

Review essay

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Anastasio et al.'s 3-in-1 model

Anastasio et al. have produced a book which is unusual both in the scope of its interdisciplinary aspirations and in the boldness of its thesis. The authors hail from an exceptionally broad range of fields: Anastasio is a neurobiologist, while his three coauthors are in history/medicine, cognitive neuroscience, and anthropology, respectively. Such truly interdisciplinary collaborations are, unfortunately, rare, and the authors deserve praise for undertaking this contribution to the field of memory studies. And the book does indeed belong to memory studies, for Anastasio et al. aim to make a contribution not only to research on individual memory but also, simultaneously, to research on collective memory. This contribution is, moreover, meant to go beyond the simple borrowing of concepts from one field (almost always individual memory) and application of them in the other, which is more common: the authors develop an original model of memory consolidation which, they hope, will provide “a new conceptual framework that can organize findings, facilitate reasoning, stimulate new insights, and propose testable hypotheses about individual and collective memory” (p. 245).

As far as the strength of their thesis (see p. 7 for a concise statement) is concerned, it is unusual to see the notion of collective *memory* taken as literally as Anastasio et al. do here. They argue, first, that the very same memory consolidation process, described by their 3-in-1 model, occurs on the individual and on all collective levels. They argue, second, that this strict analogy between individual and collective consolidation means that research on individual consolidation can tell us something about collective consolidation and vice versa—knowledge about one of the phenomena can be a source of predictions about the other. In particular, they claim that, since disrupted consolidation leads to retrograde amnesia in individual memory, we should be able to identify cases of collective retrograde amnesia resulting from similar disruption to collective consolidation; the 3-in-1 model predicts that collective retrograde amnesia will occur if the “social hippocampus” of the relevant collective memory system is damaged, just as individual retrograde amnesia occurs if the individual hippocampus is damaged.

Chapter 1 sets the stage for their main argument, beginning with a basic overview of consolidation, which Anastasio et al. define as “the process that transforms [*labile*] *short-term* memories into [*stable*] *long-term* memories” (p. 2). The remainder of the book is divided into three parts, with part I providing an overview of individual and collective consolidation and developing the 3-in-1 model, part II exploring the role of each component of the model in both individual and collective

consolidation, and part III providing an extended exploration of a single case of collective retrograde amnesia.

Chapter 2 reviews the history of individual consolidation research, distinguishing between synaptic consolidation and systems consolidation, the authors' focus. Systems-level consolidation in individual memory has been explored using connectionist models, including the well-known model developed by McClelland, McNaughton, and O'Reilly. This model features two networks, one of which learns patterns quickly, while the other slowly learns associations between patterns—the first network essentially plays patterns back to the second network repeatedly, until the second network has learned them. The model provides a nice account of retrograde amnesia, since, if there is damage to the first network (corresponding to the medial temporal lobe, including the hippocampus), recently acquired patterns are lost, instead of being stored in the second network (corresponding to the neocortex).

In chapter 3, on collective consolidation, we are on shakier ground. While the authors are at pains to emphasize that they do not mean to endorse the existence of a “group mind,” it is unclear exactly what they are attempting to avoid endorsing, especially given that they explicitly assume later in the book that collectives can have desires, emotions, and so on. This discussion might have benefited from attention to the relevant philosophy and cognitive science literature (e.g. Gilbert, 1989; Hutchins, 1995), which could have provided additional conceptual clarity. Drawing on this literature might likewise have strengthened the following sections of the chapter, which argue against Wertsch's weak conception of collective memory and in favor of Olick's strong conception; unfortunately, there is little in the way of positive argument here, so readers not already committed to a strong conception may continue to suspect that talk of collective memory is never more than shorthand.

