented in semantic memory as well (Klein, 2013a): recall the storming of the Bastille. Tulving (1983; 1985; 2002a) thus subsequently amended his definition by adding that episodic memory is distinguishable from semantic memory because of its unique phenomenology. While information in semantic memory is thought to be simply ‘known,’ episodic memory comes with ‘mental time travel’: when we remember an event, we re-experience the event as it occurred. Tulving labelled the different phenomenological states of semantic versus episodic memory as ‘noetic’ and ‘autonoetic’ consciousness, respectively.

Partly due to the phenomenological nature of this distinction, much discussion has focused on what autonoesis should be taken to be². From this debate two main lines of thinking have emerged. On the one hand, authors such as Russell and colleagues (Clayton & Russell, 2009; Russell & Hanna, 2012; Russell, 2014; for a similar view see Hills & Butterfill, 2015) have proposed a ‘minimal’ characterization of episodic memory. On this view, episodic memories are re-experienced, and thus distinguished from semantic memory by the fact that their contents are WWW-elements bound together into a holistic representation. That is, because such memories have spatio-temporal structure (such that predicates like ‘next to’, ‘before’ or ‘after’ can be applied to their elements), and include perspectivity as well

¹Specifically, it is not always clear how the distinction between episodic memory and autobiographical memory is drawn. We take autobiographical memory to refer to knowledge about the ‘self,’ and take the fact that episodic amnesiacs do not always lose this kind of knowledge to speak in favor of distinguishing between these concepts (Klein, Loftus, & Kihlstrom, 1996; Klein & Ganghi, 2010; Picard et al., 2013). On our understanding, autobiographical memory is a specific kind of memory content, which can be, but is not necessarily, represented in episodic memory.

²Autonoesis is sometimes understood as a form of phenomenal consciousness. We take such a characterization to be unhelpful for a functional explanation as long as it does not offer an account of what information is specifically carried by this phenomenology. The characterization of autonoesis in terms of its phenomenology alone does not explain anything, but merely describes a feature of episodic memory, which should be an explanandum for any functional account.

modality-specific sensory information, they carry all the features of ongoing experience. Further, because such episodic memories would represent completed events, they could be identified as ‘past’ in a minimal, non-conceptual sense (Russell & Hanna, 2012). Auto-noesis might then simply be a by-product of the ‘quasi-experiential’ character of such recalled events.

On the other hand, many have argued that episodic memory includes more than just event information (Dokic, 2001; Klein, 2013a; 2014; 2015; Klein & Nichols, 2012; Perner & Ruffman, 1995; Perner, 2001; Perner, Kloo, & Stöttinger, 2007). On this view, when we remember an episode, we represent more than just the event itself; we further represent that we had personal experience of the event in question. Specifically, Dokic (2001) has argued that we should understand the difference between episodic memory and other types of memory as lying in the fact that “genuine episodic memory gives the subject [...] a reason to believe that the information carried by it does not essentially derive from testimony or inference but comes directly from the subject’s own past life” (p. 4). This view is supported by Klein and Nichols’ (2012) report of the case of patient RB, who seems to have lost the capacity to auto-noetically remember the past. This patient reported having lost the capacity to non-reflectively tell “from the first person, ‘I had these experiences’” (p. 690). Auto-noesis thus seems to carry propositional content to the effect that the information in question was acquired first-hand. To account for this circumstance, ‘self-reflexive’ views of auto-noesis usually take episodic memory to be metarepresentational. After all, to represent that one’s memory is the outcome of a past experience, one has to represent the representational character of the memory itself (Perner, 1991).³

1.1 The structure of episodic memory

We will now propose a characterization of episodic memory trying to reconcile the two views described above. Thereby, we will distinguish between the contents of episodic memory, on the one hand, and its representational format, on the other.

1.1.1 The contents of episodic memory—Episodic memory shares many features with other capacities, such as imagination, dreaming, navigation, counterfactual thinking, and future planning (Addis et al., 2008; Buckner & Carroll, 2006; De Brigard, 2013; Hassabis, Kumaran, Vann, & Maguire, 2007; Hassabis, Kumaran, & Maguire, 2007; Schacter, Addis, & Buckner, 2007; Spreng, Mar, & Kim, 2008). The common denominator of all these different capacities seems to be that they are subserved by a system that flexibly constructs richly contextualized scenarios on the basis of stored content (Hassabis & Maguire, 2007; 2009). The neural substrate of this ‘scenario construction system’ is localized in the medial temporal lobes, specifically in the hippocampus (Buckner, Andrews-Hanna, & Schacter, 2008; Cheng, Werning, & Suddendorf, 2016; Maguire & Mullally, 2013). Constructed scenarios are thought to consist in simulations of events extended in time and space (Moser, Kropff, & Moser, 2008), and construction of a given scenario has been

³Here, we adopt Perner’s (1991;2012) view of a metarepresentation as a ‘representation of a representation *as a representation*.’ This formulation is stronger than conceptualizations proposed by other authors who conceive of a metarepresentation as merely a ‘representation of a representation’ (e.g., Sperber, 2000). However, our characterization of episodic memory as metarepresentational in this strong sense does not entail that all metarepresentations must be of this kind.

shown to activate sensory cortex in a manner similar to the perception of that scenario (Wheeler, Petersen, & Buckner, 2000).

Crucially, however, scenario construction has to be distinguished from stored information (i.e., the memory trace), on the one hand, and episodic memory, on the other. While there is debate about what exactly memory traces should be taken to be (De Brigard, 2014; Robins, 2016a), there is little disagreement in that they are not identical to the outputs of the scenario construction system (Cheng et al., 2016).⁴ Instead, scenario construction enriches and recombines trace information depending on the function its output serves. Scenario construction subserves a range of different capacities, not just episodic memory: Imagination, dreaming, navigation, planning, etc., make use of memory traces, too. All of these capacities are supported by our ability to store and retrieve information learned in specific situations in the past.

One way to understand the construction process in episodic memory retrieval is as a Bayesian inference with the aim to accurately reconstruct a past event on the basis of available evidence (Hemmer & Steyvers, 2009; De Brigard, 2012; 2013). This evidence comes from the memory traces on the one hand and relevant semantic information on the other (Cheng et al., 2016). Depending on the functional role a given construction will play, the construction process will then rely more or less heavily on the memory trace or semantic information. For example, the construction of a counterfactual or future-oriented scenario should rely less heavily on trace as compared to semantic information. Indeed, patients with semantic dementia have been found to be impaired in constructing event simulations about the future (Irish et al., 2012).

Some authors have proposed a radical constructivist view of episodic remembering, positing that memory traces essentially play no privileged role in the construction of the contents of episodic memory (e.g., Michaelian, 2016). Instead, these authors argue that there is no difference between inferences involved in the construction of factual and counterfactual scenarios (De Brigard, 2013). However, as Robins (2016b) has argued based on an analysis of common memory errors (such as the famous DRM effect; Roediger & McDermott, 1995), episodic memory construction cannot be entirely constructed. She argues that such memory errors can only occur because some information has been retained. Thus, while it seems likely that the construction process does not have to rely on trace information, it will commonly take trace information into account. In particular, there must be differences in the way construction processes make use of stored information depending on whether the function of the construction is to represent an actual or possible occurrence. That is, in constructing a scenario representing an actual past event, the construction process should assign a privileged role to the memory trace in assigning probabilities to different priors.

The contents of episodic memory are then the outputs of a scenario construction mechanism. Such constructions would qualify as ‘minimal’ episodic memory: they are ‘quasi-

⁴While we do not have the space to go into defending a specific view of memory traces here, we do not want to be understood as claiming that traces literally ‘encode’ events. The trace itself is not an event representation but rather consists merely of information allowing the hippocampus to reconstruct or reinstate a given event representation (a similar view is, for example, defended by De Brigard, 2013; 2014; and Werning, personal communication).

experiential' in the sense of including spatio-temporal context, perspectivity, and modality-specific sensory information. Scenario construction could then be taken to be sufficient for the representation of specific past events.

1.1.2 The format of episodic memory—Scenario construction alone is, however, not sufficient for episodic memory to occur: hippocampus-based constructions become episodic memories only when they are conceptualized in a certain way; namely as the outcome of past first-person experience. The event construction itself does not seem to differentiate between imagined and remembered scenarios. For this reasons, some authors have proposed that autooiesis serves as a 'memory index': a representational tag differentiating episodic memories from imaginations (Michaelian, 2016; Klein, 2013c). On this view, the difference between imagined and remembered scenarios equates to the difference between factual and counterfactual events. Autooiesis would then allow us to differentiate between factual and counterfactual events. However, if the content of autooiesis is indeed a proposition to the effect of "I had these experiences," it alone cannot differentiate counterfactual from factual event representations. Instead, autooiesis marks those events of which one had first-hand experience as opposed to some other source.

