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## Remembering, Imagining, and Memory Traces: Toward a Continuist Causal Theory

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### *Abstract:*

The (dis)continuism debate in the philosophy and cognitive science of memory concerns whether remembering is continuous with episodic future thought and episodic counterfactual thought in being a form of constructive imagining. I argue that settling that dispute will hinge on whether the memory traces (or “engrams”) that support remembering impose arational, perception-like constraints that are too strong for remembering to constitute a kind of constructive imagining. In exploring that question, I articulate two conceptions of memory traces—the replay theory and the prop theory—that return conflicting answers to whether remembering is constructive imagining. The prop theory’s vision of traces is suggestive of continuism, while the replay theory’s is a natural fit for discontinuism. Which view of traces is in fact correct remains undetermined by current empirical work. Nevertheless, it may already be possible to reach a compromise in the (dis)continuism debate, through the development of a conciliatory *continuist causal theory*. This view—only outlined here—accepts the continuism-friendly prop theory of traces, while still requiring that genuine remembering fulfills an appropriate causation condition, as required by the kinds of causal theories of remembering typically favored by discontinuists.

### *1. Introduction – ‘imagination’ in what sense?*

Those who argue that remembering is a kind of imagining, and those moved to deny it, must share some idea of what it is to be an imagining. They must, and they do. But, often, the idea is not made very clear. This creates problems, as the resolution of their debate can be no clearer than the sense of ‘imagination’ at issue.

A few cases in point: Kourken Michaelian (2016c) defends a “simulationist” theory of episodic remembering that “simply equates remembering with imagining the past” (2016, p.

110). Remembering is thus held by Michaelian to be continuous with other instances of imagining (such as envisioning the future) that are not cases of remembering. This assimilation of remembering to imagining has become known as *continuism* (Perrin, 2016b; Perrin & Michaelian, 2017). However, Michaelian does not specify what it is about remembering, or envisioning the future, that qualifies either as imagining. Likewise, Donna Rose Addis defends “a theoretical framework that views memory and imagination as the *same process*,” proposing that “memory and imagination are indeed one neurocognitive system.” This is in contrast to “the dominant perspective” in cognitive neuroscience which, she explains, “does not go so far as to conclude that memory is imagination” (2020, p. 237, 239). While Addis details many features shared by both rememberings and episodes of envisioning the future, she does not specify what qualifies them as instances of imagining. Nor are matters clearer among the “discontinuists” who deny that remembering is a kind of imagining. Denis Perrin, for instance, argues that episodic remembering and envisioning the future are “different in nature, one being memory and the other imagination,” without specifying the sense in which only future-directed thought qualifies as imagination (2016a, p. 41). Similarly, Carl Craver notes the “momentous differences in attitudinal stance one takes with respect to a past in event in remembering as opposed to imagining,” (2020, p. 277) again without explaining what he means by ‘imagining.’

Of course, ‘imagine’ and ‘imagination’ are common words. They seem to need no introduction. However, within this dispute—which I will follow others in calling the *(dis)continuism debate* (Perrin & Michaelian, 2017)—‘imagination’ is not being used in its most familiar senses. Or so I will argue in the next section, echoing and expanding on my (2021). My suggestion will be that the sense of ‘imagining’ at issue is *constructive imagining*, which, on reflection, is a relatively obscure sense of ‘imagining,’ in need of elucidation. Having shown that the (dis)continuism debate is a debate about whether remembering (and envisioning the future) is constructive imagining, I then argue (in Sections Three and Four) that settling that dispute will hinge on whether the memory traces (or “engrams”) that support remembering impose *arational*, perception-like constraints that are too strong for remembering to constitute a kind of constructive imagining. In Section Five, I articulate two conceptions of memory

traces—the replay theory and the prop theory—that return conflicting answers to that question. The prop theory’s vision of traces is suggestive of continuism, while the replay theory’s is a natural fit for discontinuism. Which view of traces is in fact correct remains undetermined by current empirical work. Nevertheless, it may already be possible to reach a compromise in the (dis)continuism debate. I conclude (in Section Five) by sketching a conciliatory *continuist causal theory*. This view—only outlined here—accepts the continuism-friendly prop theory of traces, while still requiring that genuine remembering fulfills an appropriate causation condition, as required by the kinds of causal theories of remembering typically favored by discontinuists.

## 2. ‘Imagining’ in what sense?

It is not hard to see that some of the most common senses of ‘imagination’ are not the ones at issue in the (dis)continuism debate. Witness the first definition of ‘imagination’ (definition 1a) in the *Oxford English Dictionary*: “The power or capacity to form internal images or ideas of objects and situations not actually present to the senses, including remembered objects and situations...” (OED, 2009). Here imagination is said to represent objects and situations not actually present to the senses, “including remembered objects and situations” (emphasis added). Yet, above, Addis tells us that the dominant perspective in cognitive science sees imagining and remembering as distinct. Has the OED broken ranks with the orthodox view that remembering is *not* an instance of imagining? That seems unlikely. This must not be the sense of ‘imagination’ at issue in the (dis)continuism debate.<sup>1</sup>

The OED’s second definition (1b) for ‘imagination’ reads: “An inner image or idea of an object or objects not actually present to the senses; often with the implication that the idea does not correspond to the reality of things” (OED, 2009). Here again we have the suggestion of image-like “ideas” of things not present to the senses. If we stop there, remembering again remains a clear case of imagining. Yet in this definition we get the added condition that (at least often) imagining occurs “with the implication that the idea does not correspond to the

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<sup>1</sup> The OED’s definition (2) for ‘imagination’ also appears to allow both fantasy *and* memory to be cases of imagining: “The mind considered as engaged in imagining; a person’s mind, or a part of it, represented as the place where images, ideas, and thoughts are produced and stored, or in which they are contained” (OED, 2009).

reality of things.” Supposing we take latter condition for a *necessary* condition on imagining, this understanding of imagination coheres fairly well with the broadest characterization of ‘imagine’ given by Liao & Gendler (2020) in their *Stanford Encyclopedia of Philosophy* (“SEP”) entry on imagination: “*To imagine* is to represent without aiming at things as they actually, presently, and subjectively are.” Craver (2020) appears to invoke a similar understanding of imagination, when he contrasts it to remembering by noting a “discontinuity of commitment” between the two.

