



BIROn - Birkbeck Institutional Research Online

Mahr, J. and Csibra, Gergely (2020) Witnessing, remembering and testifying: why the past is special for human beings. *Perspectives on Psychological Science*, ISSN 1745-6916. (In Press)

Downloaded from: <http://eprints.bbk.ac.uk/id/eprint/28571/>

Usage Guidelines:

Please refer to usage guidelines at <https://eprints.bbk.ac.uk/policies.html>
contact lib-eprints@bbk.ac.uk.

or alternatively

In press, Perspectives on Psychological Science

Witnessing, Remembering, and Testifying: Why the Past is Special for Human Beings

Johannes B. Mahr^{1,2} & Gergely Csibra^{1,3}

*¹ Department of Cognitive Science, Cognitive Development Center,
Central European University, Budapest, Hungary*

*² Department of Psychology and Department of Philosophy,
Harvard University, Cambridge MA, USA*

*³ Department of Psychological Sciences,
Birkbeck, University of London, United Kingdom*

Correspondence:

Johannes B. Mahr, Department of Psychology, Harvard University, 33 Kirkland Street, 02144

Cambridge, MA, USA

Email: jmahr@fas.harvard.edu

Abstract

The past is undeniably special for human beings. To a large extent, both individuals and collectives define themselves through history. Moreover, humans seem to have a special way of cognitively representing the past: episodic memory. As opposed to other ways of representing knowledge, remembering the past in episodic memory brings with it the ability to become a witness. Episodic memory allows us to determine what of our knowledge about the past comes from our own experience and thereby what parts of the past we can give testimony about. In this article, we aim to give an account of the special status of the past by asking why humans have developed the ability to give testimony about it. We argue that the past is special for human beings because it is regularly, and often principally, the only thing that can determine present social realities like commitments, entitlements, and obligations. Since the social effects of the past often do not leave physical traces behind, remembering the past and the ability to bear testimony it brings, is necessary in order to coordinate social realities with other individuals.

Keywords: episodic memory, testimony, commitments

1. The Past is Special

For human beings, the past is special. We think of the past as defining almost all aspects of our lives: where we belong, who our friends are, what our social status is, what kind of person we are. We also love to talk about the past. We share much of our (emotional) experiences with others (Pasupathi, McLean, & Weeks, 2009; Rimé et al., 1998) and, according to one estimate, 40% of our conversational time is spent telling stories about past events (Eggins & Slade, 2005; Hirst & Echterhoff, 2012). In fact, humans seem to have a ‘retrospective bias’ in their conversational behavior: we talk about our personal past two to three times as much as about our personal future (Demiray, Mehl, & Martin, 2018). The special status of the past is also reflected in the fact that humans operate a dedicated ‘episodic memory’ system for cognitively representing specific past events. While other memory systems allow us to simply ‘know’ what happened in the past, episodic memory also lets us ‘know how we know’ what happened. When we remember a past event, we do not just recall the event, we also know that we experienced it. In other words, episodic memory allows us to become *witnesses* of the past and thus give testimony about it.

The past is so all-pervasively important for us that it might seem hard to see that the question of why this should be the case is a genuine puzzle. Yet, in this article we attempt to answer this question. In approaching this question, we will take a detour via thinking about the evolution of the human cognitive architecture for thinking about the past. If it is true that episodic memory is a special way of representing information about past events that lets us ‘know how we know’ about them, then why did we develop such a system? In other words, what is special about past events that requires a special, metacognitive mechanism to think about them? This question, we think, is just the question of why past events are especially important for human beings.

Our answer to this question relies on the observation that, for human beings, specific events do not only have physical but also social effects that may not leave physical (but only mental) traces behind. For this reason, such events require a dedicated capacity allowing us to negotiate them effectively in communication.

We will proceed as follows: first, in Section 2, we will recapitulate arguments we have made elsewhere in more detail (Mahr & Csibra, 2018) about the nature and human-specific function of episodic memory. The ability to remember allows humans to distinguish knowledge about the past which they acquired on the basis of their own experience from that acquired in other ways. This ability constitutes the basis of testimony about the past: An act of testimony is an account about the past that is claimed to be based on first-hand experience. The term ‘testimony’ is sometimes (especially in philosophy) used to refer to any act of social information transmission. This is emphatically not the way ‘testimony’ will be used here. Instead, ‘testimony’, as we will use the term, refers to an account about the past based on first-hand experience and the epistemic authority such experience conveys. This use of the term might evoke associations with the legal domain, where testimony is most commonly studied, and where it has been institutionalized as ‘eye-witness testimony under oath.’ Yet, testimony understood as ‘experience-based’ communication about the past is probably the most common form of talk about the past and is not constrained to the courtroom.¹

‘Remembering’ (i.e., episodic memory) therefore is the cognitive basis of testimony. On this basis, we previously (Mahr & Csibra, 2018) argued that remembering functions to support communication about past events. However, the claim that a fundamental function of episodic memory is to facilitate the communication about specific past events by enabling testimony about them implies that communication about such events is important enough

¹ Importantly, with understanding ‘testimony’ in this way, we do not intend to make any claims about its accuracy. In fact, as will become clear (see Section 5.2), we intend to account for crucial ways in which testimony is commonly found to be inaccurate (see also Mahr & Csibra, 2018).

to justify the evolution of such a dedicated mechanism. It is, however, not clear what grounds this high importance of specific past events to human beings.

Here we aim to give a more full-fledged answer to this challenge than previously provided.² Thus, in Sections 3 and 4, we tackle the main question of this article: Why is the past special for humans? In other words, what is so special about the past that requires a dedicated mechanism allowing us to facilitate communication about it? In attempting to answer this question, we will argue that while the transmission of information about specific past events might – under some circumstances – allow for the teaching of generic information and the dissemination of reputational information to others, its main purpose is to justify claims about present social entities such as commitments, entitlements, and obligations.

The reason for this is that a large part of our social ontology is reliant on representations of history. Therefore, testimony will sometimes be helpful in coordinating what social realities we take to obtain. In Section 5 we thus develop an account of how the dependency of many ‘social facts’ on particular past events might make communication about these events necessary. On this view, transmitting the events that causally ground a given social fact will sometimes be the only way in which the existence of this fact can ultimately be established. To the extent that there is no other way to independently track the social effects of a given event, testimony about this event will be important in order to signal its existence and thereby coordinate the shared representation of social reality with others.

2. The Nature and Communicative Function of Episodic Memory

Adult humans seem to have two main ways in which they can cognitively represent information about past events. On the one hand, information about specific past events can be rep-

² Note that, while our current motivation for answering this question rests on our account of episodic memory function, both the question of why the past is special as well as our answer to it are not dependent on this account and can be debated independently from our view on the communicative function of episodic memory.

resented propositionally in semantic memory, as in “The Berlin Wall fell on the night of November 9th, 1989.” While this way of representing information about events is common, humans also recall events as rich, quasi-perceptual representations of specific past episodes (Mahr, 2019; Clayton & Russell, 2009).³

However, episodic memories are more than just mental representations of specific, past events (Mahr & Csibra, 2018). One represents in episodic memory not only that a given event occurred, uniquely, in the past, but further how one came to acquire information about this event: By having had first-hand experience of it (Dokic, 2001; Perner & Ruffman, 1995). This is illustrated by the fact that while even infants demonstrate the capacity for recalling unique events (Bauer & Leventon, 2013; Maguire & Mullally, 2014), only children around 5 years of age seem to be able to represent such unique events as sources of their beliefs (Haigh & Robinson, 2009). It is this additional piece of source information that grounds the ‘autonoetic’ character of episodic memory (Tulving, 1983; 2002). Episodic memory proper therefore is the outcome of inferential processes making explicit the way in which a given event representation relates to a given belief about a past event: namely, as a source of this belief (Burge, 1993; Teroni, 2014). In other words, when we remember the past, we commonly take ourselves to believe in the occurrence of whatever we remember *because we experienced it*.

³ Recently, a lot of research on episodic memory in cognitive psychology and cognitive neuroscience has focused on the neuro-cognitive *similarities* between remembering the past and imagining the future (e.g. Addis, 2018; Schacter et al., 2012). However, it seems to be sometimes forgotten in this research effort that remembering *the past* and imagining *the future* are obviously and crucially different activities (Mahr, 2019). Even though these capacities might share a neuro-cognitive substrate, they must have obviously been subject to different selection pressures (e.g. Hoerl & McCormack, 2019): the past plays a fundamentally different role in our lives than the future does (Mahr, in press).