These are perhaps relatively minor worries, but the last section of the chapter, which proposes an experiment designed to demonstrate the existence of collective memory, is more problematic. In the envisaged experiment, a number of individuals separately witness something; they then recall it first individually and then together, producing a group account; a combined account is also produced by mechanically combining the details provided in the individual accounts. Anastasio et al. argue that

[i]f the group account compared with the combined account is more detailed and more accurate, then that would provide a clear indication that the collective memory, in this case, is more than the sum of the combined, individual memories. (p. 57)

Setting aside the worry that experiments with small groups can tell us little about the memories of the sort of large-scale collectives with which the authors are centrally concerned, there are two problems here. First, the debate over strong forms of collective memory is presumably about whether collective memory is something ontologically new, something that cannot be reduced to individual memories, and an experiment in which individuals in a group produce a consensus account of a witnessed event does nothing to settle this question; indeed, it seems unlikely that this is the sort of question that could be settled experimentally. It would make no difference to the debate if the group account turned out to be less rather than more detailed and accurate than the combined individual accounts—this is simply not the sense of “more” that is at issue when it is argued that collective memory is more than the sum of individual memories. Second, although it is not discussed by Anastasio et al., work along these lines has already been done, and the main findings tend to show that collective memory is not “more” than the sum of individual memories, in the authors' limited sense. The collaborative recall paradigm (Weldon and Bellinger, 1997) makes use of a procedure similar to that described by the authors: individuals are first presented with stimuli;

they then recall those stimuli either alone or in a group; the items recalled by individuals alone are pooled; the amount remembered by this nominal group is then compared to the amount recalled by the collaborative group. Contrary to the spirit of the authors' prediction, the typical finding is that collaborative groups recall *less* than nominal groups (see Barnier et al., 2008 for a review).

Chapter 4 presents the 3-in-1 model, which in effect supplements the two components of the McClelland et al. model, which can be viewed as a buffer and a generalizer, with two additional components: a relater, charged with identifying associations between items, and the remembering entity as a whole, which "subsumes the elements of the consolidation process, as well as all the nonmemory factors that influence it" (pp. 61–62). Anastasio et al.'s case for the inclusion of the relater is convincing (I come back to the entity below): a model without a relater, such as the McClelland et al. model, lacks the resources for explaining both how items are categorized in consolidation (the experimenter determines category-item pairings) and why certain items are selected for consolidation and others are not. The last section of the chapter provides an example of collective consolidation, treating the formation of Kuhnian scientific paradigms as a process of consolidation.

Part II of the book consists of four chapters, each examining the role of one component of the 3-in-1 model, first in individual consolidation and then in collective consolidation. Chapter 5 begins by looking at the role of the buffer. The discussion of the role of the buffer in individual memory mostly covers fairly familiar ground, consisting primarily of a review of Baddeley and Hitch's model and related work, while the discussion of the role of the buffer in collective memory consists mainly of descriptions of various collective buffers (one example is archives).

Chapter 6 turns to the role of the relater (also referred to as the selector/relater). The generalizer is able to download items to the buffer, allowing the relater to link incoming unconsolidated items with already-consolidated items. The selection/relation process is also affected by nonmnemonic factors, through the influence of the entity's desires, plans, etc. The exception to the rule of integration of new memories with old memories is modulation, in which items tagged as especially important are stored whole in stable memory. The chapter first looks at relationality in individual memory, reviewing work in the Deese–Roediger–McDermott (DRM) paradigm, describing the role of the hippocampus in more detail, and, drawing on a theme which has been prominent in collective memory research, pointing out that memory items are normally polysemic (elements of several different memory networks). In the case of individual memory, the selector/relater can be anatomically identified with the hippocampus, and the authors boldly claim that they can also identify a "social hippocampus," constituted by "the relation-makers in society (including opinion leaders in journalism, academics, politics, etc.);" (p. 105), going on to discuss various examples of the role of such opinion leaders in collective consolidation.