However, this second sense of ‘imagination’—seemingly shared by the *OED* (1b) and *SEP*—has the converse problem of that seen with the first: it seems to preclude episodic remembering from being a kind of imagining, just as a matter of definition. When we episodically remember, we aim to represent things as they *really were* in our past; we don’t aim to represent merely fictional or make-believe worlds. This much is accepted, and even emphasized, by continuists. Michaelian (2016b) explains that his theory “discriminates between memory and episodic counterfactual thought by the requirement that [in the case of episodic remembering] the episodic construction system must aim at simulating an episode from the [actual] personal past” (p. 108). It seems clear that Michaelian and other continuists will freely grant that episodic remembering is not imagining in any sense that implies a lack of commitment to things having been as they are represented. This suggest that *OED* definition 1b, and the *SEP*’s commitment-free characterization of ‘imagination,’ simply aren’t the senses of ‘imagination’ at issue.

What, then, do continuists mean by ‘imagination’? It is not until the *OED*’s fifth (and final!) definition for ‘imagination’ that we get the beginnings of an answer. On this definition, imagination is, “the mind’s creativity and resourcefulness in using and inventing images, analogies, etc.” (*OED*, 2009). Creativity and “resourcefulness” are not things traditionally associated with memory. Generally speaking, a good memory is one that sticks to the facts, one might think, with the scientific study of episodic memory being the study of how we manage to stick to those facts when representing our personal pasts. It is easy to see why discontinuists might deny that remembering is imagining in this actively creative sense. On the other hand, there is no flat contradiction in holding that remembering is importantly creative,

requiring resourcefulness on the part of the cognitive system—an ability to draw together pieces of information from disparate areas to arrive at an appraisal of past events. And, indeed, these are the very sorts of claims continuists make about memory in highlighting its “reconstructive” nature (Addis, 2020; De Brigard, 2014a; Michaelian, 2021).

While there is fine-tuning yet to be done, we seem to have found a sense of ‘imagining’ that could be the one at work in the (dis)continuism debate. Happily, it corresponds to a kind of imagination also discussed in the philosophical literature—albeit less frequently than some others<sup>2</sup>—namely: *constructive imagining* (Van Leeuwen, 2013). Constructive imagining, Van Leeuwen (2013) explains, is “a constructive process of assembling mental representations” (2013, p. 221). When we say that *X* imagines *c*, in the constructive sense, we “express that *X* is engaged in a process of coming up with mental representations that have *c* content” (*ibid.*, p. 224). When we speak of constructive imagination as a capacity or faculty, we refer to “the capacity to form novel representations” (*ibid.*, p. 224).

This notion of constructive imagining shares with the *OED*’s fifth definition of ‘imagination’ the idea that imagining is a creative, actively constructive process involving the manipulation of mental representations of some kind. It also (unlike the *OED* definition (1b)) omits any suggestion that imaginings can only represent mere possibilities, or things we take to be unreal. Further, unlike definition (1a), it avoids simply stipulating that episodic remembering is a kind of imagining. Let’s proceed, then, with the understanding that the (dis)continuism debate concerns whether episodic remembering is a species of constructive imagining.

### 3. *Whether remembering is constructive imagining depends on the kinds of constraints imposed by memory traces*

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<sup>2</sup> More commonly discussed in philosophy are the notions of *attitudinal imagination* and *imagistic imagining*. On my favored understanding of imagistic imagining, all uses of mental imagery constitute imagistic imagining (Langland-Hassan, 2020; Van Leeuwen, 2013). Though some favor a more demanding conception of imagistic imagining, where it requires both imagery and (something like) an attitude of imagining toward the content represented by the imagery (Arcangeli, 2019; Kind, 2001). It is common to understand attitudinal imagining as occurring when someone takes an imaginative attitude toward a content (Kind, 2016; Van Leeuwen, 2013), though I favor (what I see as) a more theoretically neutral characterization where attitudinal imagining is any instance of rich, elaborated, and epistemically safe thought about the possible, fantastical, or unreal (Langland-Hassan, 2020).

What would it take to show that episodic remembering is a species of constructive imagining? The main barrier is to overcome the impression that remembering is subject to *constraints* that stand in the way of its being inherently “creative,” an active process of “assembling representations,” or simply a matter of resourcefully associating one thing with another. Consider, by analogy, ordinary perception. On the one hand, it is true that the human perceptual system makes “top down” contributions to perceptual input. Perceiving the world is never simply a matter of passively receiving input at our sensory transducers. However, the way we perceive the world to be remains tightly constrained, moment to moment, by how the world is before us. Perception would be useless to us were it not so constrained. In calling a mental process “constructive imagining,” we seem to have in mind a process that is *much less* constrained by the way the world is before us, and *much more* creative.