2.1. The role of sources in communication

Communication amounts to an attempt by a sender of information to influence a receiver's mind in a specific way (Dawkins & Krebs, 1987; Krebs & Dawkins, 1978; Sperber & Wilson, 1995). For complex, reciprocal systems of communication to remain evolutionarily stable, mechanisms have to be in place assuring that communicative behavior remains (on the whole) beneficial for both senders and receivers.

On the one hand, in order to ensure that the overall influence of the communicated information is beneficial for them, receivers must have capacities allowing them to scrutinize sources for trustworthiness, reliability and competence, and communicated information for believability (Sperber et al., 2010; Mercier, 2017; 2020). If such 'epistemic vigilance' mechanisms were not in place, receivers would not be able to judge which pieces of communicated information they ought to believe. Consequently, receivers would often be misled and exploited by senders and thus, on average, not gain from attending to communicative signals. On the other hand, speakers require capacities allowing them to influence receivers' minds effectively in spite of such vigilance. Both the mechanisms of epistemic vigilance and the mechanisms to overcome such vigilance are crucially dependent on the cognitive capacity to represent source information.

One way in which source information is important is because it can serve as a reason (Mercier & Sperber, 2011; 2017; Mercier, 2016). On the side of the sender, reasons are important insofar as one can supply them to convince an interlocutor who would otherwise not accept what one has to say based on trust alone. Thus, if someone can point to whatever caused them to believe something (their own reasons), this might be good enough for others to believe it, too. On the side of the receiver, one has to be able to tell good reasons from bad ones when deciding what to believe. This also means that the better senders are at

giving reasons the better receivers should be at processing and scrutinizing those reasons, and vice versa.

2.2. The communicative function of episodic memory

Source information is also important in communication because it allows speakers to regulate their conversational commitments. Making an assertion commits the speaker to the truth of whatever she asserts (Brandom, 1983; Turri, 2011): The speaker accepts that if she is found to be wrong she will incur direct or reputational costs. The fact that the speaker is willing to incur such costs can serve as a signal for her audience to accept whatever she claims. Thus, the stronger a speaker commits to a claim, the more convincing she should be (Mazzarella et al., 2018; Vullioud et al., 2016). Therefore, speakers should be able to regulate such commitment appropriately since over- (or under-) commitment can be costly. One of the basic ways in which such commitments can be regulated is by claiming or deferring epistemic authority about whatever one asserts (McMyler, 2007). If the speaker claims to have acquired the information in question first-hand, she at once claims epistemic authority and makes herself directly accountable for the truth of her assertion. This should in turn cause the speaker to be more strongly committed and hence more convincing compared to a case in which she defers accountability to another, second-hand source. Representing and being able to communicate sources can thereby serve a variety of goals: sources can be used to convince (“I saw it with my own eyes”), to take credit (“I found the solution on my own”), or to hedge one’s bets (“It’s only something I’ve heard”) (see e.g. Altay & Mercier, 2019; Silver & Shaw, 2018; Shaw & Olson 2015).

Considering the extent to which source information is therefore useful in communication, it is not surprising that such information is grammaticalized in about one quarter of all recorded languages as evidential markers (Aikhenvald, 2004; Nagel, 2015). Moreover, even

languages who do not encode evidentiality grammatically, have numerous other ways to express a speaker's source (Aikhenvald, 2004).

Episodic memory thus allows us to do two things: (1) represent the grounds on which we formed a given belief in the first place, which we can then transmit as reasons to others or use to decide when to change our mind, and (2) regulate the extent of our commitments in discourse by highlighting whether a given event representation originated in our own first-hand experience or not (see also Jablonka, 2017; Poole, 2008; for a view applying a similar idea to collective memory see Seeman, 2016). Of course, this is only the first layer in a complex web of potential source information. On the basis of an episodic representation we can discern whether we have seen, heard, inferred etc. information about a given event (Johnson et al., 1993). Such more fine-grained source distinctions are important because they allow one to calibrate the communicative effects of one's statements as well as answer potential challenges to one's authority ("How do you know?") more precisely than simple expressions of confidence would (Vulioud et al., 2016) and might further be useful in deciding what is informative for one's audience (Nagel, 2015).

2.3. Why do we care about the past?

If the above account of episodic memory is correct, remembering allows humans to give testimony: it allows us to decide when we can speak about the past as witnesses, that is, on the basis of first-hand experience. But why are representations of specific, past events important enough to require the inclusion of source information in the first place? In principle, one might think that such a system could apply to the representation of any type of information, including semantic, propositional facts. Autonoesis, however, is specific to representations of unique, past events, regulating the speaker's communicative commitments for claims about such events and allowing listeners to decide when to revise their beliefs. In

other words, if auto-noesis indeed serves as a signal of epistemic authority, why is it specific to past events? What is so special about the past that requires a dedicated mechanism managing claims of epistemic authority about it? Why are claims about history important enough to require justification?

One way to approach this question might be by thinking about how knowledge about the past can be relevant to human fitness. Changes in fitness can inherently only exploit possibilities in the present and future (Klein et al., 2002), but there are two obvious ways in which knowledge about the past can nonetheless be fitness relevant. On the one hand, knowledge about the past might support the learning of regularities in our environment. If we know what happened, we might be able to use this information to inductively infer regularities in the way our environment works and therefore form appropriate expectations about what will happen. On the other hand, however, knowing about the past can be important because some past causes have effects that only manifest after some time in the future (as in the case of infections, for example). In this way, knowing what happened might allow one to predict what will happen or what is the case. Now, can we apply these insights to the question of when the *transmission* of information about the past might be fitness relevant? After all, episodic memory is structured so as to facilitate the transmission of information about the past and the special status of the past seems to be particularly prominent in human social life.

It might seem plausible to answer this question by pointing to the fact that the communicative transmission of a past occurrence could function as quasi-experience for others to form judgments about. If we can transmit our own experience to someone else, to the extent that our interlocutor believes us, she might vicariously learn from this experience just as if it was her own. This fact alone would be a good reason to sometimes require justification for claims about the past. However, not all judgments are equally well transmitted in this

way: learning from social information transmission will usually benefit most from generic statements rather than claims about specific events. After all, one of the greatest benefits of human communication is that we can transmit generic information directly to others, without being reliant on individual learning episodes (Csibra & Gergely, 2011).

Moreover, it is not clear what role the ‘pastness’ of our experience would play in allowing others to learn from it. The transmission of information about specific *past* events is not identical to the transmission of information about specific events in general. That is, instead of asking what we can vicariously learn from the transmission of information about specific events, we have to ask what we can learn from the retrospective representation of such events that is important enough for event information to play a role in its transmission.

In what follows, we will therefore explore what kinds of judgments (1) are particularly sensitive to the kind of evidence provided by claims about specific past events and (2) carry particularly high social consequence so that humans would care about, and consequently regularly require additional reassurance in their transmission.

3. The Past Supports Learning: Generics and Reputations

When asked what kind of inferences are well supported by reference to past events, most would feel inclined to point to induction. Clearly, to the extent that a given judgment is supported/supportable by inductive inference, it will benefit from reference to past experience.⁴ We might thus care about what happened on particular occasions in the past because such events increase the potential sampling base behind our inductive inferences leading to our generic beliefs. After all, one way to arrive at a generic belief is by generalizing

⁴ One way to spell out this intuition is to say that testimony is appropriate in facilitating the transmission of a given judgment to the extent that this judgment is projectible (Goodman, 1983). Roughly, a judgment is projectible if it licenses generalization from a circumscribed sample to a general conclusion, that is, if it licenses induction. The kinds of representations that are sensitive to induction are generic beliefs.

over specific instances. Thus, the claim that “It rains on Thursdays in Los Angeles” could be supported by pointing out that it rained when I was there on Thursday last week (i.e. my testimony).

However, while inductive learning can be supported by evidence from specific past events, neither the specificity nor the pastness of such events is important for such learning (if it is Thursday *today* and it is raining in Los Angeles *now* this takes nothing away from the inductive power of the event). What matters instead is that the specific instance of an occurrence follows a regularity that allows for generalization. Thus, generic beliefs are only sub-optimally justified by retrospectively pointing to particulars simply because individual cases might not say much about the general pattern under scrutiny. If one inductively generalizes over a number of instances, one disregards exactly what is particular about each one. The effectiveness of pointing to a specific experience in justifying a generic claim will therefore commonly be limited simply because that experience could be an outlier.⁵ The fact that it rained last Thursday in Los Angeles does not necessitate, after all, that it will normally rain there on Thursdays.