Chapter 7 looks at the role of the generalizer (also referred to as the generalizer/specializer), which is responsible for extracting and storing long-term representations. Anastasio et al. argue that consolidation should be viewed as an ongoing process, with stable memory itself being susceptible to changes, although these occur much more slowly than in labile memory. They also emphasize that in addition to generalization, consolidation involves specialization, with existing categories being further subdivided as a result of incoming memory items. The chapter first examines the role of the generalizer/specializer in individual consolidation; reviewing relevant work in neurophysiology, cognitive neuroscience, and cognitive science; and discussing the role of schemas in memory. It next looks at the role of generalizers/specializers in collective memory, arguing for both generalization and modulation in collective memory, and pointing out that the meaning of a stable item can change as the network of relationships in which it is embedded shifts over time. The section next provides an extended example of generalization in collective memory, the writing of science textbooks, and examines the mutual influence of narratives and collectives. The chapter

concludes with a look at recursion in collective memory, arguing that “group identity, and likewise other forms of generalized collective memory, recur to influence the ongoing process of memory formation both of individuals in the group and of the group as a whole” (p. 155).

Chapter 8, the last of the primarily theoretical chapters, is concerned with the role of the entity, the influence of which on consolidation occurs primarily via the relater. The chapter first looks at the role of the entity in individual consolidation, approaching this via a discussion of how many “boxes” an adequate model of consolidation requires. This covers some of the same ground as chapter 2, taking us from Ebbinghaus’ one-box model, through McClelland et al.’s two-box model, to a model including a third box, the relater. A three-box model cannot account for the systematic inaccuracies and errors that characterize memory, hence the need for a fourth box, the entity, which encompasses the other boxes. As Anastasio et al. point out, this box is far more complex than the others, both because it contains the others and because it is meant to account for (intraindividual) nonmnemonic factors. While they seem untroubled by this added complexity, there is a real worry that including the entity in the model limits its usefulness as a model—as Anastasio et al. grant, it is not feasible to give a full description of the entity, since doing so would amount to giving a full theory of individuals, as well as a full theory of social groups.

The chapter provides brief descriptions of a number of different entity effects, including the desire for coherence, the desire to see oneself as improving over time, and the role of emotion in modulation (including in flashbulb memories), before turning to collective entity effects. Unfortunately, this section suffers from the same lack of conceptual clarity that we saw in earlier sections on collective memory. After introducing the notion of collective emotion, for example, they write that

Pennebaker and his research group (Pennebaker and Gonzales, 2009) paint a picture of the influence of emotion on the consolidation of collective memory: Emotion elicited by a tragic event causes a biphasic response characterized by initial withdrawal and subsequent re-emergence into society, and the resulting community-wide processing of the event leads to its eventual consolidation into collective memory. (p. 171)

The problem here is simply that the relevant emotions appear to be emotions of individuals, rather than of collectives. Next comes an extended discussion of collective entity effects, the influence of nonmnemonic factors on scientific collective memory formation, including a discussion of Latour and Woolgar’s well-known study of laboratory life, which treats the laboratory as a collective entity.

Part III of the book consists mainly of an extended discussion of a single example of disrupted collective consolidation, the cultural revolution in China. Chapter 9 applies the 3-in-1 model to collective memory to predict a form of collective retrograde amnesia resulting from disruption of consolidation due to damage to the social hippocampus. The authors propose to test this prediction by comparing the memories of mainland Chinese to those of other Chinese populations, in Taiwan and Northern Thailand, focusing on memory for literature and religion. The core argument is that the cultural revolution, by targeting opinion leaders in Chinese society, “purged labile non-Communist items from the collective memory buffer, and it simultaneously interrupted the functioning of the collective relater,” with the consequence that “traditional Chinese mainland society, because of its ‘lesioned’ social hippocampus, could not continue its ongoing process of collective memory consolidation,” resulting in a form of collective amnesia (p. 189). Chapter 10 looks at the persistence of consolidated collective memory for religion despite damage to the social hippocampus: for example, ancestor worship, an important part of Confucianism, was suppressed, but the basic ethical frameworks of Confucianism were preserved. Chapter 11 looks at the loss of memory for several important Chinese writers: there were a number of influential writers who largely ceased

to be known due to the upheaval of the transition to socialism and the cultural revolution; although collective memory for these writers was largely lost, it is now being recovered to some extent.