Of course, remembering is also unconstrained by how the world *presently* is before us, and so is unlike perception in that regard. Nevertheless, remembering is constrained by the external world in the sense that we can only (successfully) remember events that in fact occurred; further, on most views of memory, the remembering of an event can only be successful to the extent that it coheres with how we experienced the event to be. (Some continuists demur on this last point (see, e.g., Michaelian, 2016c, p. 110).) However, those kinds of constraints are not the ones most obviously at odds with the idea that remembering is deeply creative, or constructive. There is still a deeper, more perception-like, form of constraint that applies to remembering from within the terms of the Causal Theory of Memory (CTM) (articulated most influentially by Martin and Deutscher (1966)). While there are importantly different versions of the CTM (Bernecker, 2010; Debus, 2017), a core commitment of most is that successful remembering involves, as a necessary condition, the *preservation* and *transmission* of representational content from an initial experience that is remembered. Typically, such content is said to be preserved and transmitted through the work of a persisting *memory trace* (Bernecker, 2010; Martin & Deutscher, 1966). While the precise analysis of what it is to be a memory trace is a matter of dispute—one we will explore below—the general idea is of a mental state that is caused by an act of perception, encodes information (i.e. representational content) about the perceived event, and continues to store that information

until some later moment when, by suitably causing an episode of remembering, it allows the event that originally caused it, and about which it carries information, to be remembered (De Brigard, 2014b; Robins, 2016). According to the CTM, an event is successfully remembered when the episode of remembering preserves content from one's perception of the event, thanks to the remembering's being suitably caused by a memory trace.

If the world before us constrains perception—and thereby prevents perceiving from being constructive imagining—advocates of the CTM may hold that memory traces (which aim to record these perceptions) pass along these constraints to remembering, thereby preventing remembering from being constructive imagining as well. They may hold this even if they allow for successful memory to involve some addition and deletion of content to and from the original experience, and so provide for a degree of construction in successful memory—as countenanced by “constructive” versions of the causal theory (De Brigard, 2014b; Michaelian, 2011). The constraints are “passed along” to an act of remembering in just the way that the constraints met by a video camera—grounded its ongoing causal interaction with the recorded world—are passed on to any subsequent replay of the recording.

By contrast, one of the most provocative claims put forward by continuists is that “one can remember without drawing on information originating in one's experience of the remembered episode,” and that “one can in principle remember even where one did not actually experience the episode to begin with” (Michaelian, 2016c, p. 118). Here we seem to have a view of memory that leaves it unconstrained by past perception and, hence, free of any perception-like constraints that might prevent remembering from being constructive imagining. And, indeed, this is where the (dis)continuism debate typically occurs: between simulationists, like Michaelian, and “causal theorists,” such as Perrin (2016) and Debus (2014), who hold that at least some content preservation-via-causation-by-a-trace must occur in successful remembering. Thus Perrin and Michaelian's (2017) conclusion, in an overview of the (dis)continuism debate, that “the continuist–discontinuist debate may bottom out in a clash of intuitions over the necessity of causation for remembering” (p. 236).

Before moving forward, it is worth noting that, even on the continuist view, remembering is constrained by the external world in the sense that there is a norm in place for

any act of remembering to accurately represent the way the world was. This sort of accuracy constraint, I suggest, is compatible with being a constructive imagining—with actively assembling representations—as ordinary acts of reasoning, which are also subject to norms of truth-preservation, are similarly constrained. By contrast, the CTM sees memory traces as imposing *arational* constraints—what I have called “perception-like” constraints—akin to those imposed on perception by the external world, where one’s internal state is under control of an outside stimulus. In the case of remembering, this *arational* constraint is passed along a chain from the external world, to an encoded memory trace, to an act of remembering that makes available the information stored in the trace. It is this sort of *arational*, perception-like constraint that, I suggest, is incompatible with the kind of creativity required for constructive imagining.<sup>3</sup>

*4. Even for the committed continuist may have to concede that memory traces prevent remembering from being constructive imagining*

With the (dis)continuism debate now clearly in view, I want to map a new route to defending continuism. Doing so will require first explaining why Michaelian’s (2016a, 2016c) existing defenses of the view remain incomplete. We have seen that Michaelian allows for cases of successful memory that are not caused by memory traces and that, in exceptional cases, occur in the absence of any corresponding experience had during the remembered event. The possibility of such lays bare a key disagreement between the CTM and Michaelian’s brand of simulationism as, on the CTM, it is a requirement on a mental representation’s being a successful case of remembering that it was in fact caused—via a mediating memory trace—by an experience of the event remembered.

And yet, when it comes to assessing whether remembering—considered as a *type* of mental process—is well-conceived as constructive imagining, matters are not settled by the fact that the simulationist will count some mental episodes as successful rememberings that the causal theorist will not. This is because Michaelian never denies that memory traces frequently

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<sup>3</sup> Thanks to a referee for pressing me to clarify this point. The contrast in kinds of constraint that I have in mind will be further clarified via the two competing conceptions of memory traces—the replay theory and prop theory—outlined below.



play a role in remembering. To the contrary, he holds that, while we should abandon the CTM in favor of the simulation theory of remembering, “the simulation theory likewise invokes [memory] traces” (2016b, p. 77). He further explains that the “simulation of a given past episode presumably *often* draws on information originating in the agent’s experience of that particular episode,” while emphasizing that “it will rarely draw *exclusively* on such information, and in principle it need not draw on such information *at all* (2016b, p. 103, emphases in original). In short, while Michaelian emphasizes the *possibility* of one’s (successfully) remembering an event without drawing on something like a memory trace, nothing in his account suggests that rememberings are not *usually* caused (in part) by relevant memory traces. On his (continuist) simulation theory, remembering happens whenever a “properly functioning episodic construction system...aims to represent the personal past.” And this is quite compatible with a properly functioning episodic construction system usually drawing on memory traces as a central resource (2016b, p. 97).