To see this, note that both remembering and imagining a particular past event are compatible with the belief that the event indeed occurred. One can (even accurately) imagine a past event, which one believes to have occurred. This is, in fact, common when we represent events of which we have only second-hand information (see also Pillemer et al., 2015). Thus, while autooiesis does indeed serve as a 'memory index,' it does so by effectively distinguishing event representations according to their source. Further, if autooiesis is not part of the content of the construction, it must be an outcome of second-order processes specific to episodic memory occurring at retrieval (Klein, 2013a; Klein & Markowitsch, 2015; Wheeler, Stuss, & Tulving, 1997). The mechanisms of episodic retrieval have long been a neglected area of memory research (Roediger, 2001). An exception to this has been the 'source monitoring framework' by Johnson and colleagues (Johnson & Raye, 1981; Johnson et al., 1993). These authors have argued that episodic retrieval involves monitoring processes that determine the source of retrieved information. According to Johnson (2005), episodic memory is in fact nothing but source memory.⁵

A similar perspective has been proposed by Cosmides and Tooby (2000; see also Klein et al., 2004), who argue that the appropriate functional role that a given output of scenario construction ought to play in inference is dependent on its source. This in turn necessitates that the contents of the construction be representationally decoupled from their direct relationship to reality. This is accomplished by applying a source tag to these contents, which governs how they can be further used in inference. Indeed, source-monitoring mechanisms seem to fill the role of such decoupling processes; they 'endorse' contents under a given description (Michaelian, 2012a; 2012b).

⁵Note that our claim that the content of autooiesis refers to the source of a memory says nothing about the exact mechanisms producing this content. One possibility is that autooiesis is simply the product of source and reality monitoring processes (Johnson, 2005). But other possibilities exist: Michealian (2016), for example, proposes that autooiesis is an outcome of a distinct, 'process monitoring' mechanism. Here we merely commit to the claim that autooiesis proper is not an outcome of the event construction process itself, but depends on a second-order process.

This process, Cosmides and Tooby argue, is best described as the application of an appropriate epistemic attitude.⁶ In the case of episodic memory, the attitude of ‘remembering’ corresponds roughly to the proposition “has been obtained through first-hand informational access.” Cosmides and Tooby go on to propose similar attitudes for imagination, planning, etc. Of course, attitudes cannot be indiscriminately applied to any content; for example, one cannot remember a future event. However, this proposal makes sense of the fact that the same simulation of a specific past event can both be remembered and imagined. Moreover, since attitudes can be recursively embedded, this view can accommodate the fact that we can (for example) remember imagining. In effect, the processes involved in source monitoring can thus be described as resting on a complex metarepresentational ‘grammar,’ in which different attitudes, each with their own epistemic status, can be embedded within each other to establish the epistemic status of the construction as a whole.

Crucially, this view preserves the strengths of the minimal view of episodic memory (Russell & Hanna, 2012) in accounting for the distinctive phenomenology involved, while also accommodating the intuition underlying self-reflexive views, according to which episodic content is not enough for episodic memory to occur (Klein, 2013a). Autoeisis is here taken to be an outcome of the capacity to metarepresentationally embed outputs of the scenario construction system under the epistemic attitude of remembering.

1.1.3 Event memory and episodic memory—Hippocampus-based event constructions do not have to be embedded under a metarepresentational attitude in order to support behavioral decisions. This at least is suggested by findings showing that the hippocampus is implicated in implicit memory tasks (Hannula & Greene, 2012; Olsen et al., 2012; Sheldon & Moscovitch, 2010). That is, scenarios of specific past events can be represented as having occurred without the attitude of remembering being applied.

Note that ‘believing’ is an epistemic attitude as well; albeit one that does not necessarily require the metarepresentation of its contents. Arguably, we adopt the attitude of ‘believing’ to semantic memories by default. Thus, if the same attitude is applied to constructed scenarios, we should expect their content to acquire inferential properties similar to semantic information. However, while they do not differ in content (they are about specific past events) believed event-simulations are not episodic memories.

Instead, we reserve the term *event memory* for this kind of representation (for a similar proposal, see Rubin & Umanath, 2015). Such event memories might differ from full-blown episodic memories in that they include source information only in the sense of allowing the distinction among different events (Crystal et al., 2013), are not located in subjective time (Nysberg et al., 2010), are not necessarily subject to conscious awareness (Dew & Cabeza, 2011; Hannula & Ranganath, 2008; Henke, 2010; Moscovitch, 2008), are not self-referential (Rubin & Umanath, 2015), and do not have ‘narrative structure’ (Keven, 2016).

⁶Metarepresentations can be constructed from any representation, not just propositional ones. Thus, we chose the term *epistemic* attitude here to highlight that the metarepresentation involved in episodic memory can be viewed as analogous to a propositional attitude in that it governs the epistemic status of its content, but differs importantly in that it can apply to content which is itself not entirely propositional. Nonetheless, not all epistemic attitudes are metarepresentational (see below).

Such a distinction between event and episodic memory is at least tentatively supported by findings from several lines of research. Infants demonstrate some capacity for recalling events (Bauer & Leventon, 2013; Mullaly & Maguire, 2014), but only between the ages of three and five years children begin to access event information as the source of their beliefs (Haigh & Robinson, 2009). Moreover, the outputs of the hippocampus are not necessarily conscious (Henke, 2010) but nonetheless inform eye-movement behavior in implicit memory tasks (Hannula & Greene, 2010). In fact, eye-movements can serve as an implicit, veridical index of event memory, which can dissociate from explicit responses (e.g., Hannula et al., 2012). On the side of neuropsychology, the case of RB mentioned above demonstrates that it is possible to lose the capacity to remember events autoerotically without losing the ability to access event information as such (Klein & Nichols, 2012).

The concept of event memory thus allows us to take seriously the mnemonic abilities of young children (e.g., Burns, Russell, & Russell, 2015; Clayton & Russell, 2009; Fivush & Bauer, 2010) and non-human animals (e.g., Corballis, 2013; Clayton & Dickinson, 1998; Gupta et al., 2010; Martin-Ordas et al., 2010; 2013; Templer & Hampton, 2013) without necessarily attributing to them capabilities for episodic memory in the same sense as human adults possess them (Tulving, 2005; Redshaw, 2014). Thus, event memory most likely differs in function from episodic memory, and we will focus here on a functional explanation for the latter.

1.2 Remembering and believing the occurrence of past events

One consequence of viewing episodic memory as the outcome of the application of a distinctive epistemic attitude is that remembering has to be distinguished from believing. This might seem counter-intuitive because we usually believe whatever we remember. Nonetheless, psychologists commonly distinguish the belief in the occurrence of an event from episodic memory of the same event (Blank, 2009; Fitzgerald & Broadbridge, 2013; Mazzoni & Kirsch, 2002; Rubin, Schrauf, & Greenberg, 2003; Scoboria et al., 2014). What then should we take the relationship between remembering and believing to be?

1.2.1 Epistemic generativity—Crucially, when we remember we do not simply generate two representations: a belief that the event in question happened and an episodic memory of the event. Instead, these representations are inferentially connected: we take ourselves to have knowledge about the event in question *because* we had first-hand access to it. Perner and Ruffman (1995; followed by Suddendorf & Corballis, 1997; 2007) took this circumstance to imply that episodic memory requires a form of causal understanding; namely the capacity that informational access leads to belief. They tested this idea by investigating whether there is a correlation between children's episodic memory ability and their ability to infer 'knowing' from 'seeing'. Notwithstanding that Perner and Ruffman did indeed find such a correlation, it seems to us that what is involved in episodic memory is not only a capacity to infer 'knowing' from 'seeing' but to further represent the sources of one's own present beliefs *as sources* in the first place (Haigh & Robinson, 2009).

As we have argued above, episodic memory in some sense just is a specific type of source memory. When we remember, the content of the memory no longer functions as an event

representation but instead as the source of a present belief. Representing the source of a belief requires, but importantly goes beyond, the inferences involved in ascribing knowledge/belief on the basis of informational access. In the latter case, one simply takes note of the fact that a given agent has appropriate informational access to X and from this circumstance infers that she now knows X. From the fact that Anna has looked inside the box, Ahmed infers that she knows what is inside it. In the former case, however, one has to additionally represent the inferential relationship holding between the episode of informational access and the knowledge state. In this case, from the fact that Anna looked inside the box, Ahmed infers not only that she now knows what is inside but also that this is so because she has seen it.

In other words, to represent the source of a given belief requires the representation of the kind of justification that this belief has received. Therefore, on our account, the represented relation between a given past episode of informational access and a given present belief is one of justification. Episodic memory requires the capacity to understand not only that ‘seeing’ leads to ‘knowing’ but further that ‘seeing’ justifies claims to ‘knowledge.’