While this material may be of interest to those with an interest in Chinese literature or religion, there are a number of basic problems with the argumentative strategy of the section. First, the authors consider only a single case, failing to examine whether damage to the social hippocampus regularly results in collective retrograde amnesia and whether collective retrograde amnesia can occur in the absence of such damage. Second, they do not make a systematic case for classifying the memory loss that occurred in mainland China as collective retrograde amnesia, ignoring or downplaying disanalogies between that memory loss and the memory loss typical of individual retrograde amnesia. Finally, the authors note that damage to the social hippocampus should result not only in retrograde but also in anterograde amnesia (inability to form memories for events occurring after the damage), but they do not provide any evidence for the existence of collective anterograde amnesia. I will argue that these problems are not minor quibbles but are rather symptomatic of deeper problems with the application of the 3-in-1 model to collective consolidation.

Concluding the book, chapter 12 sums up and restates the authors' main claims. They first review their treatment of individual consolidation, emphasizing the constructive character of memories and arguing (persuasively) that the best explanation of false memories resulting from the constructive consolidation process is that "consolidation is a continuous process in which the relationships between old and new memory items are constantly being reestablished" (p. 249). This suggests a reinterpretation of the reconsolidation literature: the idea is no longer that consolidated memories become labile again when retrieved, but rather that when an old memory is activated, it is reconstructed, rather than simply recalled; disruption to this process can result in differences between the new representation and the already-consolidated representation of the same event; and the two representations are then "melded together by the ongoing consolidation process" (pp. 250–251). They next turn to collective consolidation, arguing that history should be viewed as a form of collective memory, reviewing Soviet history textbooks as an example; they also provide some examples meant to illustrate the temporal aspect of collective consolidation.

A (2 + n)-in-1 model

While the book is highly original and stimulating, ultimately, in my view, it fails to establish its main thesis. The argument overlooks or underemphasizes certain key differences between individual and collective memory. Once these differences are taken into account, it becomes apparent that while the 3-in-1 model provides a plausible account of individual consolidation, it fails as a model of collective consolidation. Features of collective consolidation thus cannot be inferred from features of individual consolidation (or vice versa), via the 3-in-1 model or any other plausible model. Indeed, the single prediction derived by Anastasio et al. from the model, the existence of a form of collective retrograde amnesia resulting from damage to the social hippocampus, turns out, on closer inspection, not to be supported by the case they cite as evidence.

Stable unconsolidated representations

In their discussion (in chapter 11) of attempts to retrieve "lost" collective memories, Anastasio et al. point out that collective memory is unlike individual memory in that a social hippocampus, unlike an individual hippocampus, can often be regenerated if damaged, thus allowing lost memories to be restored. The authors do not appear to consider this to be an important difference between individual and collective memory, and perhaps it is not, as far as their argument is concerned. Their thesis is pitched at a functional level, so the fact that social hippocampi, unlike

individual hippocampi, can be replaced does not tell directly against it—this can be considered to be a difference at the level of implementation and thus to be irrelevant to the functional thesis, since all that matters, as far as the thesis is concerned, is that individual hippocampi and social hippocampi play the same role in consolidation, however they implement it. There is, however, a more fundamental, functional difference lurking in the background here.

Suppose that a social hippocampus is destroyed, so that certain memories that otherwise would have been consolidated are lost. Later, a new social hippocampus is swapped in, allowing consolidation of these lost memories. In order for the replacement social hippocampus to be able to consolidate the lost memories, they must not have been truly lost. The cases discussed by Anastasio et al. from the history of Chinese literature illustrate this point: if no traces of the authors in question (their own writings, articles about them from the period, etc.) had remained, the sort of delayed consolidation that is now occurring would have been impossible; since many such unconsolidated traces remain available, consolidation is possible once a replacement social hippocampus is put in place, even after significant delay.

Lost individual memories, of course, cannot undergo delayed consolidation. But this is not only because individual hippocampi, unlike social hippocampi, cannot be regenerated. Suppose that it were possible to replace a damaged individual hippocampus. Lost individual memories would still not be able to undergo delayed consolidation, unless they had not been truly lost—that is, unless unconsolidated traces remained accessible. But they do not: as Anastasio et al. point out, unconsolidated individual memories are in general permanently lost. This brings us to a fundamental difference between individual and collective memory: collective memory, unlike individual memory, relies on external representations that are stable and durable (i.e. long term) even when unconsolidated.