The upshot is this: if memory traces really do impose perception-like constraints on the rememberings they cause, and thereby prevent such rememberings from being constructive imaginings, it appears that even Michaelian may be committed to remembering not being a form of constructive imagining. For while his brand of simulationism allows for the possibility of *instances* of remembering that are also instances of constructive imagining, this does not entail the more ambitious claim that remembering just *is* imagining. So long as *most* episodes of remembering are caused, and thereby constrained, by memory traces, remembering (as a type of state) need not be seen as continuous with constructive imagining.

For the continuist, two avenues of response suggest themselves: either deny that memory traces are even *typical* causes of episodic rememberings; or, alternatively, hold that memory traces don’t impose constraints on rememberings that prevent the latter from being constructive imaginings. One way to pursue the second strategy—explored below—is to argue that memory traces are *also* typical causes of mental states that we antecedently think of as (constructive) imaginings, including cases of imagining one’s future and imagining how things could have gone differently in one’s past. If, in pursuing this path, it turns out that memory traces are not quite what the standard causal theory of memory took them to be, the two

avenues of response may merge: memory traces, as conceived by the causal theory, are not typical causes of rememberings (because memory traces of *that* sort do not exist); however, the memory traces that *do* exist, and that typically cause rememberings, also cause counterfactual and future-directed imaginings. Therefore, once memory traces are properly understood, there is no conflict in being caused by a memory trace and being a constructive imagining.

The balance of this paper will assess the prospects for this kind of continuist response. We will see that, going in this direction, we face the question of whether remembering can still be distinguished from episodes of accurately representing the personal past that, intuitively, are not cases of remembering. By chapter's end I will sketch a *continuist causal theory* that aims to accept a continuist picture of memory traces while also building in causal requirements for remembering that distinguish it from the (mere) accurate representation of one's past (and from "deviant" causal dependencies as well, such as are involved in "relearning"<sup>4</sup> (Martin & Deutscher, 1966)). To get there, I first need to contrast two ways we might think of memory traces and their relation to remembering.

#### 4. *Two views of memory traces and the constraints they impose*

What follow are two metaphors for understanding the relation of episodic remembering to memory traces. The first picture—which I will call the *replay theory*—is modelled on the view of memory traces, and their relation to remembering, that is either explicit or implicit in the versions of the causal theory of memory defended by Martin & Deutscher (1966) and Bernecker (2010). The second theory—which I will call the *prop theory*—is modelled on what I take to be the view of continuists such as Michaelian (2016b) and Addis (2020). In both cases, the metaphors are idealized and admittedly picturesque renderings of the respective theories,

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<sup>4</sup> In a standard case of relearning, a person's current representation of a past event is causally dependent upon his having witnessed the past event, but (intuitively, to most) not causally dependent *in the right way*. Specifically, information about the remembered event has been forgotten and "relearned" through another's testimony—where the availability of this testimony itself causally depends upon the person who originally had the experience having relating its details to someone else, prior to forgetting it.

aimed at highlighting their differences. I will try to substantiate the accuracy of the metaphors where needed, though I encourage the reader to consider ways in which they may be inaccurate. My articulation of the metaphors is an attempt to understand the theories, not to obscure them. As there is no single understanding of what it is to be a memory trace at work in memory research (De Brigard, 2014b; Robins, 2016, 2017), these metaphors aim to highlight some of the important consequences for understanding them slightly in different ways.

On both metaphors, we can think of remembering as an event that occurs on a stage, with on-stage events serving as an analog for the conscious mind. Our imagined person doing the remembering, in each case, will be Peggy. On the first picture—the *replay* theory—the stage contains a large movie screen. Remembering occurs whenever a memory trace causes a representation of an event from Peggy’s past to be shown on the screen. On this view, memory traces are stored offstage in a very large library of such traces. For each trace in the library, there is exactly one event it allows Peggy (sometimes with prompting) to remember.<sup>5</sup> On the other hand, it is compatible with the replay theory that, in some cases, there are multiple traces in the library that enable the remembering of the very same event. Each trace stores content about the event it allows Peggy to remember by being a sketchy recording of her past perceptual (or introspective) experience of that event—a recording made at the time of the event and dutifully stored in the offstage library until such a time as it might be retrieved and replayed in an onstage act of remembering. Importantly, *which* event is remembered is fully determined by the memory trace being shown on stage. Even if the theater advertises that memories from 1989 will be shown, and even if Peggy concludes the showing by judging that she has recalled events from 1989, should it turn out that the camera operator (an employee of Peggy’s subconscious) has unwittingly selected and projected traces recorded in 1992, then it is episodes from 1992 that Peggy remembered in the showing. (Compare this to Martin &

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<sup>5</sup> It is sometimes held—e.g., by Bernecker (2010, p. 137)—that memory traces are “distributed” across nodes in neural networks. It might be thought their being distributed in this manner conflicts with the idea that only one event can be remembered through the use of each trace. Indeed, Robins (2016), argues that there is such a conflict, and, further, that there being such a conflict clashes with the causal theory of memory that Bernecker aims to defend. For present purposes, what matters is that Bernecker—and other existing defenders of the Causal Theory of Memory—are committed to traces allowing for this sort of “one trace to one experience rememberable” mapping, whether or not that is ultimately compatible their view of how traces are stored in the brain.