Moreover, while pointing to specific past events can be helpful for the justification of inductively derivable generics, generic beliefs are sensitive to all kinds of evidence. Your general meteorological knowledge, for example, might tell you that the weather is unlikely to conform to the days of the week. Thus, generic beliefs are not dependent on reference to specific past events in order to be justifiable and can also be effectively transmitted by reference to other generic facts one holds true (Prasada, 2000).

⁵ To be clear, we are not claiming that claims about history cannot be used in order to support inductive generalization; they are simply not well suited to do so.

3.1. Bounding and exemplifying generics

There are, however, two other potentially more effective ways in which the transmission of generics can be supported by claims about specific events. First, as Klein et al. (2002; see also Cosmides & Tooby, 2000) have pointed out, claims about specific events can set bounds on how far a generalization might extend. Going back to the example of “It rains on Thursdays in Los Angeles”: Pointing out that it did *not* rain when I was there last Thursday provides a good counterexample. The universally quantified version of this assertion (“It rains every Thursday in Los Angeles”) can simply not be true if this specific event occurred.

Knowledge about specific events can therefore allow listeners to debate the scope of an assertion. The bounding function of specific events seems particularly useful for the purposes of epistemic vigilance: if we are confronted with a universal claim, but we can come up with a specific instance in which it did not hold, we should, if at all, only accept a more modest version of the claim in question.

Second, instead of being just one more data point for an inductive generalization, communicated information about a specific event might serve as an exemplar (Shafto et al., 2008; 2014): a general pattern might be ‘illustrated’ and thereby supported by pointing to one specific, diagnostic instance in which it occurred (cf. “strong sampling,” Xu & Tenenbaum, 2007). You might, having never encountered a panda bear, wonder whether they are dangerous. You ask a zookeeper, who tells you that he was bitten by one once. On the one hand, as discussed above, this might cause you to inductively increase your belief in the hypothesis that panda bears are indeed dangerous. On the other hand, however, the simple fact that the zookeeper chose this specific episode from his experiences with panda bears to answer your question should cause you to treat this information as being diagnostic of a more general pattern of panda bear behavior. In other words, this episode would not make the hypothesis that panda bears are dangerous more believable because it would provide

one more instance to inductively generalize from. Instead, the listener will assume that the speaker picked that episode to share because it provides the best example to learn from and this in turn would make the target claim more convincing. A specific event can therefore serve to justify a general claim in virtue of its exemplary character.

One benefit of pointing to specific events as exemplars is thereby that one does not have to make explicit the target claim one aims to transmit. Simply pointing out that “I was bitten by a panda bear once” will sometimes be enough to make one’s audience infer that they must be dangerous. Providing exemplars, however, will likely be mostly necessary when reasons in support of a prior claim are requested. After all, as mentioned above, one of the main advantages of communication in the first place is that we can transmit ready-made generalizations to others. Only when challenged, will pointing to a specific episode (in the form of testimony) become necessary.

According to what we have discussed so far then, we should expect people to care about what happened at specific occasions in the past primarily because (1) past events can set bounds on generics, allowing us to evaluate and contradict them, and (2) because past events can serve as exemplars for transmitting generics to others in argumentation and teaching.

3.2. Disseminating reputations

Humans can teach, argue for and evaluate almost anything by pointing to exemplifying events (or chains of events). In these cases, providing reasons in the form of specific events functions according to the same principles as argumentation in general (Mercier & Sperber, 2017). A claim will require justification if the audience does not trust the speaker enough to accept her claim on that basis alone. Consequently, justification will be required when the stakes of being misled or the incentives to mislead are high.

While this is true in many specific contexts, a domain where these conditions are met very consistently are claims affecting others' reputation. According to Dunbar (2004), the most common topic of conversation is social evaluations: As much as 65% of casual conversation concerns social topics (about others' interactions, behaviors and traits) (Dunbar, Duncan, & Marriott, 1997). People's interest in others' behaviors and interactions is enormous even when they themselves are not involved (DeScioli & Kurzban, 2009), and this pattern does not seem to be exclusive to Western societies: Zinacantan people in Mexico similarly have been reported to spend 78% of conversational time talking about such social topics (Haviland, 1977).

This phenomenon is commonly termed 'gossip' (Foster 2004) and has been proposed to be essential in the stabilization of cooperative group living (Dunbar, 1998; Wu, Balliet, & Van Lange, 2015; 2016a; 2016b). Dunbar (2004) has argued that the transmission of social evaluations plays an essential role in the stabilization of our conditions of communal living. The reason for this is that information about someone's past behaviors are often taken to be diagnostic about her future behavior; that is, that such information potentially licenses trait inferences.⁶ Once trait judgments become shared across a group, they develop into reputational information.

By disseminating reputational information through a given social group, the transmission of social evaluations allows us to go beyond our personal experience when assessing the state of our social network and the dispositions of others (Sommerfeld et al., 2007). This in turn is taken to fulfill 'policing' functions (Foster, 2004), effectively implementing a form of social control because what someone believes about others' traits will determine who she associates with and how she interacts with them. Therefore, if one can manipulate others'

⁶ Crucially, such trait-inferences do not have to be valid as research on phenomena such as the 'fundamental attribution error' (Ross, 1977) and the 'correspondence bias' (Gilbert & Malone, 1995) shows.

opinions about a specific person, one can effectively control coalitional associations as well as cooperative opportunities. This explains why people gossip so much about others' past behaviors and are careful about tracking (their own and others') sources of this information (Wilson et al., 2000). They have to justify, and be vigilant against being misled about claims affecting others' reputation because of the various ways one could take advantage of changing someone's reputation (Hess & Hage, 2006). Indeed, one's conversational commitments are rarely more important than in the domain of gossip. Where a piece of gossip originates from, and how far a given speaker is removed from having experienced the episode in question herself, are crucial both for how believable the gossip is and who is responsible for it (Giardini & Conte, 2011).

4. The Past Generates Entitlements, Obligations, and Commitments

So far, we have identified generic beliefs as one kind of judgment the transmission of which can be supported by referring to specific past events. Moreover, we have argued that the transmission of judgments about others' traits and dispositions are a domain where incentives to mislead and risks to be misled are regularly high. That is, we should expect source claims and the modification of conversational commitments they allow (i.e., testimony) to be particularly important in the transmission of trait judgments; i.e., in gossip. Claims about specific past events are, however, not only relevant in the transmission of generic beliefs, and generic beliefs can be transmitted without ever referring to such events. In fact, as mentioned above, past events play a role in the transmission of generic beliefs not necessarily in virtue of the specificity or pastness of these events but rather as input to inductive learning machinery or as examples of a more general pattern. To explain why the past *for its own sake* seems to have such a special status for human beings, we should look for a domain in which retrospective reference to particulars is *required*.

A further reason for why the transmission of generics, including reputation, may not provide a sufficient evolutionary pressure for the development of testimony is the fact that the main beneficiaries of teaching and of the spread of reputational information are the recipients of such communication: They acquire knowledge to be used in the future, which may have fitness consequences. While there might be other factors that would make these types of communication fitness enhancing for communicators (e.g., reputational gain), these would only be indirect benefits. It is therefore worth asking if there is an explanation that relies on direct fitness enhancement for the person who gives testimony. How could the speaker's, as opposed to others', fitness benefit from testimony?

4.1. Type and token causes

One domain where this might be the case is causal judgments. The relationship between past and present is commonly conceived of in terms of causal relations. People constantly infer causal relations between events unfolding around them (Gopnik, 2000). Nevertheless, while causes are events, the representation of causal relations as such does not require the representation of specific events: causes are often represented in terms of 'type causation' ("being shot kills people"). What does require the representation of a specific event, however, is the retrospective inference from a specific, token effect to its token cause ("Mark died because he was shot"). Crucially, such a retrospective inference requires not just the representation of an event as the cause of an effect, but also its representation as having occurred temporally before the effect, i.e., in the past. Moreover, while in principle an unbounded set of causes underlie any given effect, humans commonly represent causes and their effects as standing in a one-to-one relationship; in other words, specific token effects are often represented as having specific token causes. Token causal judgments then

have all the qualities that would seem to make the representation of past events necessary in order to link causes to effects.

Token causal judgment is a domain in which particulars (i.e., specific past events and their counterfactual derivatives) are crucial (Campbell, 1996). Epistemic authority about the actual occurrence of specific past events might thus matter particularly in the transmission of causal judgments as causal explanations.⁷ Note, that *type* causal explanation requires claims about the past experience of a specific event only in so far as they are relevant to the transmission of generic causal beliefs more generally. Claims to personal experience will, thus, be particularly powerful in the transmission of *token* causal judgments.