Of course, Anastasio et al. themselves note that collective memory involves external representations (in addition to representations stored in individuals' memories). For example, they mention media, journals, data, archives, and artifacts, among other external representations (p. 72). But they disregard the point that such external representations are, typically, highly stable and durable, in contrast to the unconsolidated representations involved in individual memory, which are short term and labile. Indeed, the sort of external representations involved in collective memory in many cases owe their very existence to their stability and durability, which is precisely what makes them useful supplements to individual memory and allows them to play their role in collective memory (Donald, 1991; Sutton, 2010; Michaelian, 2012). The upshot is that collective consolidation should not be conceived of as being the same process as individual consolidation, a process taking us from unstable, short-term representations to stable, more or less permanent representations.

Indeed, when we turn from the unconsolidated representations involved in collective memory to the representations produced by collective consolidation, the gap between individual and collective consolidation widens, for it appears that the representations produced by collective consolidation are typically less stable and durable than the unconsolidated representations stored in the collective buffer.

Among the examples given by the authors of consolidated collective representations are viewpoints, museums, belief systems, and paradigms. (They also mention books, although these would seem more naturally to be grouped with their examples of unconsolidated collective memories.) At the more material end of the spectrum, consider museums. In a typical museum, most of the items exhibited are older than the museum itself, and may well outlast the museum. They are also more stable than the museum—the individual artifacts making up a museum's collection, if all goes well, do not undergo significant change, while the museum itself constantly evolves (adding and removing items from its collection, etc.). At the less material end of the spectrum, consider paradigms. As Anastasio et al. themselves note, one of Kuhn's basic points is that paradigms do not last

forever—they are subject to disappear abruptly, as researchers abandon one paradigm in favor of another. And of course, before this happens, the paradigm itself undergoes gradual change, in part in order to shore it up as it fails. The individual experimental findings, articles, and so on, which Anastasio describe as being the unconsolidated material out of which collective consolidation produces the paradigm, in contrast, do not change once committed to paper, and in many cases will outlast the paradigm itself.

It thus appears that while individual consolidation is a process taking us from relatively labile, relatively short-term representations to relatively stable, relatively long-term representations, collective consolidation is actually a process taking us from relatively stable, relatively long-term representations to relatively labile, relatively short-term representations.

The source of the instability of consolidated collective representations, relative to unconsolidated external representations, plausibly lies in their distributed character: a paradigm, or even a museum collection, is not a discrete, localizable item, and as such is susceptible to influences from continuing consolidation. In the end, this appears to be precisely what collective consolidation has in common with individual consolidation: both are processes taking us from relatively discrete, localizable representations (scientific articles/representations in the visuospatial sketchpad) to highly distributed representations (paradigms distributed across the community of scientists/memories distributed across the individual neocortex). The difference between the two processes is that whereas the items that individual consolidation takes as inputs are mostly ephemeral, the items that collective consolidation takes as input are not.

Summing up, I suggest that the best characterization of collective consolidation is as a process which turns isolated materials which are in no robust sense collective into representations which plausibly belong to the whole collective entity—collective consolidation takes us from relatively stable, relatively long-term but local representations to relatively unstable, relatively short-term but distributed representations.

Competing social “hippocampi”

The second key difference between individual and collective consolidation, the existence of multiple, competing social hippocampi, is noted repeatedly by Anastasio et al., who apparently do not consider it to pose a problem for the supposed analogy between individual and collective consolidation. I argue, however, that this difference represents a profound disanalogy between individual and collective consolidation.

The notion of a social hippocampus should presumably be understood in broadly functional terms: the social hippocampus is whatever plays the role in collective consolidation which is played by the hippocampus in individual consolidation. On Anastasio et al.’s account, the individual hippocampus serves as the selector/relater in consolidation, charged with selecting labile memories for consolidation and relating them to already-consolidated representations. According to Anastasio et al., the analogous role is played in collective consolidation by the opinion leaders of the relevant collective; if we consider a society as a whole, the role of the selector/relater is played, roughly, by journalists and intellectuals of various sorts (historians, scientists, etc.).