Deustcher's (1966, p. 167-168) case of the painter who, they claim, unwittingly remembers a farmyard scene from his childhood, despite thinking that he is only imagining it. The triggering of the relevant memory trace is sufficient for the remembering. Indeed, the fact that they take its use to be sufficient for the remembering of an event is one of the best indicators that they take each trace to allow the remembering of *only* one event. For if a trace could be used to remember multiple events, we would be left without an explanation of why the painter counts as remembering one of those events, to the exclusion of another, in cases where he does not even take himself to be remembering).

On the second picture—the *prop* theory—memory traces are more like stage sets used in a theater production, where each set is composed of various (reusable) props. On this view as well, memory traces spend most of their lives offstage, in storage. However, just as a theater company will not create multiple sets for every scene that occurs in the kitchen—but, sensibly, will reuse the same kitchen set for each scene that occurs in the kitchen—so, too, on this metaphor for remembering, are individual memory traces reused in the representation of distinct events. On the prop theory, episodic remembering occurs when, at Peggy's request, the stage manager brings out one or more props (that together compose a particular set) in a representation of an event from Peggy's past. (Whether *all* accurate representations of Peggy's personal past will qualify as *remembering*, on the prop theory, is a delicate question to be addressed below.) Like the camera operator on the replay view, the stage manager is a denizen of Peggy's subconscious. Skillful though he is, the stage manager is not always accurate in his use of props to represent Peggy's past. However, he is reliable enough to keep Peggy out of trouble. In the occasional cases where he misrepresents the past, it thus makes sense to think of these as unsuccessful rememberings, as opposed to pure confabulations (Cf., Michaelian, 2016b).

Sometimes, however, Peggy asks the stage manager to bring out props in the representation not of her actual past but, rather, of likely future events, or of ways things could have gone differently in her past. When he does so, what result are not cases of remembering, but are instead cases of imagining the future, or imagining counterfactual pasts—even if the very same props (and sets) might have been used in an act of successful remembering. Here

we have a difference with the replay theory, which does not allow the a memory trace to be projected both during both a remembering and an imagining of the future, as the projection of a memory trace is always sufficient for remembering the event it records, on the replay view.

Unlike the replay view—where traces are not substantially altered after they are first created—work continues on the props day to day, with details added or features removed. (Cf. Robins’s (2016) explication of memory traces as “distributed patterns.”) Each prop helps Peggy to represent one or more past events by representing features of those events, during onstage performances of the past. New props and sets are constructed only as needed to accurately depict Peggy’s life events. When she visits Alaska for the first time, the stage crew gets to work in creating sets corresponding to her new experiences. Otherwise, when she stays home, the stage crew busies itself with maintaining and elaborating existing sets. Unlike the replay view, the same memory trace (qua stage set) may be used in the remembering of distinct events. Thus, *which* event Peggy is remembering—and even whether she is remembering as opposed to imagining the future—is not determined by the memory trace (or traces) currently on stage. The prop theory distinguishes remembering from imagining the future, fantasizing, or considering counterfactual pasts, by appeal to Peggy’s intentions in bringing props on stage. (Some prop theorists also consider the beliefs that Peggy acquires on the basis of having witnessed the performance as relevant to determining the kind of performance that took place (Fernández, 2019)).

The prop theory leaves us with some obvious puzzles. First, what is the difference between Peggy’s accurately representing one of her past experiences (as she might do on the basis of testimony, or after “relearning” (Martin & Deutscher, 1966)) and her truly remembering it? The same props are called on stage in each case in the service of depicting events from Peggy’s personal past. Second, how does the stage manager know *which* sets to bring on stage in the representation of an event from Peggy’s past? If the answer is that he himself remembers what happened when and is drawing on that knowledge in the selection of sets, we will naturally want to know what sort of analogy should be used to describe the stage manager’s memory. If we apply the prop picture to him as well, we are left with the question

of how his own stage manager knows which sets to bring on stage. The prop theorist will have to face up to such questions.

However, there are corresponding puzzles for the replay theory. First, we are left without an account of the relation between remembering, on the one hand, and imagining the future and counterfactual pasts, on the other. We can see that the latter processes will not simply involve projecting memory traces, as that is what remembering consists in, on the replay view. Recall that, on the replay view, projecting a memory trace is sufficient for remembering. Moreover, the projection of a pre-recorded memory trace lacks the creativity inherent in imagining the future and counterfactual pasts. The replay theory must either hold that some other store of representations is exploited in constructive imagining, or, more likely, that during constructive imagining, memory traces are copied, cut up, and newly pasted together in ways that render them no longer memory traces (and that now qualify the acts as constructive imaginings). In any case, the replay theorist owes an account of the relation between memory traces and constructive imagining, whereas the prop theory already has one at hand. This is due, in part, to the replay theorist's *discontinuism* about the relationship between remembering and imagining.

What about the other question we raised for the prop theory, of how the stage manager knows which props to bring on stage in the remembering of an event, given that the same props can be reused for many different purposes, and in the accurate representation of distinct events from one's past. It might seem that the replay theory avoids such questions simply in virtue of reserving exactly one memory trace for each event that can be remembered. The camera operator just needs to find the correct trace and project it. But this is an illusion. To see that it is, suppose that, on the replay view, there is a librarian in charge of storing each newly encoded memory trace (where the "librarian" is another figment of Peggy's subconscious mind). And suppose that this librarian simply tosses each new trace she receives into a giant bin, without labelling it. In that case, there is still exactly one trace for each event Peggy can possibly remember. But the camera operator faces a hopeless task when asked to project a memory of any specific event. He will have to rummage hopelessly through many thousands of traces, lacking any means for recognizing the right one *as* the right one when it is found. (Lest

we attribute to him preexisting knowledge of what happened, which again raises the question about the appropriate metaphor for understanding *his* knowledge.)

