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Commentary

The Adaptive Value of Forgetting: A Direction for Future Research

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Forgetting is something we tend to notice only when our memory fails. We may lament that we have forgotten details about an event from our past, or forgotten a fact we should be able to recall, or forgotten to give a message to a colleague in a timely manner. But forgetting is happening all the time—people do not retain all details of every moment of their lives. Fawcett and Hulbert (2020) have done a great service by reminding us that "everyday forgetting" represents a feature of a well-designed memory system. A memory system that retained the ability to reconstruct all knowledge and experiences might become unwieldy, so a system that forgets is likely efficient. Fawcett and Hulbert also point out additional benefits of forgetting that have received little attention—for example, that forgetting may benefit social interactions and may help people maintain positive self-images. These ideas strike us as fruitful new territory at the intersection of the science of memory and the science of well-being. The upshot is that forgetting might be "adaptive" in the sense that it may be useful or convenient to forget certain things rather than retaining everything. The crucial questions then become, why do we forget certain things but not others? And how does a memory system know which things to forget and which to prioritize and retain?

At one point in the history of research on human learning and memory, forgetting was a central topic and the focus of intensive study. Textbooks on human learning contained entire chapters on forgetting (e.g., Deese, 1958; McGeoch, 1942). The interference theory of forgetting was developed with vigor throughout the 1960s (Crowder, 1976), but around the time of a review article by Postman and Underwood (1973), development of that theory slowed considerably. To be sure, there have been several treatments of the science of forgetting in recent years, thoroughly covered by Fawcett and Hulbert (e.g., M. C. Anderson, 2003; Anderson & Neely, 1996; MacLeod, Dodd, Sheard, Wilson, & Bibi, 2003; Sara, 2017; Wixted, 2004). But we wonder, for example, how many undergraduate psychology courses still offer much coverage of theories of forgetting, per se. Consider that in one contemporary memory textbook (Schwartz, 2017), the term "forgetting curve" appears once, and the curve itself is not depicted.

We propose that there is a lesson to be learned from the decline of the interference theory of forgetting decades ago. The central thesis of our commentary is that research on forgetting declined because the approach was largely structural, and to reinvigorate the science of forgetting, future research should be driven by functional questions. The key ideas that drove research on forgetting for decades—ideas about response competition, unlearning, response set suppression, selector mechanisms, and so on—might as well have been describing artificial storage systems rather than biological agents attempting to coordinate their actions in a dynamic environment. Purely structural approaches tend to lead to an illusory criterion for progress in a cycle that goes something like this: Researchers propose hypothetical constructs and design studies to test the workings of those constructs, even though no one knows whether those constructs actually exist. For example, dozens of studies might be designed to illuminate the workings of a selector mechanism without ever knowing for sure that people possess such a mechanism. Because no one knows whether the hypothetical constructs exist, researchers mark their progress in terms of how well they understand the tasks they created to measure the constructs. Eventually, researchers end up studying the tasks (Nairne, 2005). When there seems to be nothing further to mine from a task, the task, and perhaps the topic altogether, can be easily discarded.

Applied research may have it somewhat easier than purely theory-driven research because the criterion for progress may

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be clearer (Nairne, 2005). For example, in educational research, we know we are making progress when we identify activities that improve student learning or when one instructional technique proves more effective than another. In some circumstances, the goal may indeed be to gain greater understanding of a particular task. In research on eyewitness lineup identification, for example, researchers know they are making progress when they pinpoint factors that help or hurt performance on that specific memory task. Perhaps this is one reason why the idea of "everyday forgetting" seems alluring, because tying the science of forgetting to everyday scenarios might provide a tangible criterion for progress. The argument is somewhat like Neisser's (1978) original argument for "everyday memory": Looking at everyday experiences might reveal the important questions and establish clearer markers for progress.

A functional approach to the science of forgetting differs in obvious ways from a purely structural approach, but it also differs in important ways from an "everyday" approach. The fundamental functional question about forgetting is, how would forgetting help agents with survival and reproduction? From a functional standpoint, the idea that forgetting is adaptive has a specific meaning. Many authors have noted that forgetting can be beneficial and have used the term *adaptive* to describe such benefits (e.g., E. L. Bjork & R. A. Bjork, 1988; R. A. Bjork, 1989). Fawcett and Hulbert reiterate this in describing the "adaptive and virtuous qualities" of forgetting. The examples they give of the adaptive value of forgetting are tied to everyday scenarios—for example, forgetting information about an old town when one moves to a new town, or forgetting an embarrassing moment during a fun night of karaoke. When viewed post hoc in the context of these everyday scenarios, forgetting is indeed useful and convenient.

But the problems with using "adaptive" as a proxy for "useful" become apparent quickly. For example, Fawcett and Hulbert write, "Forgetting helps us rid ourselves of mundane experiences, the details of which are unlikely to be *important* later" (p. 3, emphasis is ours). But what determines importance? How do our memory systems know what is important and what is not? Fawcett and Hulbert also write, "Forgetting allows us to update experiences and memories with new information to maximize *relevance* and minimize competition" (emphasis is ours). But what makes information relevant? And relevant to what end? Fawcett and Hulbert then write, "Information loss begins at the moment of experience, with attention *favoring* certain details over others" (emphasis is ours). The questions may be obvious at this point. What makes one detail favored over another? And how do our memory systems know which details to pay attention to and which to ignore?