But this is at best a gross oversimplification: as the authors themselves point out, there will normally be multiple, competing social hippocampi in a given society (journalists vs historians, for example), each of which may attempt to select different memories for consolidation or to shape the course of consolidation in different ways (relating selected representations to different already-consolidated representations, thus giving them different meanings). So no one group of intellectuals can be singled out as the social hippocampus for a given society, since no one group, by itself, directs the overall consolidation process. One might try to make a case for viewing the whole

collection of groups of opinion leaders as constituting the social hippocampus for the relevant society. Considerations of parsimony, however, suggest that it is preferable to view the overall consolidation process simply as being determined by the interaction of the different groups in the collection. The same approach is suggested by the fact that the conflict between different groups is often protracted and even violent (as in Anastasio et al.'s example of the cultural revolution).

Where does this leave us? The "social hippocampi" identified by Anastasio et al. are not worthy of the name. No one group of opinion leaders is in charge of the overall consolidation process. And unless a case can be made for treating the whole collection of groups of opinion leaders as a unified entity directing the consolidation process, which seems unlikely, there is nothing that can be identified as the social hippocampus for a society. Instead, what we have are sets of competing collective relaters, the membership of which varies as the relevant groups of opinion leaders gain and lose influence.

This is a crucial point, as far as Anastasio et al.'s claim that their 3-in-1 model accurately describes both individual and collective consolidation is concerned. In order for the model to accurately describe collective consolidation, there must be a unique relater for each collective memory system, but there is not. Instead of a 3-in-1 model, what is required, as far as collective consolidation is concerned, is a $(2 + n)$ -in-1 model: a buffer + n relaters + a generalizer, within the consolidating entity. This alternative model of collective consolidation is summarized in Figure 1.

Is "collective amnesia" amnesia?

These points about the involvement in collective memory of stable, long-term external representations and multiple competing selector/relaters undermine Anastasio et al.'s case for their thesis. This can be seen by looking more closely at part III of the book, their study of a supposed case of collective retrograde amnesia, where they claim to describe a case of collective retrograde amnesia, resulting from damage to the mainland Chinese social hippocampus inflicted during the cultural revolution, in which more recent memories for aspects of Chinese literature and religion were lost, while remote memories for these areas were spared.

The collective memory loss that Anastasio et al. identify in the Chinese case in fact fails to match the characteristic profile of individual memory loss resulting from damage to the hippocampus. First, "collective retrograde amnesia" is reversible. (The authors themselves point this out: according to them, it is actually being reversed, in the case of lost memory for literature.) Second, it is highly domain-specific, with memories for certain areas being lost while memories for other areas are unaffected. (The authors do not point this out, although they are of course aware of it: in the case they discuss, they claim only that memory for literature and religion is affected, not arguing for a more general form of memory loss.) Finally, collective retrograde amnesia is not normally accompanied by collective anterograde amnesia, in which the affected collective is unable to form new memories following damage to its selector/relater. (As the authors point out, in the Chinese case, alternative collective memories have been consolidated.)

These differences between individual amnesia and collective amnesia are not predicted by the 3-in-1 model. On the contrary, the model predicts that collective retrograde amnesia should be irreversible, domain-general, and normally accompanied by collective anterograde amnesia. It should be irreversible because unconsolidated representations are labile and short term, so that collective memories left unconsolidated are permanently lost, just as individual memories left unconsolidated are permanently lost. It should be domain-general because once the selector/relater for a given memory system is destroyed, no as-yet unconsolidated memories can undergo consolidation. And it should be accompanied by anterograde amnesia because once the selector/relater is