Another way to frame the distinction between episodic memory, event memory and semantic memory would be according to their respective role in belief formation: in contrast to event memories and semantic memories, episodic memories are not beliefs but rather provide grounds for believing. In more technical terms, event memory and semantic memory are *epistemically preservative*: they preserve the original justification of the endorsement of their contents through time. In contrast, episodic memory is *epistemically generative*⁷: it generates present justification for why we should endorse its contents (Burge, 1993; Dokic, 2001; Matthen, 2010). When we remember a given event, the fact that we remember supports our belief that this event indeed occurred in so far as it provides a reason for this belief (Teroni, 2014; see also Audi, 1995). If you episodically remember that you were walking on the Red Square last August, you believe that this is indeed what you did simply because you remember it. Other types of memory, on this conception, are different exactly because they do not include a justification of their own contents. When we retrieve information non-episodically, we ‘just know’ without also ‘knowing why we know.’⁸

1.2.2 Memory-belief congruency—Remembering and believing thus stand in a relation of justification in which the fact that we remember justifies our beliefs about past events. If this is the case, we might expect the contents of episodic memory to be largely veridical so as to provide normatively appropriate, reliable grounds for our beliefs. In particular, we should not expect our beliefs themselves to have any influence on what we remember.

⁷The term ‘generative’ is sometimes used to describe the view that episodic memory’s contribution to the formation of knowledge is the production of new belief(-content) due to its constructive character (Michaelian, 2011). This is then commonly contrasted with ‘preservative’ semantic memory, which merely ‘preserves’ beliefs formed in the past without adding to their content. This way of framing the distinction is certainly appropriate to describe the differences between event memory and semantic memory. As far as episodic memory is concerned, however, we want to be clear that we adopt the term of ‘epistemic generativity’ to illustrate that only episodic (but neither event nor semantic) memory produces present *justification* for beliefs on the basis of constructed content.

⁸In contrast, perceptual beliefs, for example, are entirely transparent. The perceptual character of the belief itself only figures in any inferences drawn from such belief in exceptional circumstances (for example in realizing that one is subject to a perceptual illusion). Our claim here is that while we often rely on information about past events in a similarly transparent fashion, in episodic memory only proper the representational character of the memory itself plays a part in the inferences we draw from it (see Burge, 1993).

As illustrated by Neisser's (1981) famous case study of the memory of John Dean, the question of what it means for a memory to be veridical is not a straightforward one (Koriat and Goldsmith, 1996). Dean, a former counsel to president Richard Nixon during the 'Watergate' affair, provided testimony that was in essence often correct but contained many (mostly self-serving) incorrect details. While it seems fair to say that episodic memory is usually reliably veridical to a significant extent, there has been a long tradition of research pointing out the fallibility of this system. Starting with Bartlett's (1932) classic treatment, an impressive amount of evidence suggests that the construction process on which episodic memory relies is surprisingly error-prone. Both encoding and retrieval processes typically alter information substantially (e.g., Alba & Hasher, 1983; Roediger, 1996; Schacter, 2001). Crucially, one important line of evidence suggests that beliefs play an unexpectedly large role in the construction of episodic memories (Conway, 2005; Ross, 1989; Blank, 2009). In many situations, construction seems to be guided by one's current beliefs about whatever is to be remembered rather than the memory trace itself. If the construction process underlying episodic memory were indeed optimized to support beliefs about actual occurrences, such a trade-off would be unexpected.

Evidence for top-down influences on episodic memory comes from a range of experiments investigating the effects of post-hoc manipulation of participants' attitudes, expectations or appraisals on their memories. It is usually found in these studies that people remember the past inaccurately but congruent with, and supportive of, their newly acquired beliefs. For example, in a study by Henkel & Mather (2007), participants were asked to make a choice between two options each of which had an equal amount of positive and negative features associated with it. When asked to remember their choice later, however, participants misremembered the features of the options they chose as more positive than they were (see also Benney & Henkel, 2006; Mather & Johnson, 2000; Mather, Shafir, & Johnson, 2000; 2003). Crucially, this shift was dependent on what participants believed they had chosen irrespective of their actual choice (see also Pärnamets, Hall, & Johansson, 2015). That is, here participants remembered having made a choice they did not actually make (but believed they did), and additionally remembered the option they believed to have chosen as having had more positive features than it actually did. In other words, they displayed both memory congruency with the induced belief and a memory distortion supporting this belief.

Similar 'congruency effects' have been found in such diverse domains as memory for emotions (Levine, 1997), attitudes (Rodriguez & Strange, 2015; Goethals, & Reckman, 1973), one's own behaviors (Ross et al., 1983, 1981), one's own traits (Santioso, Fong, & Kunda, 1990), and even one's own clinical symptoms (Merckelbach, Jelicic, & Pieters, 2010; 2011). The methods of these studies are diverse and it is therefore unclear to what extent each of these effects is specific to episodic memory. Evidence suggesting such specificity, however, is supplied by research on memory manipulation.

By now, there is an impressive literature showing that it is possible to induce in people vivid, detailed false memories, which are subjectively indistinguishable from accurate recollections (Lampinen, Neuschatz, & Payne, 1997; Payne et al., 1996). People usually create false or altered memories in response to having changed their beliefs about a given event. This in turn is usually the outcome of having been exposed to persuasive communication (Nash,

Wheeler, & Hope, 2014). In fact, persuasion is a main factor in the effectiveness of most memory manipulation paradigms (Leding, 2012). This suggests that induced beliefs can guide constructive retrieval.

On the basis of evidence about such belief-memory congruency effects it seems fair to conclude that retrieval has a tendency to confirm prior beliefs rather than to contradict them. Such evidence then is not easily reconcilable with a view that takes episodic memory to be exclusively aimed at re-constructing events in the way they actually occurred. Rather, these studies show that the episodic construction process seems to just as often be geared toward constructing event representations so as to be consistent with, and supportive of, our prior beliefs. Commonsensically, we would assume episodic memory to be an exclusively belief-forming system: phenomenologically it seems to us that we form beliefs about the past on the basis of remembering it, not vice versa. In contrast, research on memory illusions suggests that beliefs about the past and episodic memory are reciprocally interconnected: Sometimes we remember an event because we believe it occurred.⁹ And in turn, once we have constructed a memory on the basis of such a belief, the memory itself might serve to strengthen the belief that induced it.

Crucially, this does not mean that episodic memory is not commonly veridical. In fact, the effects of prior beliefs and attitudes on subsequent memory seem to be highly context dependent (e.g., Eagly et al., 2001). Veridicality in episodic memory construction is not an all-or-nothing affair. Instead, retrieval processes seem to aim to strike a balance between congruency with memory traces on the one hand and belief justification on the other. However, such a balancing act is not always possible. In some such cases then, remembering an event will lead to belief revision, while in others, believing that an event occurred will lead to the construction of an event simulation without a corresponding trace.

1.3 The features of episodic memory

We are now in a position to specify the features of episodic memory that any functional account should be able to account for. Episodic memory consists of an epistemic attitude taken towards the simulation of a specific past event, which serves to justify a belief about the occurrence of this event. We are thus in agreement with Klein (2015), who similarly argues that episodic memory is not individuated through its contents alone but rather through the manner in which this content is made available. More formally, episodic memory is

1. Quasi-experiential

The representation is an outcome of scenario construction: it includes spatio-temporal structure, perspectivity, and modality-specific sensory information.

2. Event specific

The representation is specific to a single spatio-temporal context.

⁹Compare this to perceptual processes where it is a common trope to point out that high-level beliefs do not and should not have any influence on what we perceive (Firestone & Scholl, 2015).

3. Past-directed

The event in question is represented as having occurred in the past.

4. Auto-noetic

Event information is (meta-)represented as having been obtained ‘first-hand.’

5. Epistemically generative

The memory is not represented as a belief but provides grounds for believing.

Importantly, we take these features to be individually necessary and jointly sufficient for episodic memory to occur. Thus, since the fact that episodic construction is congruency prone is not necessary to episodic memory, we did not list it as a separate feature here. Nonetheless, as we will argue below, we take congruency proneness to be a functional property, i.e., a feature rather than a bug, of this system. Moreover, we can separate this list of features according to which properties pertain to the content vs. the format of episodic memory. While features (1) – (3) pertain to the content (and are thus shared with event memory), (4) – (5) pertain to the format of episodic memory. The differences between the different kinds of memory capacities discussed above are illustrated in Table 1.

2 What is episodic memory for?

Adaptive function cannot be discerned by merely asking what a given cognitive ability is useful for (Millikan, 1984; Sperber & Hirschfeld, 2004): one can use a pair of scissors as a paperweight but that does not allow one to infer that scissors are designed for keeping paper from flying away. Rather, in order to arrive at an estimation of ‘proper’ function, one needs to identify a fitness relevant problem, which the mechanism under consideration will solve more efficiently than comparable, cheaper alternatives. This then allows one to infer that the capacity in question has been retained in the selection process because of its differential contribution to the solution of said task.