Without any independent criteria, the reasoning can quickly become circular. Why was a particular item forgotten? Because it was not important or relevant or favored. Why was it not important (or relevant or favored)? Well, it must not have been important, because it was forgotten. Unlike researchers, however, our memory systems cannot rely on just-so stories and reason after the fact. Memory systems would need rules or heuristics in advance to determine which details and information to prioritize and which to forget.

One possibility hinted at by Fawcett and Hulbert is that distinctive events are remembered and everything else that makes up ordinary everyday experience is forgotten. Fawcett and Hulbert give an example of forgetting the "inconsequential specifics" of eating cereal in the morning and propose that a person would only remember an event if it were "out of the ordinary," like finding a prize in the cereal box. It is certainly true that distinctiveness aids memory (Hunt & Worthen, 2006), but not all distinctive events are well remembered simply because they are out of the ordinary, and our memory systems do not treat all events equally. We suspect that finding a dead rodent in a cereal box would be more memorable than finding a prize-winning voucher, even though both events would be distinctive, out of the ordinary, and emotionally evocative.

A cognitive process like forgetting would be *adaptive* not just because it seems useful or convenient in some circumstance but because it improved the ability to survive and reproduce in our evolutionary past (Buller, 2005). This is the criterion for examining the adaptive value of forgetting. A considerable amount of recent work has used functional reasoning to generate testable hypotheses about factors that might increase the likelihood of remembering certain items (Nairne, Pandeirada, & Fernandes, 2017). For example, thinking about how items might be relevant to survival improves memory for those items (Nairne, Thompson, & Pandeirada, 2007), things that are animate are more memorable than inanimate things (Nairne, VanArsdall, Pandeirada, Cogdill, & LeBreton, 2013), and information pertaining to disease and contamination is highly memorable (Fernandes, Pandeirada, Nairne, & Soares, 2017). These examples show that processing items along fitness-relevant dimensions enhances memory. Similar functional reasoning can be applied to forgetting. Specifically, it might be adaptive to forget certain types of items or items that are processed in fitness-relevant contexts.

For example, a well-designed memory system should forget information that is outdated or inappropriate in a current context, but this may be especially true when the outdated information is fitness relevant. If a location no longer has food, if a water supply has dried up, or if a predator that prowled an area is now deceased, it would be costly to continue to remember that there had once been food, water, or a predator in those locations. Thus, it may be adaptive to prioritize forgetting of those fitness relevant items. It may also be advantageous to forget information that interferes with the recall of fitness relevant knowledge. If a person were trying to recall the nearest location of a water source, it would be beneficial to forget other water locations that are not nearby. Forgetting irrelevant locations may be more likely in the context of finding a water source to drink from relative to finding water for a leisurely swim. As another example, Fawcett and Hulbert note that forgetting may operate in the service of social cooperation, which is clearly a fitness relevant context. But the question remains: How would a memory system know what to forget and what to prioritize? A variety of factors would likely matter, such as the type of information (e.g., information about trustworthiness, such as whether a person is a cheater

or a thief) and the nature of the relationship (e.g., whether a person is kin or a potential mate). We do not know whether or how these factors matter, nor do we claim to have proposed fully formed hypotheses. These are merely a few examples of how one might apply functional reasoning to understand and examine the adaptive value of forgetting (for another functional approach, see Anderson & Schooler, 1991).

Two additional topics were given little attention by Fawcett and Hulbert but are essential for the science of forgetting. One involves the distinctions among episodic, semantic, and prospective forms of memory and forgetting, distinctions that seemed blurred in Fawcett and Hulbert's article. Episodic forgetting is fundamentally different from semantic forgetting. When a person forgets that the item "tiger" occurred on a list, she has not forgotten that a tiger is a large cat with stripes and sharp teeth commonly found in Asia; she forgot that the item occurred at a particular place and time. Likewise, a person may remember a number of episodic details about an event but forget semantic details, like remembering and perhaps vividly picturing a dinner you had with a friend last Saturday night but forgetting the name of the restaurant. And prospective forgetting is yet another distinct form of forgetting. A person can forget to execute an intended action at a specific time without forgetting the action. For example, forgetting to give a message to a friend the next time you see him is different from forgetting the message itself (McDaniel & Einstein, 2007). These distinctions are essential for a complete science of forgetting.

The second topic is the role of retrieval processes in forgetting. Fawcett and Hulbert mention retrieval cueing briefly, but retrieval is central to understanding forgetting. What a person remembers or forgets is always a function of the retrieval cues available in the environment. It is difficult or perhaps impossible to know whether items are ever forgotten absolutely, because memory is always examined with particular retrieval cues in a given retrieval context. An item that appears completely forgotten under one set of retrieval conditions may be perfectly memorable under another. And the gradual decline in recall over time—the hallmark pattern of forgetting itself—may be completely eliminated when appropriate retrieval cues are available (e.g., Tulving & Psotka, 1971).

We agree with Fawcett and Hulbert that the time is ripe for a new look at forgetting and that it would be productive to consider forgetting in the context of everyday events. We also agree that forgetting is adaptive, but this means more than simply appearing useful or convenient at times. Forgetting is adaptive because it presumably improved the ability to survive and reproduce in our evolutionary past, so forgetting should be sensitive to fitness-relevant information. Asking functional questions about the adaptive value of forgetting represents a new direction for research with a clear path for future progress.

Author Contributions

Both authors contributed to writing this article, and both authors approve of the submitted version of the manuscript.

Conflict of Interest

The authors declare that they have no conflict of interest.

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