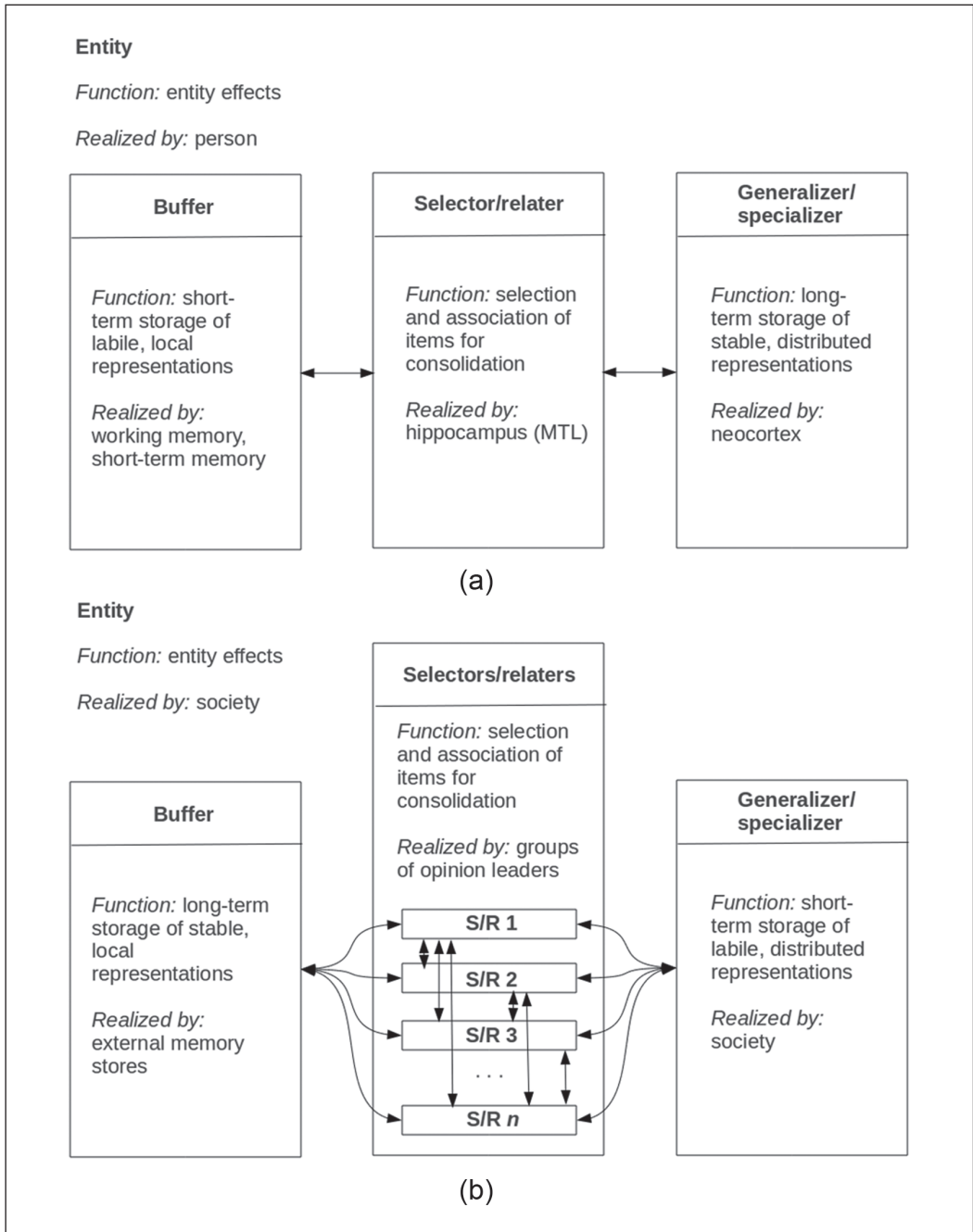


Figure 1. Whereas individual consolidation takes us from relatively labile, short-term, local representations to relatively stable, long-term, distributed representations, collective consolidation takes us from relatively stable, long-term, local representations to relatively labile, short-term, distributed representations. Whereas individual consolidation is directed by a single selector/relater, realized by the hippocampus, collective consolidation is the outcome of competition among multiple selector/relaters, realized by rival groups of opinion leaders. (a) Anastasio et al.'s 3-in-1 model of consolidation, applied to individual memory only (based on their figure on p. 72); and (b) a (2 + n)-in-1 model of collective consolidation.

destroyed, the collective should lack the means to consolidate memories from representations stored in the collective buffer in the future.