An obvious way to solve this problem is for the librarian to organize the traces as they are stored, by the time of their encoding. For instance, she might place each trace in a protective sleeve and write, on the outside, the location and date at which it was recorded. The camera operator would then have a way of searching for memories by date. However, the limitations of ordinary human memory tell strongly against this tweak to the metaphor. Humans are generally very bad at retrieving memories *simply* on the basis of the time and date at which they occurred. Asked to think of nothing but an arbitrary date in the past—October 6<sup>th</sup>, 2004, say—and to retrieve associated memories, there is normally very little we will come up with. It seems that we don't do anything akin to pulling out the *October 6, 2004* trace to see what is recorded there. The search instead proceeds by an indirect, associative route, starting with the general period of time and the typical kinds of activities and schedules in place then. A more accurate extension of the replay metaphor may be of a lackluster librarian—or a more harried one—who simply tosses each new trace into a bin with others that seem related in one way or another. There may be “early 1992” or “fall of 2010” bins, or “baseball game” and “camping trip” bins. Or, keeping the traces out of bins, the librarian might simply write labels on the protective sleeves of each trace that are less specific than the time and place it was recorded: they might read “college,” “elementary school,” and “my sister’s wedding,” for example. In trying to retrieve relevant traces, the camera operator could then focus on specific bins or labels (even if how he successfully sorts from within those results remains unresolved). A complicating factor on this system is that many traces could fit into multiple bins or accept multiple labels. A trace from a camping trip taken with one’s brother during college could be copied and placed into each of a “college,” “camping,” or “my brother” bin, or accept such a label, for instance. Such copying of traces is compatible with the replay theory, so long as each trace still only allows the remembering of one event. However, it suggests a much larger, and more difficult to search, storage facility, with most bins containing many traces that also appear in other bins—or where the information on one trace’s label is much the same as that on another.

What matters for present purposes is that some sort of filing system is needed on the replay theory; and, given what we know about the limits of human memory, the system will not organize memory traces by the exact time and place of their occurrence, but by more general features. Importantly, there is no barrier to the prop theory's hiring a librarian to do the same kind of sorting as on the replay view. In cases where new props and sets are created, they can be sorted by the librarian into bins based on their subject-matter ("parent's kitchen," "sister's wedding") or the general timeframe to which they are relevant ("college years," "late 80's"). On both views, the labels on the bins can later be updated by the librarian to reflect their contents' new relevancies in light of subsequent experience. Though, keeping human limits in mind, these labels will remain at a high level of generality. The key point here is that the prop theory's doing without traces of the sort featured in the replay theory—that enable one-to-one mappings between traces and successful episodic memories—does not prevent it from employing much the same storage and retrieval system, and therefore does not place it at a special disadvantage in explaining how appropriate props are retrieved and displayed in acts of remembering.

Now, if the prop theory is a fairly accurate metaphor for remembering, imagining the future, and imagining counterfactual pasts, it is easy to see all these processes as cases of constructive imagining. In each instance, the stage manager draws from among the same collection of props to creatively assemble a representation of some episode. Unlike the camera operator on the replay view, he is not locked into simply replaying pre-recorded sequences. In fact, there are no such recordings to make use of. It is true that the stage manager works under real *constraints* as soon as he sets upon the project of representing an episode from Peggy's actual personal past. He cannot freely put out whichever props might strike his fancy—not without putting Peggy at epistemic risk. But similar constraints are operative when he is asked to represent likely future events, or events that would have occurred had some counterfactual event occurred. In each case, it is important to Peggy's wellbeing that he represent things accurately—either as they will be, or as they would have been. All three acts—remembering, imagining the future, and imagining the counterfactual past—remain sufficiently creative and stimulus-independent to be seen as constructive imagining.



The prop theory offers a sketch, then, of how continuism could be true (and remembering a kind of constructive imagining), even if memory traces are typical causes of remembering. This is not yet to show how continuism could be made consistent with the idea that remembering requires appropriate causation by an earlier experience of the event remembered (as required by the CTM). We do not yet have a *causal* continuist view on the table. Sketching that possibility is the project of the next section. For now we simply have a main ingredient: an otherwise plausible conception of memory traces that allows for their frequent involvement in acts of remembering that are well viewed as constructive imaginings.

#### *6. Sketch of a way forward for continuism and the prop theory of traces*

In my view, it remains an open empirical question which metaphor—the prop theory or replay theory—provides a more accurate picture of memory traces.<sup>6</sup> Nevertheless, there are ways theorists can support the prop theory (and the brand of continuism it allows) in the interim. We have seen that the prop theory, as outlined, does not offer an obvious means for