Applied to the current context, the question is therefore what fitness-relevant problem is solved by an auto-noetic and epistemically generative memory system for past events (episodic memory) that could not be solved by a memory system without these features (event memory).¹⁰

2.1 Future-oriented mental time travel

Information about the past is important only in so far as it enables us to make better decisions in the present so as to ensure benefits in the future (Klein et al., 2000). Some authors have taken this constraint very literally, viewing episodic memory as part of a wider system that has evolved to enable us to mentally travel into the future (Michaelian, 2016; Schacter et al., 2007; Schacter & Addis, 2007; Suddendorf & Corballis, 1997; 2007). The

¹⁰Note that we thus take the primary relevant contrast to be the one to event memory and not to semantic memory. To be sure, there is much to be said about the function of event memory (e.g., Nagy & Orban, 2016), but this will not be our focus here.

proponents of this view deliberately frame their account in terms of mental time travel, as they view the abilities of constructing the personal past and the personal future as two sides of the same cognitive system. On this view, the capacity for episodic memory is just one instantiation of a wider ability to construct scenarios in time, the function of which is taken to be planning for and thinking about the future.

Support for this mental time travel account comes from neuropsychology and cognitive neuroscience. On the side of neuropsychology, it has been found that patients with hippocampal lesions often (not always: Maguire, Varga-Khadem, & Hassabis, 2010) do not only lose the ability for episodic memory but also the ability to imagine their personal future (Klein, Loftus, & Kihlstrom, 2002), as well as to imagine counterfactual scenarios (Hassabis et al., 2007). On the other hand, functional neuroimaging studies have shown the activation of a common brain network when participants were engaged in past or future-oriented mental time travel (Okuda et al., 2003; Addis et al., 2007).

From this, some authors have concluded that episodic memory and episodic future thinking (Atance & O'Neill, 2001; Szupnar, 2010) draw on the same underlying cognitive process and must therefore have evolved for the same reason: to imagine the future through constructively making available elements of the past, which can be flexibly recombined in the service of simulation (Suddendorf & Corballis, 2007; Schacter & Addis, 2007; 2009). That is, since the future is what determines whether one will live to procreate, this aspect of mental time travel should arguably be what caused humans to retain and develop an episodic system over evolutionary time.

2.1.1 Mental time travel and constructiveness—This view is usually presented as having the advantage of being able to explain the constructive character of episodic memory: imagining the future requires flexible recombination of stored event information. Since, on this view, selection of this system has been driven by the future-directed aspect, the past-directed counterpart must be similarly constructive. This then is thought to explain the myriad ways in which our reconstructions of the past are error-prone: selection has simply not optimized this system to represent the past accurately.

This account of constructiveness is, however, problematic, since it leaves us without an explanation for why we should ever be able to reliably and veridically recall past events. If evolutionary selection merely constrained our ability to mentally travel in time insofar as it was useful for simulating the future, retaining the actual past should be accidental. The future is not just a replay of the past, and to assume so would leave us unable to predict events based on new contingencies. We take it that this is exactly why this account is attractive as an explanation of constructiveness of episodic memory. Episodic memory is, however, also reliably veridical in many cases; a fact that becomes mysterious on this view.

2.1.2 Remembering the future—One might reply that recollection of the actual past would be helpful for imagining the future: our simulations of the future could be enhanced if we remembered the past first (Szupnar & McDermott, 2008). Selection then might have ensured veridicality in episodic memory because of the benefits an accurate representation of the past provides for our understanding of the future. To be sure, in order to imagine the

future it is important to retain information learned in the past, as this will highly constrain any inference as to what might happen in the future. However, it is not clear what re-experiencing the past episodically does for simulating the future, or how it would contribute more to future planning than what semantic memory, extracted from past experience, could supply. As emphasized above, episodic memory is not identical to stored information, and mentally traveling back to the past will not itself include any information about the future.

In fact, if past- and future-directed mental time travel operate over the same type of content and merely differ in the temporal orientation they assign to their constructions, it is not clear why one would need the past-directed aspect at all to imagine the future. To see this, note that inferring what might happen in the future on the basis of an episodic memory is not the same as mentally traveling into the future in the sense required here. Suppose that the last time you were at the swimming pool there was a long line at the entrance. When planning to go to the swimming pool the next time, you might recollect this fact episodically and therefore infer that there will likely be a long line again this time. Future oriented mental time travel, however, is not the outcome of an explicit inference of this kind. Instead, in this case, when you ask yourself whether you should go to the swimming pool today, you might imagine that there will be a long line. Of course, the reason that this piece of information might be included in your imagination of this scenario might lie in the fact that there was a long line last time you were there, and you might even be able to infer this from your imagination. Crucially, however, there is no need for you to represent this when constructing your future swimming-pool scenario.

It is thus telling that past- and future-directed mental time travel can be dissociated in episodic amnesia (Maguire et al., 2010; Schacter et al., 2012). The loss of the capacity for episodic memory alone does not impair significantly people's ability to draw inferences about the future. Episodic amnesiacs are not 'stuck in time': they understand what the future is (Craver et al., 2014a), can make future-regarding decisions (Craver et al., 2014b) and show discounting of future rewards (Kwan et al., 2012). The claim that we can remember the past in order to imagine the future then, seems unlikely to be true.

2.2 Source monitoring as a way to guarantee reliability

One way to reconcile the claim that scenario construction evolved to simulate future states of affairs with the fact that episodic memory is nonetheless reliably veridical has been to posit post-hoc monitoring systems operating over retrieved content (Michaelian, 2012a; 2012b; 2016). Michaelian¹¹ proposes that, because selection has not optimized the construction process to accurately represent the past, such accuracy must be ensured post-hoc. Since, in large part, the accuracy of our memories depends on their source, and episodes do not include a 'source tag' specifying their origin, the source has to be inferred by monitoring mechanisms at retrieval. Without such mechanisms, the argument further goes, episodic memory would be too unreliable to be useful. While this assessment is certainly plausible as an account of how episodic memory serves as source memory, it does little to put worries about its reliability to rest. The questions about veridicality raised above

¹¹Michaelian (2016) offers a more extensive discussion of the issues addressed in this section than we can cover here. Here we simply point out what we perceive to be the most central of our disagreements with his account.

are not issues about source information but rather about the reliability of the construction process itself.

Further, from an evolutionary perspective, if a mechanism carries out its function unreliably, we should expect selection to act on the workings of this mechanism itself rather than producing an additional, expensive, second-order monitoring process. In fact, it is not clear in general why second-order processes would help if we cannot expect certain first-order processes to be reliable. After all, why should the second-order process be expected to be any more reliable? As Kornblith (2012) has pointed out, the assumption that reflection can serve as a way to ensure the reliability of our first-order beliefs generally leads to an infinite regress simply because reflection cannot guarantee its own reliability (see also Mercier & Sperber, 2011).

2.3 Episodic memory as an epiphenomenon

It seems that the mental time travel account, with its focus on the construction process, is by itself unable to explain episodic memory. As Klein (2013b) has argued, future-oriented mental time travel differs from episodic memory in important respects. We have argued in Section 1.1.3 that episodic memory is decidedly not identical with the outputs of scenario construction. Indeed, Cheng et al. (2016; see also Michaelian, 2015) have pointed out that auto-noesis is not necessary for mental time travel to occur.

Admitting that episodic memory and mental time travel into the future are importantly different, a proponent of the mental time travel account might say that the ability to mentally travel into the future simply entails the ability to travel into the past as well. On this view, the subjective past is a by-product of representing subjective time at all, which in turn, would be an outcome of a selection process driven by the benefits of imagining the future. Episodic memory would then turn out to be an epiphenomenon of our ability to mentally travel into the future.

This, however, seems equally unlikely. For one, the evidence cited above shows that one can retain a sense of the subjective future without the subjective past. If our ability to traverse the subjective past was simply a necessary consequence of our ability to imagine the subjective future, this should not be possible. Moreover, the subjective past and subjective future play entirely different roles in our inferences and actions. When you remember, for example, that there was an earthquake in your street last year, it simply does not have the same cognitive consequences as imagining that there might be an earthquake in your street at some point in the future. From this insight alone, we should expect episodic memory and episodic future thought to play different roles in our cognitive ecology, and subsequently be subject to different selection pressures.

In sum, it might well be that thinking episodically about the future and the past share many similarities, because they operate over the same type of content (i.e., event simulations). This fact alone, however, does not explain why we have the ability to do both.

3 The communicative function of episodic memory

We now proceed to propose a novel account of episodic memory function in two steps. First, we address the format of episodic memory by providing an explanation of its epistemic generativity, auto-noetic character, and proneness to belief-congruency (Sections 3.1 & 3.2). In a second step, we will then briefly address the question of why such a capacity is required for the representation of specific past events; that is, we address the content of episodic memory (Section 3.4).