4.2. Physical and social effects

The benefits of making token causal judgments may depend on the nature of the effect in question. Finding a token cause for a *physical* effect is an inference to a specific, past event, but establishing this causal relation affects our future fitness only to the extent that it allows us to inductively generalize it (and use this generalization, for example, in planning future actions). While causal thinking is a powerful learning engine allowing us to understand, predict and explain contingencies in our environment, these benefits only partially apply to thinking in terms of token causes: particular instances of causation serve as learning opportunities mostly in light of our capacity for building causal maps from representations of type causal relations. Moreover, token instances of causation can usually only be interpreted through the application of type causal assumptions and serve as opportunities for learning only in so far as they inform these assumptions. In the physical domain, token causal judgments are therefore most important as inputs for inductive learning mechanisms.

⁷ In order to play a role in causal judgment itself, the representation of event information is sufficient. Epistemic authority about the event in question (and hence remembering proper) only becomes relevant in the transmission of such causal judgments.

As we have argued above, however, inductive inferences are not optimally transmitted through testimony.

This is similarly true for retrospective causal inference: Say you arrive in your office one day to find that your computer screen is lying on the floor and does not work anymore. When you ask your office-mate what happened, she informs you that one of your co-workers threw your screen on the ground in a fit of frustration. Regarding the purely physical cause-effect relations at play here, this information will be relevant to you in so far as it informs you that computer screens tend to stop working when thrown on the ground. That is, you will benefit from knowing the physical cause of why your screen stopped working in so far as you can infer a type causal relationship from this specific instance. You might then, for example, fix your screen to your desk so as to avoid it falling or being thrown on the ground in the future. In this way (i.e., via a type causal inference), information about token causal relations can impact your future behavior adaptively.

For humans, however, causes instantiated in specific past events are often more than opportunities for learning about our physical environment via type causal inferences; they may have important social implications, too. Many physical or biological causes produce not only physical but also social effects. If I manually create an artifact, I may earn rights to use it or own it; if my aunt dies, I may inherit some of her property; if your dog kills my lamb, you may have to compensate me; if I father a child, I may have to contribute to her upbringing; if a landslide destroys my crop, I may be relieved from the duty of contributing to the common good; etc.

Note that while some, but not all, of these events are actions of social agents, all of them produce lasting changes in the physical environment. However, crucially, they also produce social facts: Someone becomes/ceases to be the owner of a resource, a father, a debtor, etc., thereby producing entitlements and obligations that have fitness consequences for the fu-

ture. And because, unlike the physical/biological effects of the same causes, these social facts are not perceivable, only the causes that produced them in the past prove that they obtain. In fact, these causes are thought to play a constitutive role in them. To a large extent, this explains why we are bound to care so much about specific past events (including their actual details).

Going back to the example of the broken screen above: The crucial inference you will likely draw from the information that your co-worker threw your screen on the ground will in fact not be a type-causal relation. Instead, you will form an accountability judgment that serves as the basis for a claim to an entitlement for compensation. That is, in this case, knowing the specific token cause will have an effect on your future fitness not (primarily) by allowing you to learn about type causal relations but by allowing you to infer and transmit the social effects produced contingently with the physical ones.

4.3. When testimony is necessary: communicatively generated commitments

People see certain physical events as generating (and sometimes even constituting) social effects. Thus, occurrences of certain specific past events can inform us about present and future social entitlements and obligations, and since these social effects exist primarily as mental representations, testimony about such events can be an important argument during negotiations of entitlements. However, strictly speaking, testimony is not the only way to prove the occurrence of such events. Even though the social consequences of such events (e.g., the entitlement for compensation) are not perceivable, their contingent physical effects (the broken screen) can still be traceable. This in turn, at least in principle, may allow retrospective inference from effects to their causes without relying on the testimony of others. One can always try to do the detective work backwards from the physical effects to infer, and argue for, the cause and thereby for its social effect. The craftwork on an artifact may

show who created it; the exhumed corpse of my aunt can prove that she really died; the injuries of my lamb may reveal that your dog was the culprit; fatherhood can be inferred from DNA tests or from facial resemblance; the change of the landscape provides evidence of a landslide; etc. Thus, while testimony (and the episodic memory it requires) is useful to argue for the validity of a given social fact in all of these cases, it is not mandatory: Contingent physical effects may allow us to infer the past physical (or biological) causes that induced the present social facts in question.

Nonetheless, once the ability to represent the social effects of events emerged in human evolution, it likely made the ability to refer to the past on the basis of remembering it (i.e., testimony) extremely useful. Once in place, however, this ability could then have given rise to new forms of commitments that do not necessarily rely on traceable physical effects: Promises, agreements, bets, and marriages are all examples of social effects which do not necessarily leave physical traces behind. Instead, they are generated by communicative acts. These instances of communication normally have no correlated, lasting physical effects. Therefore, not only their social effect but also the cause itself exists only in the mind of the participants.

If Margaret promises Elena that she will be back home by 7pm, the effect of this promise (i.e., that Margaret is now committed to a certain behavior) is not observable; it survives – if at all – only in the minds of Margaret and Elena (and any possible witnesses). Nonetheless, the promise-commitment relation here seems to be of the same kind as the token cause-to-token effect relation described above.

The proof that such a cause occurred could only come from testimony - hence the necessity of episodic memory. In a sense then, social effects of this sort have an inherent 'dual temporality'. On the one hand, they are about the future: A promise obliges to a behavior, an ownership transfer entitles the beneficiary to privileged use, etc. Nonetheless, once es-

tablished, the existence of the ensuing obligations and entitlements can be justified or proven only by reference to the past event that established them. Without the ability to communicatively refer to the past, such practices could not have developed.

Crucially, it is exactly because of the dependence on testimony of these causal events that societies developed ways to ensure their provability by recruiting witnesses for ceremonies, and (only more recently) by creating correlated physical effects of these 'non-physical' causes in the form of documents (contracts, certificates, memoranda, bills, records, etc.; e.g., Basu et al., 2009). That is, the ephemeral nature of the cause-effect relationship in social commitments induced the cultural evolution of a host of 'commitment devices' (Fessler & Quintelier, 2013), designed to alleviate reliance on individual memory alone by requiring the commitment event to become physically traceable in one form or another. Further, events grounding explicit commitments are often ritually structured so as to be public and easily referable: a promise is accompanied by a handshake, a marriage by a ceremony, etc. Making a commitment public, for example, not only increases the cost of possible defection but also coordinates the representation of this social fact in the community. It is worth noting, however, that while unperceivable social facts (ownership, kinship relations, social status, etc.) are frequently signaled publicly to make sure that others are aware of them without having to prove them again and again, these documents do not simply indicate that certain social facts obtain but are also designed to prove that the specific cause that brought them about indeed occurred (this is why date and place, which together individuate a specific episodic event, are included in them).

Before we continue, let us recap the argument we have developed in the last two sections. Information about specific, past events can be used for various purposes. It can support inductive inferences about projectible properties of objects, agents, situations, and causal relations, which support the acquisition of generic knowledge about kinds, individu-

als, and type causal relations. However, this purpose can be achieved in various other ways as well, and so it does not require the preservation, representation, or testimony about, past events. A special subset of token causal events, however, produces not only (or no traceable) physical effects but also social facts that allocate entitlements and obligations to specific individuals or groups. These social facts are generated by their own token causes, and therefore the ultimate proof of their existence is evidence of the occurrence of these token events. Episodic memory and testimony of past events can thus be crucial for the stable maintenance of such social facts in the community (see below). In fact, reliance on communicatively established commitments (such as promises), which may not leave any physical trace behind, could not even emerge without cognitive mechanisms that ground both prospective memory, to ensure fulfillment, and retrospective memory and testimony, to ensure accountability.

5. The Historicity of Social Facts

What then is the relationship between social facts (obligations, entitlements, commitments, etc.) and episodic memory? It has been proposed that memory capacities are necessary for enabling certain forms of social interaction of the sort 'who did what to whom' (e.g., Stevens & Hauser, 2004). However, tracking social relations of this kind can also be accomplished by cognitive 'bookkeeping' mechanisms that keep and update scores of interacting agents upon each encounter. A given interaction would then be interpreted depending on the score of each agent involved (e.g., Nowak & Sigmund, 1998). In this way, nothing about the event in question has to be remembered, because its outcome simply updates such a score. Say, Isa lends 5 Euros to Rahmeed. In order for Rahmeed to reciprocate and pay Isa back, all he has to keep in memory is that he now owes Isa 5 Euros. Nothing else about the lending event itself has to be remembered.