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<sup>6</sup> While I cannot adequately review the relevant empirical literature here, a few observations can be made. Much of the behavioral and neuroimaging evidence put forward by continuists—involving co-occurring deficits in remembering and imagining the future (Hassabis, Kumaran, Vann, & Maguire, 2007; Hassabis & Maguire, 2009), and co-activation of a core neural network during each (Schacter & Addis, 2007; Schacter, Addis, & Buckner, 2007; Szpunar, Watson, & McDermott, 2007)—is equally consistent with a replay conception of traces where traces are a resource common to both remembering and imagining the future, being modified and recombined in new ways only during the latter. Simulationists have also highlighted the fact that systematic errors are common in episodic memory; and it has been shown that one’s sense of whether one is remembering can be manipulated in predictable ways (Garry, Manning, Loftus, & Sherman, 1996; Loftus & Pickrell, 1995). This makes sense if, as on the prop theory, remembering involves the active attempt of a stage manager to assemble relevant representations, as the stage manager may be sensitive to various cues that, at times, could lead him astray. However, as we saw above, the question of *how* relevant traces are organized, and the means by which they are retrieved, is far from straightforward even on the replay view, having much to do with the general labels attached to them. Errors in retrieval are to be expected there as well. Perhaps more telling in favor of the prop theory is recent empirical work indicating that memory traces are subject to processes of reconsolidation, during which stored traces are “reopened” so as to be updated and refined in the light of new experiences (Dudai, 2012; Nadel, 2007; Sara, 2000). If a single trace is causally shaped by multiple distinct experiences, it is plausible to think that the matter of *which* experience is being remembered through use of the trace is not determined by the trace itself. Such a trace could then be seen as a kind of prop that can be used to remember the various different experiences from which it derives. It is possible, however, for there to be traces that are subject to process of reconsolidation processes yet that are still only used to remember one event. This could be the case if, for instance, the information added to the trace during reconsolidation still only pertained to the original event during which the trace was produced. Whether, and how often, reconsolidation in fact results in trace promiscuity seems to me unsettled by current empirical work.

distinguishing successful remembering from (merely) accurately representing one's personal past. Nor does it distinguish remembering from accurate representation via *deviant* causal chains—such as occur in Martin & Deutscher's (1966) cases of relearning and a person's reliance on "suggestible states." These gaps will, for many, stand as a barrier to accepting the prop theory's vision of memory traces, whatever virtues the prop theory otherwise possesses. It was, after all, the *raison d'être* of the replay view's appeal to memory traces to distinguish remembering from other instances of accurately representing one's past (Martin & Deutscher, 1966). And, indeed, while I cannot argue for this now, I think that a theory of remembering that fails to draw these distinctions is indeed incomplete. It would certainly help the prospects of the prop theory, and the kind of continuism it allows, if a general means for articulating such a distinction were available—one that does not, inadvertently, give up on the prop theory. I will end by pointing the way to such a view.

The key to making the prop theory (and continuism) more plausible is to show how a causal condition *of the right kind*—an "appropriate" causation condition—can be fulfilled by successful rememberings, even if memory traces are as the prop theory imagines them. To see how we might get there, let us begin with a statement of a very general causal theory, where what constitutes appropriate causation is left open:

*Causal Theory:* *S*'s representation *r* is a remembering of event *e* iff: *S* observed *e*, *r* represents *e* within certain limits of accuracy, and *r* is appropriately caused by *S*'s observation of *e*.

This is essentially what we find in Martin & Deutscher (1966) and Bernecker (2010) before they go on to explicate what it is for *r* to be *appropriately* caused by *S*'s observation of *e* in terms of a memory trace. Note, however, that in principle this Causal Theory *could be* true even if traces are as the prop theory sees them. We would simply need an alternative account of what it is for representation *r* to be appropriately caused by *S*'s observation—one that does not cash it out in terms of causation by a reply-style memory trace. What other options are there? There is not room here for a full development of any, but I will end by pointing the way to some possibilities.

On the constructive view of episodic remembering—a natural fit for the prop theory of traces—remembering is less perception-like and more inference-like. In generating a single act of remembering, we draw upon a variety of cognitive cues and representations in order to construct (what we take for) an accurate representation of a past event. These include memory traces (as the prop theory sees them), but also background beliefs about one’s past and feelings of fluency or ease at representing an event (Bastin et al., 2019; Whittlesea & Williams, 2000). It may be that one or more of these other states can at times bear the burden of providing an appropriate causal link between the event and its remembering, in lieu of a memory trace.

For example, in remembering the enormous pillars inside Barcelona’s La Sagrada Familia basilica, my belief that I have only ventured inside that building once may be an essential component to the episodic remembering—a piece of information partly relied upon in fostering a representation of a specific *event* (my visit to La Sagrada Familia) and not simply an atemporal representation of the pillars themselves. If we suppose that this belief was caused by my visit that day, and that I would not seem to remember the visit were it not for this belief, then—at least in this instance—this persisting belief may be the state that guarantees that there is an appropriate causal relation between my observing the pillars and my remembering them. The idea here is that, while I could perhaps accurately represent the pillars themselves without this belief, I would not remember *the event* of being at La Sagrada Familia without the additional contribution of the event-caused belief that I once visited there.

Alternatively, it has been shown that people process a stimulus more quickly and easily—i.e., with greater *fluency*—if they have perceived it recently (Whittlesea, 1993; Whittlesea & Williams, 2001). Let mental state *F* be a state that is caused by one’s perceiving of *S* and that causes one to be fluent for stimulus *S*. Suppose now that I recently turned off the stove and am trying to remember whether I have done so. I can easily generate props suitable for representing my turning off the stove, as I’ve perceived myself doing so many times. But I may only have the sense of *remembering* turning off the stove when those props are generated with fluency. Let us suppose that this fluency results from mental state *F*, which itself causally results from recently perceiving myself turn off the stove. In this sort of example, it may be

mental state  $F$ —fluency for stimulus  $S$  (the stove)—that guarantees that there is an appropriate causal relation between my observing myself turn off the stove and my remembering doing so. This can be the case even if the remembering draws on states (such as suitable memory traces), in addition to  $F$ . What is important is the counterfactual that, had I not just perceived myself turning off the stove, I would not now seem to remember doing so—the truth of which is guaranteed by the causal relevance of  $F$ , a state of fluency.<sup>7</sup>

On this (revisionary) approach to the causal theory—call it a *causal constructive* theory—there is not just one way for a representation  $r$  to be appropriately causally dependent on an observation of event  $e$ . There may be several—a disjunction of appropriate causes—where the answer to which cause assures an appropriate causal link to the remembered event may vary from case to case, in keeping with the idea that multiple sources of information are drawn upon in ordinary cases of remembering. It will be an empirical project to determine what kinds of states and processes fall within this disjunction of appropriate causes. In order for this proposal not to be vacuous, consisting in a completely open-ended list of what may count as an appropriate cause, there will ultimately need to be some fixed set of such causes, the activity of which typifies a healthy episodic memory system. The guiding idea (well, *hunch*) behind this proposal is that there will indeed be some limited number of them (considered as types of causes) at work in cases where, intuitively, we judge there to be a non-deviant causal chain in place. We should not expect ourselves to be able to enumerate them all now, prior to a more complete empirical investigation.