As presented above, we take episodic memory to play a generative role in the formation of our beliefs. To get at the proper function of this capacity, let us first consider why it should be necessary to represent our own reasons in support of our beliefs to ourselves. One answer to this question is provided by Cosmides and Tooby (2000): reasons delineate the conditions under which we should revise the beliefs we formed on their basis. Explicitly representing the reasons for every piece of endorsed information we hold, however, would be both unfeasible and unnecessary. It would be unfeasible because it would require that we store the causal history of any and all inferences we draw, which would call for indefinite storage and computational capacity. And it would be unnecessary because mechanisms of belief update can be implemented in a manner for which explicit representation of ‘reasons’ is not required (such as Bayesian belief updating).

Thus, commonly we simply store the outcome of our inferences and discard the history of the inference itself. However, as Cosmides and Tooby (2000) also point out, a domain in which reasons are regularly useful is the realm of human communicative interactions. Humans rely on communicated information to an extraordinary extent. Such reliance, however, comes with challenges that necessitate the development of dedicated cognitive machinery. Part of this machinery is the handling of reasons (Mercier & Sperber, 2011; forthcoming).

Most forms of communication are cooperative, and as such subject to the same evolutionary constraints to stability as cooperation more generally (Tooby & Cosmides, 1992). Communicative exchange of information is beneficial for speakers in so far as it enables them to influence their listeners’ mental state. Conversely, listeners benefit from communication to the extent that they can distinguish reliable from unreliable signals in order to acquire useful information (Dawkins & Krebs, 1978; Krebs & Dawkins, 1984). As such, communication systems can only survive in the selection process if there is a way to ensure that engaging in information exchange remains beneficial for both parties. On the one hand, if there were no way to ensure that signals are reliable (in the face of possible deception and incompetence), listeners would soon stop paying attention to them. On the other hand, if speakers had no way of influencing their listeners’ mental state effectively and to their benefit, they would stop sending messages (Sperber, 2001).

On this basis, Sperber et al. (2010) argue that we should expect humans to have evolved a suite of capacities which let us — as receivers — scrutinize communicated information for its veracity through assessing both its content and its source. The mechanisms allowing us to do this are collectively referred to as *epistemic vigilance*. These capacities are thought to

provide us with means to avoid being misinformed either through an interlocutor's incompetence or deceptive intent. Conversely, speakers should be endowed with capacities allowing them to effectively influence their interlocutors. According to Mercier and Sperber (2011; forthcoming; Mercier, 2016) one way this capacity manifests is in our ability for reasoning. Reasoning allows us to argue for why others should accept whatever we are claiming by providing reasons for it. Note that this entails that epistemic vigilance and our ability to overcome such vigilance must be reciprocally interconnected. The better listeners are at scrutinizing communicated information, the better we should expect speakers to be at convincing their interlocutors, and vice versa. Reasoning serves both to maximize the persuasive effects of one's message as well as to scrutinize the validity of the content of received messages. Moreover, one way a speaker might maximize the persuasive effect of her message would be to turn her epistemic vigilance against herself so as to simulate the likelihood that an interlocutor would perceive her intended message as valid. When we reason privately, we in effect anticipate having to convince others. This picture suggests that we should be able to produce reasons for our own beliefs and be sensitive to the quality of the reasons others provide for their assertions.

Communication then, is clearly a domain where having explicit access to reasons is indispensable (for a thorough analysis of this claim see Mercier & Sperber, forthcoming). In virtue of episodic memory's generative role in belief justification, we might therefore expect it to play a crucial role in enabling certain kinds of justificatory reasoning on the one hand and supporting epistemic vigilance on the other.

3.1 The negotiation of epistemic authority

Reasons, if we are to identify them as such, are metarepresentational. Taking p as a reason for q requires more than representing p and inferring q from it: the fact that p and q stand in a relation of justification must also be represented. Reasoning then is the activity of handling inferences in a way that explicitly represents the justificatory relationships holding between different representational contents. Note that it is not essential that a justificatory relationship actually obtains. Rather, what matters is that such a relationship is represented. You might be wrong in taking the fact that (1) you cannot see beyond the horizon to be a reason to believe that (2) the earth is flat. However, this does not stop you from taking (1) to be a reason for (2). According to the argumentative theory of reasoning, the capacity for representing reasons evolved not because it helps us to draw better inferences but to enable us to make others to draw the inferences we want them to draw, i.e., to convince them, as well as to evaluate others' reasons (Mercier & Sperber, 2011).

As we have argued above (Section 1.2), when we remember we represent to ourselves why we believe certain things about the past. In other words, we represent to ourselves the justificatory relationship between the source of our belief and the belief itself. This is not to say that our beliefs are exclusively justified in this way. Not all of our beliefs are such that they could be appropriately justified through recollection, nor is recollection the only way to justify even those beliefs that are of this kind. Nonetheless, there is a large range of beliefs for which knowing that one remembers is a good reason to hold them.

3.1.1 Remembering as a reason for others—But how could the fact that one remembers serve as a reason for others to believe a given assertion? Note that, in cases where minimal mutual trust between interlocutors can be assumed, it is indeed the case that ‘remembering’ is generally taken by others to be a reason for accepting certain claims. Consider the following situation: John and Jenny are on a walk when Jenny expresses that she is worried that they might have left on the oven at home. To this John replies “Don’t worry, I remember that we turned it off.” Why should the statement that John remembers here be any more reassuring than simply stating: “Don’t worry, we turned it off”? Here, “I remember” serves as a reason for Jenny to accept John’s statement just as it serves as a reason for John to indeed believe that the oven was turned off.

Now, clearly remembering does not work as a reason here in the same way as an argument does. Instead, we can get a clearer sense of the work such auto-noetic claims do in interlocation by taking a closer look at the pragmatic structure of testimony. Testimony entitles an interlocutor to take whatever is conveyed as true on the authority of the speaker. This entails that by giving testimony, the speaker herself has to take responsibility for the truth of whatever is stated (McMyler, 2007; Turri, 2011). In the case of ‘second-hand’ testimony one can defer this responsibility, but only in so far as one can actually access the source of the information in question.

Indeed, Nagel (2015) has recently argued that our propensity to represent the ways in which our epistemic states are grounded through source monitoring relates exactly to this circumstance. She observes that the different sources of belief we intuitively take to hold epistemic warrant do not regularly coincide with actual differences in reliability: an expert judgment received through testimony, for example, might well be more reliable than what one has concluded on the basis of one’s own perception. It thus seems unlikely that source monitoring would serve a purely epistemic function. Instead, Nagel observes, “[s]ource monitoring matters when we need to communicate our judgments to others: indeed, even to decide what does and does not need to be conveyed, it matters where our judgments are coming from, and where our evidence is situated, relative to ourselves and our audience” (p. 301). In fact, the ubiquity with which source information is useful in communication has arguably led to its grammaticalization in about one quarter of all known languages as evidential markers (Aikhenvald, 2004; Spears, 2008). The distinction between indirect and direct forms of evidence seems to be common to all evidential systems.

This begins to make sense of why episodic recollection comes with a representation of its own origin. On this view, auto-noesis is the capacity enabling us to distinguish between cases in which we can assert epistemic authority for our own testimony and cases in which we cannot. Note that even in cases where one defers responsibility to someone else, one will have to take responsibility for the very act of doing so. If Hanna tells you, “Mary told me that Mark was not at the party yesterday,” while Hanna does not take epistemic responsibility for whether Mark was indeed at said party, she does take responsibility for the fact that Mary told her that he was not. A similar analysis applies to other types of sources for our beliefs, which are made available through the source component of episodic memory (seeing, being told, inference, etc.).

One reason for why it is important to monitor which assertions we can commit to in discourse is reputational. If we discursively commit to, and thereby allow others to rely on, the truth of an assertion, we take responsibility for its truth, and thereby put our reputation as a reliable informant on the line. Thus, discursive commitment comes at a potential (direct or reputational) cost in case our message is found to be unreliable. For our interlocutors the fact that we are willing to incur such a cost is a reason to believe us. Through this dynamic, as Vullioud et al. (2016) have recently argued, discursive commitment is a way to stabilize communication. Claims to remembering then do not offer a way of overcoming skepticism in the same way as argumentation proper does.¹² Instead, it is an issue of competence: episodic memory allows us to signal to others that we indeed have epistemic authority on a certain matter, which in turn commits us to our message and this should cause others to believe us.

In fact, it is hard to see how else one would ‘argue’ about certain past events. When it comes to the past, sometimes epistemic authority is all we have to go on in order to decide what to believe. Indeed, young children preferentially endorse the testimony of informants who had first-hand informational access (Terrier et al., 2016), and Castelain et al. (2015) showed that young Maya children are more likely to endorse the testimony of a source claiming to have epistemic authority (“The hen went this way because I have seen it”) over a source giving no reason even when it conflicted with another cue usually governing such endorsement (power).