A number of different authors have proposed that such a tracking mechanism could have been implemented through an ‘attitudinal’ (Brosnan & DeWaal, 2002) or emotional scoring system in non-human animals (Schino & Aureli, 2009; see also Gervais & Fessler, 2016). It is likely that in many situations exchange-related information is tracked in a similar manner in humans (Bell et al., 2017; for a modeling approach related to this issue see Kleiman-Weiner et al., 2016). The representation of specific, past events is therefore not a requirement for maintaining stable pairwise social relations. Learning from ‘exchange events’ is similar to learning from events which have no social consequences: one can draw inferences from such events without storing much of what happened.

While commitments and entitlements can only ultimately be proven by reference to specific past events, the representation of their existence does not depend on the capacity to recall specific past events. In order to know that John owns his car, you do not have to remember anything about the event in which he acquired it (even though you have to assume that there was such an event). Why should the transmission of the privately represented social effects of a given event be important then?

5.1. Maintaining and stabilizing social facts

The social effects produced by ordinary physical or biological events have to be maintained by some forms of public representation, such as face-to-face communication. After all, they often exist only in the minds of individuals, and communication is the main means by which these effects become and remain shared. If they are not shared, social facts do not fulfill their function, so it is in everyone’s interest to coordinate them appropriately.

Put differently, in order to become social facts, the privately represented social effects of events have to be shared and agreement about them has to be established. Ownership, social structure, and social roles are good examples here: they may also be marked by perma-

nent public signals to ensure common acceptance even in the absence of direct verbal communication. Social facts such as these may be generated by token causes, but their shared maintenance depends on communication, and if their existence is disputed, they can be negotiated by reference to the events that brought them about. Social facts inherently depend on public agreement, and to achieve such agreement, the past events grounding a given fact have to be available. This is important not only in cases of conflict. Rather, it is simply not possible to decide privately whether a given social fact indeed applies. While one can represent a social fact as such without entertaining the (historical) reasons why it obtains, in communication such reasons might have to be explicitly invoked as the ultimate argument for its existence.

Crucially, for humans, an event can be ambiguous as to what social implications it establishes. A given episode is often important not just because of factual occurrences but for the myriad ways in which these events *could have* turned out. What a person *did not* do, and what her intentions were in acting, for example, are essential in computing the ways in which commitments should be distributed (e.g. Gerstenberg et al., 2018). While humans have a host of specialized cognitive mechanisms that enables them to carry out such computations online, the transmission of the conclusion will often require justification. Distinguishing between, for example, incompetence and malevolence will sometimes require that one refers to details of the specific action in question. While malevolence should trigger punishment or ostracism, incompetence does not necessarily call for these reactions (see Nowak & Sigmund, 2005 for why the ability to make such a distinction might be important). The social coordination of the representations of implications of specific events will thus often unavoidably require communication about such events (for a similar point see Pietraszewski, 2016).

Testimony, therefore, helps to maintain and coordinate the validity of entitlements, obligations, and commitments within a social group. While it might also serve other important functions, testimony can play a ‘signaling’ role in advertising the existence of certain social facts: I claim that this knife is mine and I justify it by the fact that I made it, or that I inherited it, or that it was donated to me, etc. It does not necessarily require an open challenge or violation of property rights to make these assertions; in the absence of a permanent symbol system to mark ownership and other entitlements, repeated declarations of social facts may be necessary to maintain their shared nature and to let newcomers know about them.

Note that this conclusion does not require that communicatively coordinating social facts should always, or even necessarily, involve pointing to specific past events. After all, beliefs can be transmitted on the basis of trust alone, without requiring the representation or transmission of reasons. Moreover, social effects affecting a whole community are commonly structured so as to be purposefully independent of individual testimony. Events establishing important social effects are ritualized or designed so as to generate public knowledge from the outset by either generating concomitant physical effects (e.g., documents) or many witnesses. In this case, testimony becomes less important.⁸ In fact, the motivation to make such events independent of individual testimony has likely led to the development of technologies allowing for the generation of public knowledge.

Once public knowledge about a given social fact has been established it will rarely be challenged: marriages or kinship relations rarely, if ever, become a matter of dispute. There-

⁸ Events that only affect a subset of group members are therefore often more likely to become the subject of transmission by testimony because these are often not structured so as to produce public knowledge or leave intentional records. This is another reason why testimony about other group members is common in gossip: this information is not just interesting because it potentially allows interlocutors to draw trait inferences but also because of the fact that we can effectively transmit commitments, entitlements, accountabilities etc. in this way. The fact that the mayor has been cheating on his wife with his secretary, for example, will likely become the subject of testimony of individual community members while the fact that he is the mayor (while similarly dependent on a specific past event) will rarely have to be testified to because commonly everyone already knows about it and there are documents proving it.

fore, social effects that affect the whole community will often not depend on testimony to be maintained because they generate public knowledge or are otherwise made traceable for everyone. One reason for this, however, is that they are assumed to be ultimately appropriately justified by past events, which can be made available in one form or another in case of doubt. Only the possibility of pointing to the establishing event in any given case ensures that disagreements about the fact in question could be resolved in principle. Many social facts are simply such that only their establishing event can ultimately arbitrate whether (or in what way) they obtain. If there was no way to refer to or to make available these events, there would be no way to ultimately ensure the appropriateness of claims about such social facts, and consequently to justify the ensuing entitlements and to enforce their fulfillment.

Nonetheless, if our analysis here is correct then the capacity for testimony, underpinned by human episodic memory, must have enabled the capacity for coordinating certain social facts in the first place, and for generating new types of social facts that could not even exist without testimony. The reason for this is *not* that such commitments require episodic memory to be cognitively traceable and behaviorally implementable by the individuals involved. Rather, they require testimony to be shared in a community. This is because in some cases there could be no fact of the matter whether a given obligation, entitlement or commitment applies without the potential of testimony about the specific, past event causally grounding the social effect under dispute.

5.2. Motivated remembering, memory bias, and narrativity

The above argument predicts that episodic memory is motivated (and hence to some extent biased) by design so as to justify one's own present entitlements (see also Lambek, 1996). Mahr and Csibra (2018) argued that one way in which such a bias manifests is through 'recollective my-side bias.' Episodic memory construction is more likely to confirm

and support our prior beliefs than to contradict them. However, this might not be the only source of architectural bias in episodic memory. Episodes are neither retrieved nor communicated as atomized particles but as narratives. Testimony is not just given as a series of propositions but it is narrativized in a way that makes it more likely for the audience to draw certain inferences over others. According to Keven (2016; Keven et al., 2017), episodic memory retrieval includes a mechanism (referred to as 'narrative binding') connecting isolated event representations by inferring not only temporal ('X happened before/after Y') but also causal ('X occurred because of Y') and teleological ('X occurred so as to bring about Y') relations between them. On this view, episodic memories allow us to understand the past so as to make sense in light of causal and teleological relations between different events as well as their connection to the present (Bietti, Tilston, & Bangerter, 2018).

How did I get to work this morning? I went to the bus stop to get the bus at 7:45 but the stop was closed because of a construction site and so I had to take the metro to work instead. Already this minimalistic account of the events of this morning includes a significant amount of selection and interpretation in so far as certain events and their causal/teleological relations are highlighted and others left out. In order to effectively argue for the validity of a given social fact, making the temporal relations between events available is not enough. Instead, we have to be able to bind events in a way that highlights the causal connections in question (e.g., having been forced to change the mode of transport this morning added delay to my travel and caused me to be late for work). Narrative binding processes therefore always include a modicum of interpretation: relating events causally and teleologically includes a selection process in which certain events are highlighted over others. Narratives are often effective because they display events as being (causally and teleologically) related in a way that suggests certain conclusions over others. The fact that episodic memory is narrativized and often biased in favor of present beliefs, attitudes, and goals (Anderson &

Haslmayr, 2014; Coman et al., 2014; Conway, 2005; Kappes & Crocket, 2016) follows from its crucial communicative role in establishing social facts in the present through reference to history. Thus, on our account, remembering (both individually and collectively) does not necessarily only or even primarily function to produce an accurate representation of the past.⁹

Moreover, our account provides a new perspective on the question of why we care so much about the accuracy of our representations of the past in the first place. Phenomena of memory fallibility and inaccuracy contributed to the birth of experimental psychology (Ebbinghaus, 1885; Bartlett, 1932) and continue to constitute one of its major areas of research (e.g. Schacter, 2001; Kurkela & Dennis, 2016). More generally, humans have devoted entire academic fields to the accurate reconstruction of history. While humans surely have a general instrumental interest in the accuracy of their representations, to the extent that humans in general (and academics in particular) have a special interest in the accuracy of representations of the past, this interest is likely at least partly explained by the social importance of the past for the present.