I have argued that there are important disanalogies between individual and collective consolidation, and that the 3-in-1 model should be replaced with a $(2 + n)$ -in-1 model, as far as collective consolidation is concerned. Relying on the $(2 + n)$ -in-1 model, we will no longer predict a form of collective retrograde amnesia closely analogous to individual retrograde amnesia; indeed, we can predict precisely the observed differences between individual memory loss following damage to the hippocampus and collective memory loss following damage to collective selector/relaters. Given the $(2 + n)$ -in-1 model, loss of collective memory for the recent past should be reversible because many of the relevant unconsolidated representations will survive, allowing delayed consolidation. It should be domain-specific, because there is not a single social hippocampus but rather multiple selector/relaters—even given that one group of opinion leaders is prevented from consolidating collective memories around a given event or topic, other groups may be able to consolidate memories for other areas. And since a group of opinion leaders, once destroyed or otherwise prevented from playing its usual role in the formation of collective memories, is often quickly replaced by a rival group of opinion leaders, there is no reason to expect loss of collective memory for recent events to be accompanied by an inability to form collective memory for future events.

Thus the alternative $(2 + n)$ -in-1 model, by abandoning the supposed analogy between individual and collective consolidation and incorporating these two points, predicts precisely the form of memory loss Anastasio et al. describe in the Chinese case. Indeed, although it agrees with the 3-in-1 model about the key functional elements of consolidation and their directions of interaction, it provides us with a radically different perspective on collective retrograde amnesia. Individual retrograde amnesia is an exceptional occurrence. “Collective retrograde amnesia,” in contrast, should be a routine event, resulting whenever a given group of opinion leaders is prevented from playing its usual role, which is a typical occurrence during periods of revolution and other forms of social upheaval.

I conclude that the 3-in-1 model does not provide the sort of link between individual and collective memory research hoped for by the authors. Indeed, given the important disanalogies between individual and collective consolidation revealed by a critique of the model, we should probably begin to wonder whether the search for a common theoretical vocabulary with which we can describe both individual and collective memory is not in vain. But despite my disagreements with their central claims, I emphasize that, in my view, Anastasio et al. have produced an extremely valuable contribution to memory studies: the 3-in-1 model is plausible as far as individual consolidation is concerned, and the failure of the model as a model of collective consolidation should spur us to search for alternative accounts of the process.

References

- Barnier A, Sutton J, Harris C, et al. (2008) A conceptual and empirical framework for the social distribution of cognition: the case of memory. *Cognitive Systems Research* 9(1–2): 33–51.
- Donald M (1991) *Origins of the Modern Mind*. Cambridge, MA: Harvard University Press.
- Gilbert M (1989) *On Social Facts*. London: Routledge.
- Hutchins E (1995) How a cockpit remembers its speeds. *Cognitive Science: A Multidisciplinary Journal* 19(3): 265–288.
- McClelland JL, McNaughton BL and O’Reilly RC (1995) Why there are complementary learning systems in the hippocampus and neocortex: Insights from the successes and failures of connectionist models of learning and memory. *Psychological Review* 102(3): 419–457.
- Michaelian K (2012) Is external memory memory? Biological memory and extended mind. *Consciousness and Cognition* 21(3): 1154–1165.

- Pennebaker JW and Gonzales AL (2009) Making history: social and psychological processes underlying collective memory. In: Boyer P and Wertsch JV (eds) *Memory in Mind and Culture*. New York: Cambridge University Press, pp. 171–193.
- Sutton J (2010) Exograms and interdisciplinarity: history, the extended mind, and the civilizing process. In: Menary R (ed.) *The Extended Mind*. Cambridge, MA: MIT Press, pp. 189–225.
- Weldon MS and Bellinger KD (1997) Collective memory: collaborative and individual processes in remembering. *Journal of Experimental Psychology: Learning, Memory, and Cognition* 23(5): 1160–1175.