I have given the barest sketch of two such causal chains, by finding a possible causal role for beliefs of a certain sort and for feelings of fluency. Importantly, in the cases described, these may seem to be non-deviant causes of (genuine) remembering, *even though* they do not involve memory traces as the relevant causes. Showing this to be an open possibility is the main point of this section. Once we view remembering as a complex inferential process,

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<sup>7</sup> This does not entail that *all* cases where there is experienced fluency for a stimulus will result in genuine remembering, as fluency for a stimulus can be caused by things other than perceiving it (such as imagining it). (Thanks to a reviewer for noting this.) The point is simply that, in some cases, a state of fluency for a stimulus may be what provide an appropriate causal link to a past perception of the stimulus.

involving, in each instance, the collaboration of multiple mental states, we have correspondingly many candidates for the mental state or process that (partly) enable the remembering and that may provide an appropriate causal link to an observation of the event remembered. Memory traces need not always bear that burden. We may now see, in the offing, a kind of compromise between constructivist continuism and the causal theory.

*Postscript: Reply to Schirmer dos Santos, McCarroll, and Sant'Anna*

I find much to agree with, and a few things that perplex, in Schirmer dos Santos, McCarroll and Sant'Anna's (this volume) meditation on the (dis)continuism debate. They and I agree that it would sell debate short to suggest that continuists and discontinuists are talking past each other—each using different senses of the term 'remembering' and, for that reason, arriving at conflicting conclusions about the relation of remembering to imagining. Yet Schirmer dos Santos, McCarroll, and Sant'Anna (hereafter, "SMS") nevertheless want to emphasize that the debate is in some sense linguistic, resulting from each side's meaning something different by 'remembering.' For SMS, this difference in the meaning of 'remember' in the mouths of each group does not detract from the substance of the debate. They think we should see causal theorists and simulationists as involved in a "metalinguistic negotiation" over what the meaning of 'remember' *ought* to be. Causalists prescribe that 'remember' should be defined such that remembering requires the fulfillment of an appropriate causation condition. Whereas simulationists propose to define 'remembering' so that its instances—including even its *successful* instances—need only result from the reliable functioning of an episodic construction system.

Supposing this is correct, what, exactly, is *meta-linguistic* about this dispute? I am not sure. SMS are clear that they do not see the (dis)continuism debate as a (confused) meta-linguistic debate of the sort had when two people argue over the meaning of the word 'bank', each unwittingly using a different word (homonyms) with an entirely different meaning. In the case of 'remembering,' they explain, there is one side will ultimately have to cede to the other

concerning its proper use. Why isn't this then a straightforward dispute about the nature of remembering? What makes it meta-linguistic?

Their answer seems to lie in the idea that—to pull from their quotation of Ludlow (2008, p. 117)—this is a case where “crucial aspects of word meaning depend upon facts about the world that remain open.” Each side can be seen as *prescribing* a certain use of the term, as a part of a research strategy, perhaps, until there are good empirical reasons not to use it in that way. The problem I see with this is that simulationists—such as Michaelian (2016c), De Brigard (2014a), and Addis (2020)—seem to think the facts are already in. They do not advocate the simulationist conception of remembering as a kind of bold guess about how to describe certain borderline cases of remembering. They think that the last two decades of work on episodic remembering already strongly favor a simulationist view, where appropriate causal connections are not essential to successful remembering. To accuse them of a meta-linguistic negotiation seems a coy way of saying that one doesn't buy the empirical case that has been made. Well, perhaps one shouldn't buy it, but then debate seems to be about the quality of the evidence for and against simulationism and not about the meaning of 'remember.'

So, while I agree with SMS that there is a real debate afoot between continuists and discontinuists, I do not fully see the benefit in framing it as metalinguistic in nature. As they note, I think the debate hangs on whether remembering is a kind of *constructive* imagining, and not over whether remembering is a kind of *attitudinal* imagining. In their Section Four, SMS emphasize that they see an important debate still to be had concerning the attitudes involved in each of remembering and imagining and are dissatisfied with my apparent dismissal of such a debate. To clarify my own view on the matter: I do maintain that there is no substantive debate to be had over whether remembering is a kind of attitudinal imagining (because all sides will agree it is not). However, I also think there are interesting questions to ask concerning whether some *imagistic* imaginings—that is, some occurrent uses of mental imagery—may involve the same kind of (judgment-like) attitude as remembering. I outline a way of framing that question in my (2015) and (2020), where I develop a view on which some imagery-involving states are judgments (though I do not in either adequately address questions surrounding remembering). I think SMS also see this question as substantive and worth

pursuing. To be precise, however, this is not the question of whether remembering is a kind of imagining (which we can call the (dis)continuism-about-imagination debate), but whether some judgments that make use of mental imagery involve the same attitude as remembering. This we can call the (dis)continuism-about-judgment debate. It revolves around question of whether remembering is a kind of occurrent belief.

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