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Enhanced action control as a prior function of episodic memory

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Abstract

Improved control of agency is likely to be a prior and more important function of episodic memory than the epistemic-communicative role pinpointed by Mahr and Csibra. Taking the memory trace upon which scenario construction is based to be a stored internal model produced in past perceptual processing promises to provide a better account of autothetic character than metarepresentational embedding.

Mahr and Csibra (2018) argue that the proper function of episodic memory is to support epistemic authority in communication. While this is really an evolutionary claim, they explicitly eschew historical evidence and instead present the claim as an inference from design features. This is an accepted strategy, though one which can misfire in 'spandrel' cases, where some trait developed for another function or simply as a by-product becomes available for further purposes (Gould & Lewontin, 1979). In this case the Mahr–Csibra functional hypothesis has consequences which may well be considered surprising: that episodic memory has a relatively short evolutionary history and is exclusively human.

We are sceptical that a major cognitive capacity will have one single function. In general, there are likely to be many fitness-relevant functions for any cognitive adaptation. Mahr and Csibra are right to claim that episodic memory plays an epistemic role that is useful in social interaction. But it is not clear what pressing adaptive problem this function helps to solve. Contrast the Mahr–Csibra hypothesis with the proposal of a cheater detection module (Cosmides, 1989; Cosmides & Tooby, 1992). Those engaging in social contracts need to defend themselves against exploitation by free riders. But how do those engaging in communication benefit from such authority as episodic memory confers upon

beliefs? If anything, hearers will have to exert *greater* vigilance to guard against the more cunning deceptions that can be supported by claims to have seen or heard something. Admittedly, speakers may communicate more confidently given the source knowledge incorporated in episodic memory. But such source knowledge is epistemically supportive in relation to the subject's own beliefs, *whether communicated or not*. Did I leave the house secure? Yes, I can remember how it looked and felt to turn the key in the lock, so I did. That sort of inference is surely adaptively valuable.

We think there is a strong case for holding that a prior function of episodic memory is the fact that auto-noetic recall enables experience to improve an agent's control of his or her actions. One remembers seeing and hearing, which is different from remembering *that* one saw or heard, since the auto-noetic character represents the perspective of a perceptual agent. One also remembers doing things and what that felt like, and how successful the action was. Could anyone become a skilled hunter without episodic memory? While practice may improve proficiency in simple skills merely in terms of acquiring dexterity and strength (through procedural memory), improvement in any innovative technique requires experience to enhance future performance in a more flexible way, through episodic memory of previous attempts and their outcomes. Just as a driver (without satellite navigation) relies on episodic memory to retrace a once travelled but unfamiliar route, our ancestors needed to remember the path through a forest, recalling dangers previously met and now to be avoided. The special salience given to memories by social emotions bears witness to the adaptive advantage episodic memory gives in social interaction: remembering occasions when one was shamed or embarrassed helps to avoid their recurrence.

What happens when an agent draws on episodic recollection, in the exercise of a complex skill, in the recall of a past event, or for that matter in the social-communicative situations which Mahr and Csibra highlight? We suggest that he or she has recourse to stored *internal models* (Wolpert et al., 1995; Wolpert et al., 1998; Petro & Muckli, 2016) of previous actions, which represent the agent in his or her interactions with the environment *from the agent's point of view*. The stored internal model is the memory trace which is embellished by a process of scenario construction. Is combining a source-tag with scenario construction and in addition

embedding the content within metarepresentation (Mahr and Csibra's 'distinctive epistemic attitude') sufficient to account for auto-noesis? We think not. Mahr and Csibra are right that auto-noesis is a generative source of knowledge about the personal past. But if that is so, then the metarepresentation of propositional content – which they seem to claim is the root of the auto-noetic character of episodic recollection – is not the *origin of*, but *derived from* that source. Auto-noesis is built in from the start, rather than being added by metarepresentation. Thus, we are puzzled by the way Mahr and Csibra distinguish episodic from 'event' memory, in that this seems no mere distinction between 'actor' and 'spectator' memory, but between remembering with and without auto-noesis. Even spectating, however, involves a particular point of view that matches the auto-noetic character of later recollection. As for actions involving a deliberate intervention in an organism's environment, these are made possible by an organism representing itself in relation to environmental features. It is no surprise, then, that auto-noetic self-representation should also be part of later episodic recollections. This applies to one's remembering locking the front door; it may even apply to a scrub jay remembering caching food (Clayton & Dickinson, 1998).

Given that the function of internal models is to fine-tune and successfully complete actions, it is more than plausible that reactivating a stored internal model will facilitate successful replication and provide a check on successful completion. Now that we realize the extent to which the brain is a predictive machine (Clark, 2013; 2014), we should acknowledge that the nature and representational format of the internal model depends upon the two-way flow of perceptual processing. Thinking of the memory trace as merely stored information is a relic of the armchair take on perception, whether as passive imprinting or as bottom-up input computation. Given that the percipient is not just spectating, but also running, scrambling, and grappling, the internal models generated and corrected in perceptual experience operate to tune the agent for interaction with his or her environment. One consequence of this attunement is episodic memory, then available for replicating actions, as well as social-communicative purposes, which recycle a capacity already there. So in our view Mahr and Csibra's metarepresentational embedding of episodic content really relates to our ability to *report on* our auto-noetic recollections.

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