5.3. Accountability judgments and the role of social norms

One might propose that testimony not only plays a role in signaling and coordinating the validity of social facts, as we argued above, but is moreover of crucial importance in the enforcement of social norms themselves. After all, the context in which testimony seems to matter most in contemporary societies is the legal domain. Testimony has been investigated by cognitive psychologists mostly in the form of eyewitness testimony for crimes (e.g., Neisser, 1981; Wright et al., 2009), and ethnographic accounts have often particularly fo-

⁹ For a more in-depth discussion of the accuracy-constructiveness (or, as Conway, 2005 calls it “coherence-correspondence”) trade-off as well as different memory errors not mentioned here and how they relate to the current perspective, see Mahr and Csibra (2018).

cused on the role of witnesses in the legal domain (e.g., Gluckman, 1955). Thinking about the relationship between our capacity for testimony and norm enforcement, one might thus conclude that testimony enables the enforcement of social norms by informing others about the violation of those norms. Without the ability to share information about such violations, people would always be dependent on first-hand experience in judging whether a norm has been violated, which would not make it possible for norms to be widely enforced by third parties/communities in general.

In our view, however, the role that testimony plays in norm enforcement is just a special case of the more general role we have outlined above. In essence, sharing event information pertinent to norm violations aims to transmit a judgment - an *accountability* judgment - to establish a social fact about such accountability. That is, while accountability judgments as such are private, they can be justified and thereby transmitted to others by pointing to the event in which a norm was violated.¹⁰ The transmission of such a judgment aims to establish a shared representation of accountability, through which it would become a social fact. The enforcement of the norm in question, however, may follow from the accountability judgment itself, not from its transmission. Only once accountability has been established and is shared within a group, norm enforcement may ensue. The transmission of the norm violation event only serves to coordinate the representation of accountability and is not directly involved in the enforcement of the norm.

Thus, testimony is common in the social negotiation of accountability judgments because additional reassurance in communication about the past is required when the stakes are high. Arguably, as the domain of norm enforcement has become institutionalized, the forms in which testimony is given in this context (e.g., as 'eye witness testimony' under oath,

¹⁰ Again, while these events will commonly be actions, they do not have to be (the absence of action, for example, can just as well lead to accountability).

etc.) have become cultural institutions, too. Norm enforcement is facilitated through testimony because the fact of a norm being violated is sometimes not physically traceable. In fact, contrary to other domains, accountability transmission can hardly be alleviated from its dependence on testimony through cultural or technological solutions in principle: norm violations are usually carried out in a way that avoids their publicity or documentation.

Testimony, therefore, will often help in justifying and determining punishment. In essence, however, norm enforcement and our capacity for testimony are not dependent on one another. Norms can be enforced without the involvement of testimony, and testimony is effective and occurs outside the domain of norm violations and their enforcement. It is important to note here, however, that, the role of testimony in the transmission and coordination of social facts, depends, to some extent, on social norms in the first place. After all, what social consequences follow from a given event is commonly governed by social norms.

For example, in East Timor land ownership is negotiated based on a norm of first possession (Fitzpatrick & Barnes, 2010).¹¹ Due to such a norm, it becomes relevant who (or whose ancestors) first settled on a given piece of land in deciding disputes about land ownership. This particular past event would, however, entirely lose its importance as a way of determining present land ownership in the absence of a norm of first possession.

It follows from this point that our propensity to represent (and observe) social norms must have existed prior to the emergence of the role of testimony outlined here.

Nonetheless, while testimony might not play a role in the enforcement of social norms and commitments, it certainly makes them more effective. Our capacity to bear testimony changes the dynamics of social interactions in crucial ways. The possibility of testimony transforms the pay-off structure of two-person interactions into one in which third-parties

¹¹ The idea of first possession as a guide to ownership seems to emerge cross-culturally in human development by around 8 years of age (Nancekivelli, Friedman, & Gelman, 2019).

are always at least potentially present. In fact, (the possibility of) report has been shown to be highly effective in promoting cooperation (e.g., Wu, Balliet, & Van Lange, 2015; 2016b). People intensely care about whether their behavior is being witnessed by others and this concern emerges relatively early in development: By the age of five, children have developed a robust sense of the consequences of someone else witnessing their norm violations (and the communicative forms of aggression that can ensue) and adjust their behaviors accordingly. Five-year-olds behave more prosocially in the presence of peers (Engelmann, Herrmann, & Tomasello, 2012), when they believe to be watched (Piazza, Bering, & Ingram, 2011), or when their actions are witnessed by others (Leimgruber, Shaw, Santos, & Olson, 2012). On the one hand, these effects are likely to be due to the fact that witnessing someone's behavior might cause third-parties to draw inferences about their traits and accountabilities. On the other hand, people are likely aware that witnesses could pass on their evaluations via testimony. This would spread their judgments to the community, which might in turn motivate alliance recruitment against the observed individuals (Pietraszewski, 2016; Boehm, 2012) and potentially influence their reputation. In fact, gossip is likely to play an important role in this process: While (as discussed above) gossip regulates the spread of reputational information, it also serves as a norm enforcing device by transmitting others' accountabilities through reference to norm violating behaviors.

6. Conclusion

The main aim of this article has been to give an account of the role of representations of the past that makes it intelligible why it has such a special status for humans. The past plays a particularly crucial role in human social life. For humans, events do not only have effects in their physical but also in their social environment. The representation of such effects impacts our future fitness to the extent that we can establish the validity of the ensuing social

effects with others. Commonly, the only way this can be achieved is by retrospectively pointing to the event that produced the social effect in the first place. For this reason, the past becomes highly important to us and is also so frequently contested. It is this circumstance that makes the ability to remember the past in episodic memory particularly beneficial.

Episodic memory allows one to become a witness of the past and give testimony about it. Testimony is a way to facilitate the transmission of information about past events by conferring epistemic authority and increasing speaker commitment. Such facilitation is required in cases in which one's audience requires additional reassurance about whatever one is asserting. Given the extraordinary importance of representations about the past in deciding what social realities apply in the present, we should expect claims about history to be a context in which listeners regularly require such additional reassurance.

Testimony will thereby be most important in the negotiation and transmission of our own and others' commitments, entitlements, and accountabilities. Communicatively pointing to the past allows us to justify assertions about the existence of social facts, and a large range of cultural practices has developed exactly to alleviate the reliance of social reality on individual memory and testimony.

This view has consequences for how the evolution of episodic memory (the cognitive basis of testimony) must have looked like. Episodic memory might have developed only once humans were able to represent the social effects of the events in their environment. This ability, however, must have required the prior emergence of social norms determining these social cause-effect relationships. If no one represented or followed social norms, the past would lose its importance as a way of coordinating social realities. Once in place, our ability to testify about past events could then have also be used to transmit generic beliefs to others and thereby make reputation dissemination more effective.

Acknowledgements

This work was partly supported by a grant from the European Research Council (PARTNERS, #742231). We are grateful to Hugo Mercier, Kourken Michaelian, Csaba Pléh, Barbara Pomiechowska, Dan Sperber, and Denis Tatone for their valuable comments on earlier versions of this article.