Of course, episodic memory is not the only device allowing us to regulate our communicative commitments. Markers of confidence seem to be another one (Vullioud et al., 2016). Episodic memory is simply the mechanism specifically geared towards regulating communicative negotiation about past events. Therefore, communicatively negotiating the past often becomes a matter of convincing one’s interlocutor that one remembers; that is, that one has epistemic authority on the matter in question. Because remembering is such an effective way of asserting epistemic authority, it might be beneficial to attribute the origins of (at least certain types of) event information to our own experience in situations in which this would be communicatively useful. This might explain some occurrences of the famous misinformation effect (Loftus, 2005). Here, witnesses have been found to persistently over-attribute misleading information acquired about an event after its occurrence (post-event misinformation) to their experience of this event. From the perspective proposed here, this might simply be the best way to make use of this information in appearing as a good witness. After all, if the participants in these studies believe the misinformation to be correct (as they seem to do), they must have experienced the event in this manner, too.

Going further, this analysis also reveals a functional aspect of the fact that episodic recollections are often rich in contextual details. While event memory should similarly be characterized by the availability of contextual details, these details play a functional role for communicative purposes in episodic memory. When we debate a past event, the fact that we can produce rich, detailed descriptions serves as evidence for others to believe that we are

¹²To be sure, we frequently rely on epistemic authority in argumentation. Nonetheless, the mechanism by which claims to authority and arguments try to change others’ minds differ.

indeed remembering (Bell & Loftus, 1988, 1989), as it does for ourselves, too (Johnson & Raye, 1981). The reason for this might be that contextual details (1) give one's interlocutor more leverage to detect potential inconsistencies and reduce vagueness (Kraut, 1978), as well as (2) supply information that might potentially be independently verified. For example, information about the location and co-witnesses of an event makes it possible to potentially obtain evidence about the event that is not dependent on the testimony of one's immediate interlocutor. Such independent verification will in practice often not be carried out. Instead, it might be enough that an interlocutor is willing to make her account subject to such verification, which is taken as a reason to accept her testimony. Consequentially, contextual elements which, at least potentially, make verification possible might be more readily available in recollection simply because this information should allow one to be perceived as more convincing. When we argue about the past, we often do not contest whether the event in question happened but rather in what way it did, and having access to contextual details is often crucial to establish which of multiple accounts of an event should be endorsed and what it should be taken to entail.

3.1.2 The consequences of discursive commitment—Another prediction following from this account concerns the fact that once one has publicly committed to, and therefore taken epistemic responsibility for, the truth of a certain version of events through testimony, this should have subsequent consequences on how and what one remembers. On the one hand, after testimony, it becomes less important to recall the actual event. Instead, in order to uphold one's commitment, maximize believability, and avoid reputational damage through inconsistency, one should stick to one's own account to a certain extent. In cases where one's account of an event and the actual happenings diverge, one might thus subsequently remember the event in question in a way that supports one's report. A range of memory distortion effects occurring as a consequence of memory report suggests that this is indeed what happens. For example, Cochran et al. (2016) investigated the effect of altering participants' memory reports on their memory for crime events. They found that participants often did not detect the changes to their reports and instead altered their memories to fit the manipulated reports. Tversky and Marsh (2000) found that the public stance one takes on a past event biases recall to emphasize details supporting one's claim (see Higgins & Rholes, 1978, and Greene, 1981 for related effects). This stance, in turn, has been found to depend on one's particular audience (arguably serving both reputation management and making one's own memory report easier to accept for others), further altering memory (Echterhoff et al., 2008; 2009; Kopietz et al., 2009; Pasupathi, 1998). In effect, after having reported an event, people subsequently do not recall the original event but rather a version in line with their latest retelling of it (Marsh, 2007).

The extent to which such distortions would be communicatively useful should be constrained by how skeptical and informed one's audience is. People should be sensitive to the costs of being found wrong, and appropriately adjust the extent to which they prioritize consistency with their own account over accuracy. Thus, the distorting effects of giving testimony might be mediated by how skeptical and informed one perceives one's audience to be. To our knowledge, this prediction has not been tested.

On the other hand, commitment to one's testimony should cause one to be less easily convinced of a different version of occurrences since this would undermine one's own epistemic authority. Indeed, participants' susceptibility to social influence has been found to depend on whether they had committed in one way or another to certain details of an event (Bregman & McAllister, 1982; Loftus, 1977; Schooler, Foster, & Loftus, 1988). The reason for this cannot be simply epistemic since in general participants have been shown to be quite ready to update their memories on the basis of others' testimony. Instead, our account suggests that participants in these studies became resistant to social influence in order to ensure their own believability.

3.1.3 Recollective myside bias—Being able to convince others that we are indeed remembering is only important in so far as it helps us to convince them about *what* we are remembering. The contents of our memories are crucial for supporting certain conclusions over others when it comes to the interpretation of what a given event entails. Thus, if episodic memory indeed has the communicative function of appropriately asserting epistemic authority about the past, we should expect it to make content available in a way that supports our claims.

Mercier and Sperber (2011) have argued that because the production of reasons does not serve normative epistemic goals but to convince others, it should primarily find reasons in favor of whatever we want to claim. Their view predicts the well-known myside bias in reasoning: the human tendency to reason from conclusions to premises and not vice versa as normatively required. By analogy, when we claim that episodic memory is crucial for persuading others of a particular version of the past, we should similarly expect such a bias in remembering: in order to be able to 'argue' for our beliefs about a past event, our recollections should tend to support those beliefs instead of contradicting them.

Indeed, such a 'recollective myside bias' is instantiated through the way in which our beliefs guide the construction of memory content. Similarly to confirmatory reasoning, belief-guided memory construction (reviewed in Section 1.2.2) can be taken to be a version of the myside bias to the extent that one constructs a memory justifying what one already believes to have happened. Understanding memory re-construction as an instance of myside bias for the purposes of persuasion can make sense of the surprising interplay between beliefs and memory content: the constructive process tends to retrospectively create memories confirming and supporting held beliefs and attitudes. From this perspective, such false memories are simply the results of an inherent tendency to justify our beliefs about the past to ourselves in order to be able to justify them towards others; they illustrate a functional feature, rather than a bug in, the mechanisms of episodic memory. Thus, inducing beliefs about the past in participants is followed by false memories because once we have accepted a piece of information, justifiability is ensured through the construction of supporting memory content.

Of course, if we are correct, there should be limits to this form of my-side bias. If the costs of being found wrong are high, or our audience can monitor our assertions effectively, we ourselves should be more 'skeptical' towards the outputs of our own construction system

(i.e., spend more efforts on checking their consistency), and consequently be less likely to form a false memory.

3.1.4 Selective remembering and motivated forgetting—A similar analysis can be applied to phenomena described under the heading of ‘motivated forgetting’ (Anderson & Hanslmayr, 2014). Motivated forgetting describes a process by which selective or inhibited retrieval leads to forgetting of aspects of (or entire) events. People tend to selectively remember arguments in favor of an endorsed conclusion or attitude while forgetting counter-arguments to the same conclusion (Waldum & Sahakyan, 2012). This process has been shown to be especially prevalent in the domain of moral violations. In fact, memories of own moral violations are more likely to be forgotten than memories of own moral behavior, so that people sometimes seem to display a form of ‘unethical amnesia’ of their past (Kouchaki & Gino, 2016). In contrast, Bell, Schain, and Echterhoff (2014) have shown that memory for the cheating behavior of *others* is well remembered when it is associated with personal costs but easily forgotten when associated with personal benefits. These processes lead to the phenomenon of ‘rose-colored’ memories, which emphasize one’s own moral character. Given the importance of episodic memory for the communicative negotiation of the past, such effects are not surprising. Both on the individual (Kappes & Crockett, 2016), as well on the collective level (Coman et al., 2014), selective remembering and motivated forgetting serve communicative ends: convincing oneself simply helps to convince others (von Hippel & Trivers, 2011).

3.1.5 Remembering reasons—As we noted in Section 1.1.2, taking remembering to be an attitude makes intelligible how one can remember imagining, believing, wanting, etc. On our view this makes sense in so far as the process of retrieving reasons via ‘introspection’ in many cases amounts to an attempt at remembering these reasons. To see this, consider Johansson et al.’s (2005; for a higher stakes example see Hall, Johansson, & Strandberg, 2012) famous choice blindness experiments. In a series of two-alternative forced-choice trials, participants were asked to choose between two faces the one they found more attractive. After answering, participants were presented again with the chosen face and asked to explain why they had chosen this face. Crucially, in a certain proportion of trials, the experimenter switched the presented face by sleight of hand so that the participant was now presented with the face they had not chosen. In this situation, not only did a substantial number of participants not notice the change, they went on to give reasons for why they ostensibly had chosen the face presented to them. How did the participants come up with reasons for a choice they had not made in this situation? Clearly, they must have constructed these reasons on the fly in response to being asked to justify their choice. Crucially, however, since the participants did not notice that they were justifying a choice they had not made, they presumably believed that the reasons they gave were actually the reasons that had guided their (imagined) original choice. The only way, however, this is possible is if participants sincerely took themselves to *remember* these reasons. This kind of post-hoc generation of memories is often required when we genuinely give reasons for our behavior after the fact. In this way, the attitude of remembering is crucial to introspecting our own past reasons.