References

- Addis, D.R. (2018). Are episodic memories special? On the sameness of remembered and imagined event simulation. *Journal of the Royal Society of New Zealand, 48*(2-3), 64-88.
- Aikhenvald, A. (2004). *Evidentiality*. Oxford University Press.
- Altay, S., & Mercier, H. (2019). I Found the Solution! How We Use Sources to Appear Competent. *Manuscript under review*.
- Anderson, M.C. & Hanslmayr, S. (2014). Neural mechanisms of motivated forgetting. *Trends in Cognitive Sciences, 18*(6), 279-292.
- Bartlett, F.C. (1932). *Remembering: A study in experimental and social psychology*. Cambridge University Press.
- Basu, S., Dickhaut, J., Hecht, G., Towry, K. & Waymire, G. (2009). Recordkeeping alters economic history by promoting reciprocity. *Proceedings of the National Academy of Sciences, 106*(4), 1009-1014.
- Bateson, M., Nettle, D. & Roberts, G. (2006). Cues of being watched enhance cooperation in a real-world setting. *Biology Letters, 2*, 412-414.
- Bauer, P. J. & Leventon, J. S. (2013). Memory for one-time experiences in the second year of life: Implications for the status of episodic memory. *Infancy, 18*(5), 755-781.
- Bell, R., Koranyi, N., Buchner, A. & Rothermund, K. (2017). The implicit cognition of reciprocal exchange: automatic retrieval of positive and negative experiences with partners in a prisoner's dilemma game. *Cognition and Emotion, 31*(4), 657-670.
- Bietti, L., Tilston, O., & Bangerter, A. (2018). Storytelling as collective adaptive sensemaking. *Topics in Cognitive Science*. doi: 10.1111/tops.12358
- Boehm, C. (2012). *Moral origins: the evolution of virtue, altruism and shame*. Basic Books.
- Brandom, R. (1983). Asserting. *Nous, 17*(4), 637-650.

- Brosnan, S. F. & DeWaal, F. B. (2002). A proximate perspective on reciprocal altruism. *Human Nature, 13*(1), 129-152.
- Burge, T. (1993). Content preservation. *The Philosophical Review, 102*(4), 457-488.
- Campbell, J. (1996). Human vs. animal time. In: M.A. Pastor and J. Artieda (eds.), *Time, Internal Clocks and Movement*. (pp. 115-126). Elsevier.
- Clayton, N. & Russell, J. (2009). Looking for episodic memory in animals and young children: Prospects for a new minimalism. *Neuropsychologia, 47*(11): 2330-2340.
- Coman, A., Stone, C.B., Castano, E., & Hirst, W. (2014). Justifying atrocities: The effect of moral-disengagement strategies on socially shared retrieval-induced forgetting. *Psychological Science, 25*(6), 1281-1285.
- Conway, M.A. (2005). Memory and the self. *Journal of Memory and Language, 53*, 592-628.
- Cosmides, L. & Tooby, J. (2000). Consider the source: The evolution of adaptations for decoupling and metarepresentation. In: D. Sperber (ed.), *Metarepresentations: A Multidisciplinary Perspective*. (pp. 53-115). Oxford University Press.
- Csibra, G. & Gergely, G. (2011). Natural pedagogy as evolutionary adaptation. *Philosophical Transactions of the Royal Society: B, 366*(1567), 1149-57.
- Dawkins, R. & Krebs, J. R. (1978). Animal signals: information or manipulation. In J. R. Krebs and N.B. Davies (Eds.), *Behavioral Ecology: An Evolutionary Approach* (pp. 282-309). Basil Blackwell Scientific Publications.
- Demiray, B., Mehl, M. R., & Martin, M. (2018). Conversational time travel: Evidence of a retrospective bias in real life conversations. *Frontiers in Psychology, 9*, 2160.
- Dokic, J. (2001) Is memory purely preservative? In: T. Hoerl & T. McCormack (Eds.), *Time and Memory. Issues in Philosophy and Psychology*. (pp. 213-232) Oxford University Press.
- Dunbar, R. I. M. (2004). Gossip in evolutionary perspective. *Review of General Psychology, 8*(2), 100-110.

- Dunbar, R. I. M. (1998). *Grooming, gossip, and the evolution of language*. Harvard University Press.
- Dunbar, R. I. M., Duncan, N. D. C., & Nettle, D. (1997). Human conversational behavior. *Human Nature, 6*, 67-78.
- Ebbinghaus, H. (1885). *Über das Gedächtnis: Untersuchungen zur experimentellen Psychologie*. Duncker & Humboldt.
- Eggs, S. & Slade, D. (2005). *Analyzing casual conversation*. Equinox.
- Engelmann, J. M., Hermann, E. & Tomasello, M. (2012). Five-year olds, but not chimpanzees, attempt to manage their reputations. *PLoSone, 7*(10), e48433.
- Fitzpatrick, D. & Barnes, S. (2010). The relative resilience of property: First possession and order without law in East Timor. *Law & Society Review, 44*(2), 205-237.
- Foster, E. K. (2004). Research on gossip: Taxonomy, methods, and future directions. *Review of General Psychology, 8*(2), 78-99.
- Gerstenberg, T., Ullman, T. D., Nagel, J., Kleiman-Weiner, M., Lagnado, D. A., & Tenenbaum, J. B. (2018). Lucky or clever? From expectations to responsibility judgments. *Cognition, 177*, 122-141.
- Giardini, F. & Conte, R. (2011). Gossip for social control in natural and artificial societies. *Simulation, 0*(00), 1-15.
- Gilbert, D.T. & Malone, P.S. (1995). The correspondence bias. *Psychological Bulletin, 117*, 21-38.
- Gluckman, M. (1955). *The judicial process among the Barotse of Northern Rhodesia*. Manchester University Press.
- Goodman, N. (1983). *Fact, fiction and forecast*. Harvard University Press.

- Gopnik, A. (2000). Explanation as orgasm: The function, evolution and phenomenology of the theory-formation system. In F. Keil & R. Wilson (eds.). *Cognition and Explanation*. (pp. 299-323) MIT Press.
- Haigh, S. N. & Robinson, E. J. (2009). What children know about the source of their knowledge without reporting it as the source. *European Journal of Developmental Psychology*, 6(3), 318-336.
- Haviland, J. B. (1977). *Gossip, reputation and knowledge in Zinacantan*. University of Chicago Press.
- Hess, N.H. & Hagen, E.H. (2006). Psychological adaptations for assessing gossip veracity. *Human Nature*, 17(3), 337-354.
- Hirst, W. & Echterhoff, G. (2012). Remembering in conversation: The social sharing and reshaping of memories. *Annual Review of Psychology*, 63(21), 21.1-21.25.
- Jablonka, E. (2017). Collective narratives, false memories and the evolution of autobiographical memory. *Biology & Philosophy*, 32(6), 839-853.
- Johnson, M. K., Hashtroudi, S., & Lindsay, D. S. (1993). Source monitoring. *Psychological Bulletin*, 114(1), 3-28.
- Kappes, A. & Crocket, M.J. (2016). The benefits of a rose-colored hindsight. *Trends in Cognitive Sciences*, 20(9), 644-646.
- Keven, N. (2016). Events, narratives and memory. *Synthese*, 193(8), 2497-2517.
- Keven, N. Kurczek, J., Rosenbaum, R.S., & Craver, C. (2017). Narrative construction is intact in episodic amnesia. *Neuropsychologia*, 110, 104-112.
- Kleimann-Weiner, M., Ho, M. K., Austerweil, J. L., Littman, M. L. & Tennenbaum, J. B. (2016). Coordinate to cooperate or compete: Abstract goals and joint intentions in social interaction. *Proceedings of the 38th Annual Conference of the Cognitive Science Society*. Available online at: <https://par.nsf.gov/biblio/10026426>

- Klein, S., Cosmides, L., Tooby, J. & Chance, S. (2002). Decisions and the evolution of memory: Multiple systems, multiple functions. *Psychological Review*, *109*(2), 306-329.
- Klein, S. B. (2013). Making the case that episodic recollection is attributable to operations occurring at retrieval rather than to content stored in a dedicated subsystem of long-term memory. *Frontiers in Behavioral Neuroscience*, *7*(3), 1-14.
- Krebs, J. R. & Dawkins, R. (1984). Animal signals: mind-reading and manipulation. In J. R. Krebs and N. B. Davies (eds.), *Behavioral ecology: an evolutionary approach* (2nd edition, pp. 380-402). *Blackwell Science*.
- Kurkela, K.A. & Dennis, N.A. (2016). Event-related fMRI studies of false memory: An activation likelihood estimation meta-analysis. *Neuropsychologia*, *81*, 149-167.
- Lambek, M. (1996). The past imperfect: remembering as moral practice. In: P. Antze & M. Lambek (eds.), *Tense past: Cultural Essays in Trauma and Memory* (pp. 235-255). Routledge.
- Leimgruber, K. L., Shaw, A., Santos, L. R. & Olson, K. R. (2012). Young children are more generous when others are aware of their actions. *PLOSone*, *7*(10), e48292.
- Maguire, E. & Mullally, S. (2014). Learning to remember: The early ontogeny of episodic memory. *Developmental Cognitive Neuroscience*, *9*(100): 12-29.
- Mahr, J.B. (2019). The dimensions of episodic simulation. *Manuscript submitted for publication*.
- Mahr, J.B. (in press). Thinking about the past as the past for the past's sake: Why did temporal reasoning evolve? *Behavioral and Brain Sciences*.
- Mahr, J.B. & Csibra, G. (2018). Why do we remember? The communicative function of episodic memory. *Behavioral and Brain Sciences*, *41*.
- Mazzarella, D., Reinecke, R., Noveck, I. & Mercier, H. (2018). Saying, presupposing, and implicating: How pragmatics modulates commitment. *Journal of Pragmatics*, *133*, 15-27.

- McMyler, B. (2007). Knowledge at second hand. *Inquiry*, 50(5), 511-540.
- Mercier, H. (2020). *Not born yesterday: The science of who we trust and what we believe*. Princeton University Press.
- Mercier, H. (2017). How gullible are we? A review of the evidence from psychology and social science. *Review of General Psychology*, 21(2), 103-122.
- Mercier, H. (2016). The argumentative theory: Predictions and empirical evidence. *Trends in Cognitive Sciences*, 20(9), 689-700.
- Mercier, H. & Sperber, D. (2017). *The Enigma of Reason*. Harvard University Press.
- Mercier, H. & Sperber, D. (2011). Why do humans reason? Arguments for an argumentative theory of reasoning. *Behavioral and Brain Sciences*, 34(2), 57-74.
- Nagel, J. (2015). The social value of reasoning in epistemic justification. *Episteme*, 12(2), 297-308.
- Nancekivell, S.E., Friedman, O., & Gelman, S. (2019). Ownership matters: People possess a naïve theory of ownership. *Trends in Cognitive Sciences*, 23(2), 102-113.
- Neisser, U. (1981). John Dean's memory: A case study. *Cognition*, 9, 102-115.
- Nowak, M.A. & Sigmund, K. (1998). Evolution of indirect reciprocity by image scoring. *Nature*, 393, 573-577.
- Nowak, M.A. & Sigmund, K. (2005). Evolution of indirect reciprocity. *Nature*, 437, 1291-1298.
- O'Keefe, J. & Nadel, L. (1978). *The hippocampus as a cognitive map*. Oxford University Press.
- Piazza, J., Bering, J. M. & Ingram, G. (2011). "Princess Alice is watching you": children's belief in an invisible person inhibits cheating. *Journal of Experimental Child Psychology*, 109, 311-320.
- Pasupathi, M., McLean, K.C. & Weeks, T. (2009). To tell or not to tell: Disclosure and the narrative self. *Journal of Personality*, 77(1), 89-124.

- Perner, J. & Ruffman, T. (1995). Episodic memory and autonoetic consciousness: Developmental evidence and a theory of childhood amnesia. *Journal of Experimental Child Psychology, 59*, 516-548.
- Perky, C. (1910). An experimental study of imagination. *The American Journal of Psychology, 21*(3), 422-452.
- Piazza, J., Bering, J. M. & Ingram, G. (2011). "Princess Alice is watching you": Children's belief in an invisible person inhibits cheating. *Journal of Experimental Child Psychology, 109*, 311-320.
- Pietraszewski, D. (2016). How the mind sees coalitional and group conflict: the evolutionary invariances of n-person conflict dynamics. *Evolution and Human Behavior, 37*(6), 470-480.
- Prasada, S. (2000). Acquiring generic knowledge. *Trends in Cognitive Sciences, 4*, 66-72.
- Poole, R. (2008). Memory, responsibility, and the claims of the past. *Memory Studies, 1*, 149-166.
- Rimé, B., Finkenauer, C., Luminet, O., Zech, E. & Phillipot, P. (1998). Social sharing of emotions: new evidence and new questions. *European Review of Social Psychology, 9*(1), 145-189.
- Robinson, E. J. & Whitcombe, E. L. (2003). Children's suggestibility in relation to their understanding about sources of knowledge. *Child Development, 74*, 48-62.
- Ross, L. (1977). The intuitive psychologist and his shortcomings: Distortions in the attribution process. In Berkowitz, L. (Ed.), *Advances in Experimental Social Psychology 10*. (pp. 173-220). Academic Press.
- Russell, J. & Hanna, R. (2012). A minimalist approach to the development of episodic memory. *Mind & Language, 27*(1), 29-54.

- Seeman, A. (2016). Reminiscing together: Joint experiences, epistemic groups, and sense of self. *Synthese*. Available online at: <https://doi.org/10.1007/s11229-016-1156-3>
- Schacter, D.L., Addis, D. R., Hassabis, D., Martin, V. C., Spreng, R. N. & Szupnar, K. K. (2012). The future of memory: remembering, imagining, and the brain. *Neuron*, 76, 677-694.
- Schacter, D.L. (2001). *The seven sins of memory*. Houghton Mifflin.
- Schino, G. & Aureli, F. (2009). Reciprocal altruism in primates: Partner choice, cognition and emotions. *Advances in the Study of Behavior*, 39, 45-69.
- Shafto, P. & Goodman, N.D. (2008). Teaching games: Statistical sampling assumptions for learning in pedagogical situations. In *Proceedings of the 30th annual conference of the Cognitive Science Society* (pp. 1632-1637). Cognitive Science Society.
- Shafto, P., Goodman, N.D. & Griffiths, T.L. (2014). A rational account of pedagogical reasoning: Teaching by, and learning from, examples. *Cognitive Psychology*, 71, 55-89.
- Shaw, A., & Olson, K. (2015). Whose idea is it anyway? The importance of reputation in acknowledgement. *Developmental Science*, 18(3), 502–509.
- Silver, I., & Shaw, A. (2018). No harm, still foul: Concerns about reputation drive dislike of harmless plagiarizers. *Cognitive Science*, 42, 213–240.
- Sommerfed, G. D., Krambeck, H., Semmann, D. & Milinski, M. (2007). Gossip as an alternative for direct observation in games of indirect reciprocity. *Proceedings of the National Academy of Sciences*, 104(44), 17435-17440.
- Sperber, D., Clemént, F., Heintz, C., Mascaro, O., Mercier, H., Origg, G. & Wilson, D. (2010). Epistemic Vigilance. *Mind & Language*, 25(4), 359-393.
- Teroni, F. (2014). The epistemological disunity of memory. In: A. Reboul (ed.), *Mind, Values and Metaphysics: Philosophical Papers Dedicated to Kevin Mulligan – vol. 2* (pp. 183-202). Springer.
- Tulving, E. (1983). *Elements of episodic memory*. Oxford University Press.

- Tulving, E. (2002). Episodic memory: From mind to brain. *Annual Review of Psychology*, *53*, 1-25.
- Turri, J. (2011). Promises to keep: speech acts and the value of reflective knowledge. *Logos & Episteme*, *2*(4), 583-590.
- Vulliamy, C., Clément, F., Scott-Phillips, T. & Mercier, H. (2017). Confidence as an expression of commitment: why misplaced expressions of confidence backfire. *Evolution and Human Behavior*, *38*(1), 9-17.
- Wheeler, M. E., Petersen, S. E., & Buckner, L. R. (2000). Memory's echo: vivid remembering activates sensory-specific cortex. *Proceedings of the National Academy of Sciences*, *97*(20), 1125-1129.
- Whitcombe, E. L. & Robinson, E. J. (2000). Children's decisions about what to believe and their ability to report the source of their belief. *Cognitive Development*, *15*, 329-346.
- Wilson, D. S., Wilczynski, C., Wells, A., & Weiser, L. (2000). Gossip and other aspects of language as group-level adaptations. In: C. Heyes & L. Huber (eds.). *The Evolution of Cognition*. (pp.347-365) MIT Press.
- Wright, D. B., Memon, A., Skagerberg, E. M. & Gabbert, F. (2009). When eyewitnesses talk. *Current Directions in Psychological Science*, *18*(3), 174-178.
- Wu, J., Balliet, D., & Van Lange, P.A.M. (2015). When does gossip promote generosity? Indirect reciprocity under the shadow of the future. *Social Psychological and Personality Science*, *6*(8), 923-930.
- Wu, J., Balliet, D., & Van Lange, P.A.M. (2016a). Reputation, gossip, and human cooperation. *Social and Personality Psychology Compass*, *10*(6), 350-364.
- Wu, J., Balliet, D., & Van Lange, P.A.M. (2016b). Gossip versus punishment: The efficiency of reputation to promote and maintain cooperation. *Scientific Reports*, *6*, 23919.

Xu, F. & Tenenbaum, J. (2007). Sensitivity to sampling in Bayesian word learning. *Developmental Science*, 10, 288–29.