3.1.6 Source monitoring as self-directed epistemic vigilance—As mentioned above, epistemic vigilance and the mechanisms designed to disarm such vigilance are essentially two sides of the same coin. The easiest and most effective way to anticipate one's interlocutor's vigilance might be to exercise such vigilance against one's own assertions before uttering them. Source monitoring, as described by Johnson et al. (1993), displays just such a structure. Michaelian (2012a; 2012b) noted that source monitoring mechanisms are endorsement devices: they decide to what extent we should believe the contents of our own recollections by scrutinizing them for their believability, just as, and to the extent to which, others do when they hear our testimony. These endorsement mechanisms might then be one way in which we can gauge whether we should indeed commit to a certain claim about the past or not. While Johnson and colleagues seem to assume that source monitoring is purely epistemic in function and compulsory in event recall, it might well be that these processes are only applied in situations in which scrutiny is required: situations in which one expects to face a (skeptical) audience.¹³

3.2 Supporting epistemic vigilance

Source monitoring does not just serve anticipating others' vigilance but also functions to exercise vigilance against others. This is borne out by the fact that children become increasingly less suggestible as a result of source memory development (Lampinen & Smith, 1995; Bright-Paul, Jarrold, & Wright, 2005; Giles, Gopnik, & Heyman, 2002). Having access to the sources of our beliefs allows us to keep track of the sources of transmitted information and scrutinize such sources for their competence and intentions.

3.2.1 Source-directed epistemic vigilance—Similarly to our account, Cosmides, Tooby, and colleagues (Cosmides & Tooby, 2000; Klein et al., 2002; 2009; see also Boyer, 2009) emphasize the role of episodic memory in epistemic vigilance. On their view, the fact that humans so excessively rely on communicated information has necessitated a mechanism allowing us to adjust the truth-value of our beliefs according to their source. In order to decide whether an interlocutor is trustworthy, or whether to reevaluate such trust, it is necessary to have access to her past behavior in specific situations. When we learn new information about an interlocutor's reliability after the fact, it is important to have access to our interaction history with this specific person in order to be able to reevaluate any pieces of information we might have received from her. The importance of source monitoring in such situations is showcased in misinformation studies, in which participants are able to recover their original event representation when they are informed of the deceptive character of the misinformation (Blank & Launay, 2014; Echeterhoff et al., 2005; Oeberst & Blank, 2012). However, as evidenced by the mediocre effectiveness of most 'post-warnings,' episodic memory seems to be rarely used in this way. Most of the time when we are informed that a given source is untrustworthy we merely discount this source in the future. Nonetheless, as predicted by our account, encoding is mediated by epistemic vigilance towards the source of information: misinformation and conformity effects are not automatic

¹³In fact, from our perspective, the term 'source monitoring' is slightly misleading because what these mechanisms monitor is not the source of our memories but their believability. While the outcome of this process might be the ascription of a source, it does not 'monitor' sources.

but rather depend on participants' evaluation of their own confidence and the reliability of the source of the presented information (Allan et al., 2012; French et al., 2011; Gabbert, Memon, & Wright, 2007; Jaeger et al., 2012; Lindsay & Johnson, 1989). When participants have reason to doubt their own (Asefi & Garry, 2003; Clifasefi et al., 2007) or others' ability (Kwong See, Wood, & Hoffman, 2001) or trustworthiness (Dodd & Bradshaw, 1980), they refrain from memory update. In such cases, rather than simply updating their own event representations on the basis of others' testimony, participants encode it in a separate trace (Ludmer, Edelson, & Dudai, 2015).

3.2.2 Interpersonal reality monitoring—The two-sided nature of vigilance and counter-vigilance is illustrated in another aspect of recollection. In deciding whether someone is telling the truth in recounting the past, we usually try to determine whether our interlocutor is remembering or making up the contents of her testimony. Research in the tradition of the source monitoring framework has investigated how we make this decision about ourselves through so-called 'reality monitoring' mechanisms (Johnson & Raye, 1988; Johnson, 1991).

Apart from allowing us to determine whether we should take ourselves to be actually remembering, reality monitoring could play a role in making this decision about others, too. That is, in order to decide whether we are remembering or imagining a given event, we might utilize the same mechanisms that are charged with this decision when evaluating others' testimony. This is suggested to some degree by studies on 'interpersonal reality monitoring' — the ability to judge whether other people's memories reflect real or imagined events (Johnson, Bush, & Mitchell, 1998; Johnson & Suengas, 1989). These studies suggest that participants use the same criteria to evaluate their own memory content and others' memory accounts, and can display above chance discrimination performance in such situations (Clark-Foos, Brewer, & Marsh, 2015). Note, however, that this is not a matter of detecting outright deception but rather one of deciding whether we should grant our interlocutor epistemic authority. In detecting deception, we likely use other mechanisms to assess others' intentions, which then in turn might influence our reality monitoring decisions.

3.2.3 Veridical recollection and epistemic vigilance—Viewing episodic memory as striking a balance between the productive and receptive sides of communication can make sense of the confusing interplay between veridicality and malleability described in Section 1.2.2. Similar to reasoning (Mercier & Sperber, 2011), the evolution of episodic memory systems should have been subject to an 'arms race' between senders and receivers of communicated information about past events. While senders have an interest in inducing in their audience a representation of the past that is to their benefit, receivers are interested in acquiring useful (i.e., true) information. Thus, the better senders should be at manipulating their audience's beliefs about the past to their own benefit, the better receivers should be at discerning true from misleading information. Both sides of this interaction therefore require the capacity to represent the past accurately.

On the one hand, speakers should be sensitive to how informed and skeptical their audience is and consequently be more careful about what they commit to (i.e., exert more effort in

checking their own memory representation for its believability). In other words, if episodic memory were never true it would not convince anyone.¹⁴ Receivers, on the other hand, should be sensitive to their interlocutor's intentions and (if available) spend more cognitive resources to monitor the believability of her utterances.

Thus, the epistemic vigilance functions of episodic memory coincide with the 'epistemic route' from memory content to belief: We are able to form and revise beliefs on the basis of episodic recollection because this enables us to guard against others' incompetence and deceptive intent in communicative interaction. This perspective then gives us an explanation for why (and when) we should expect episodic memory to be veridical: epistemic vigilance requires sensitivity to the actual past so as to be able to review others' claims and decide when to revise our own beliefs on the basis of such claims. Moreover, the fact that we can expect others to be vigilant, and as such sensitive to the truth, should force us to stick to actual events to the extent that others can monitor us in communicative interaction. Thus, the construction process in episodic memory should be sensitive to the communicative situation we find ourselves in. In cases in which we face a skeptical audience, which raises the costs of being found unreliable, or when we are scrutinizing someone else's claims on the basis of our own memory, construction should aim at accurate event representation.

3.3 Episodic memory format explained

Taking a perspective from human communication on episodic memory can illuminate its format in a functional light. Here we summarize the above discussion in terms of how we have made sense of the features pertaining to the format of episodic memory identified in Section 1.3.

- *Epistemic generativity* allows us to (meta-)represent the reasons for our beliefs about past events so as to give these reasons in testimony.
- *Autonoesis* delineates for which of our claims about the past we can assert epistemic authority.

Beyond the above features that discriminate episodic memory from event memory, our analysis also account for why episodic memory is both congruency prone (risking to be false) and aiming at veridicality simultaneously. The fact that scenario construction is congruency prone allows us to effectively 'argue' for those beliefs we already hold. Nonetheless, episodic memory is commonly veridical because it serves a role in epistemic vigilance, which requires some degree of sensitivity to actual occurrences.

3.4 Past events as reasons

Our account so far has focused on the structural features of episodic memory. But what arguably is at stake in an explanation of episodic memory function is not only its metarepresentational nature. After all, these are aspects shared with many other aspects of cognition supporting human communication (Mercier & Sperber, forthcoming). What makes these features interesting is rather the content to which they pertain in episodic memory:

¹⁴This is not to say that there are no other reasons why *event memory* requires veridicality. Since we are not concerned with event memory here, however, we will not discuss this issue.

specific past events. The question that we have yet to answer is why such a representational structure should be necessary for this content in particular. Why did humans develop a specific mechanism regulating their communicative commitment about past events? Why would we ever want to convince others about a particular version of history, and why do we care what others assert about the details of events they experienced in the past? While a full treatment of this question would exceed the boundaries of the current article, we provide here a short attempt at one potential answer, without claiming that it exhaustively accounts for all examples of humans' obsession with the past.

3.4.1 Remembering events generating social commitments—Because knowledge about specific events can be critical in assessing the truth of certain generalizations, their recollection can also be crucial in supporting the communicative assertion of many such generalizations (“I remember seeing him beating his wife, therefore he must be an aggressive person”). In principle, any inductively derived conclusion can be supported or undermined by pointing to specific events. Nonetheless, reference to past events is not mandatory in arguing for inductive generalizations. In principle one can argue for such assertions by pointing to other generalizations one holds true as well.

There are however, certain claims for which it is impossible to argue except by reference to specific past events; namely the assertion of social commitments. Examples of such events are agreements between multiple parties that commit one or the other interactant to a certain behavior in the future (Schelling, 1960). But these are by no means the only examples; potentially any event can be used to establish social commitments or entitlements depending on what interpretation one chooses after the fact. Indeed, most events that happen to us on a daily basis are heavily loaded with social meaning, which largely depends on their potential to ground such social commitments. And this potential is in turn realized only when a case can be made that a given event did indeed occur in a specific way in the past. In fact, sometimes this is the only way to argue for many present entitlements.

The acts through which we engage in and negotiate our social commitments are causal events: their effect is the establishment of a social ‘fact.’ However, in contrast to causal events that result in changes in the physical environment, not only are many of the events ‘establishing’ such social commitments (like promises) entirely transient, but their effects are dependent on a social agreement, which in turn is dependent on what our conspecifics believe. The transient nature of these ‘social’ events is problematic both because, on the one hand, their committing force is dependent on their continuous influence through time, while, on the other hand, by themselves they do not leave any physical traces of the events in question. If Susan promises Alan to meet him in front of the cinema at 8pm, she is obliged to be there, but this commitment survives (if at all) only in the mind of each party and perhaps of the witnesses of the interaction.

In principle, nothing but a reference to the specific occurrence establishing the commitment could be used to communicatively enforce the resultant obligations and entitlements. In fact, this is arguably one of the reasons for why humans have culturally developed so many ‘commitment devices’: ways of making such arrangements either physically traceable in the form of written contracts and other kinds of symbols, or making the commitment public so

that it becomes impossible to deny one's obligation without damaging one's reputation with everyone who co-witnessed the event in question. Short of, and often in spite of, such commitment devices, however, nothing but one's memory of the interaction will be able to advocate whether and how obligations and commitments are distributed. If Susan does not turn up in time in front of the cinema, invoking Alan's memory of the interaction with Susan will allow him to confront her not just by citing the obligation that she failed to meet but also by justifying his belief in the existence of this obligation by referring to the event that generated it. The ability to explicitly refer back to specific past events is therefore essential for the argumentative negotiation of present obligations and entitlements.

3.4.2 Bookkeeping or remembering?—Social commitments have evolutionary significance because they make it possible for parties in an exchange to gain benefits that would be unattainable in the face of the risk of defection. Such commitments become important in the large spectrum of social relations in which the incentives of the involved parties are only partly aligned. As soon as incentives are entirely aligned or entirely misaligned, there is no room for such commitments to be effective because, in the former case, trust is not required and, in the latter case, trust is impossible. As Schelling (1960) pointed out, such a situation of partly misaligned incentives characterizes the large majority of our social interactions. Thus, social commitments dramatically expand the range of possible ways of cooperation.

In principle, in order to make social commitments effective, all that is cognitively required is a mechanism that keeps track of the distribution of who owes what to whom (Brosnan & DeWaal, 2002; Schino & Aureli, 2009; 2010). Such a 'bookkeeping mechanism' does not need to consider the reasons for these commitments themselves. Bookkeeping allows one to keep track of and appropriately handle one's own and others' commitments. It also allows one to regulate one's trust towards others based on their willingness to reciprocate. Bookkeeping does not, however, allow one to argue for, and by arguing to effectively enforce, negotiate or establish, one's entitlements. One can engage in various behavioral strategies to collect what one is owed or to retaliate against defection. However, being able to justify and thereby convince others about entitlements could avoid costly, and potentially escalating, physical conflict. Thus, episodic memory, by enabling reference to the past events that established specific entitlements, could serve the negotiation of cooperative interactions in humans.

3.4.3 Episodic memory content explained—These considerations then might provide an example for why humans should have developed a mechanism regulating communicative interaction about *specific events* in the *past*:

- Social commitments are often generated by *singular events* whose effects are solely dependent on the way these events can be referred back to by the parties involved or by their witnesses.
- The effects of social commitments always take place *in the future*, and their negotiation therefore will necessarily require representing them as having occurred *in the past*.

4 Conclusions

We have provided an attempt to explain human, mature episodic memory in functional terms. We have distinguished episodic memory from event memory, and analyzed it as playing a generative role in the justification of our beliefs about past events. In explaining the function of this capacity, we have followed a two-pronged approach.

First, we have provided an account of the metarepresentational structure of episodic memory in terms of its role in communicative interaction. According to this view, autoevidence allows us to determine when and how to assert epistemic authority in negotiating the past. In effect, episodic memory allows us to communicatively support our interpretations of the past. This view can make sense of a range of empirical evidence; most importantly, why episodic memory construction has the tendency to confirm what we believe about the past and why it is nonetheless commonly veridical.

One consequence of this analysis is that episodic memory should be taken to be human specific. Other accounts arguing for this conclusion have been criticized for being unfalsifiable because they do not offer behavioral markers that could differentiate between autoevident and non-autoevident forms of event memory. Our account identifies a clear function for autoevident remembering (the negotiation of epistemic authority), which other animals, in the absence of a communication medium capable of conveying justifications, do not need to fulfill. Thus, from our perspective, it seems unlikely that other animals (and very young children) would have the capacity for entertaining autoevident memories, simply because they do not need it.

Another consequence of our account is therefore that the capacity for episodic memory and the capacity to communicate about the past linguistically should be importantly connected both developmentally and constitutively. While we have not made any specific claims about development, there is at least correlational evidence from developmental psychology suggesting that the capacities for episodic memory and communication about the past are connected (e.g., Nelson & Fivush, 2004). Childhood amnesia is generally thought to end between the ages of three to five (Hayne & Jack, 2011), the same time when children begin to be able to use source information productively (Gopnik & Graf, 1988; Drumme & Newcombe, 2002; Wimmer, Hogrefe & Perner, 1988; Whitcombe & Robinson, 2000) and start to display epistemic vigilance (Clément, Koenig & Harris, 2004; Mascaro & Sperber, 2009; Koenig & Harris, 2007). In fact, infants (Bauer & Leventon, 2013) and young children (Burns et al., 2014; Király et al., in preparation; Mullaly & Maguire, 2014) can recall and make use of event information, suggesting the operation of constructive processes resulting in event memories. However, only after the age of three do they become able to use this information as source information in communication (Haigh & Robinson, 2009). These correlations invite further investigations of the relationship between the development of episodic memory and communicative expertise.

More generally, the account offered here is merely a functional one and does not make precise predictions about the information processing mechanisms involved. The function we propose could be implemented by a range of different mechanisms. Nonetheless, our

account predicts that the main achievements in episodic memory development occur as a consequence of the development of retrieval mechanisms. Encoding mechanisms are important for a much wider range of capacities, most of which are not in fact connected to our capacity to communicate about the past.

Second, we have argued that a metarepresentational format is necessary for the representation of at least one type of past events — events that ground social commitments. Both the ambiguity and the centrality of social commitments in human social life necessitate efficient means to negotiate them communicatively.

There has been intense interest in the study of human memory and the cultural uses of recollection in the social sciences (a ‘memory boom’, Winter, 2001). From our perspective, it is not surprising that remembering should be of central interest to social scientists. After all, if we are right, episodic memory in some sense enables the commitments and entitlements that make up the web of social relationships we are embedded in both as individuals and as members of social collectives. Indeed, the same kinds of justificatory practices that are used in the negotiation of interpersonal commitments emerge on the collective level in how past events and their commemoration are used in the political arena in the negotiation of collective commitments and entitlements (e.g., Olick & Levy, 1997; Pool 2008; Weiss, 1997). We take our account to contribute to the integration of these different perspectives on human memory and its uses. Recollection, far from being the intimately private affair we intuitively take it to be, has a fundamentally social dimension.

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Table 1
Different Representational Features of Episodic Memory, Event Memory and Semantic Memory

	Quasi-experiential	Event specific	Past-directed	Epistemically generative	Autooetic
Episodic memory	Yes	Yes	Yes	Yes	Yes
Event memory	Yes	Yes	(Yes)	No	No
Semantic memory	No	Not necessarily	Not necessarily	No	No