Title: Event Completion: A Test Case for Theories of Reference in Memory

Authors: Michael Murez[1] & Brent Strickland[2,3,4]

[1] CAPHI, UR 7463, Nantes Université, Nantes, France.

[2] Institut Jean Nicod (ENS–PSL, EHESS, CNRS), Paris, France

[3] School of Collective Intelligence, UM6P, Rabat, Morocco

[4] Africa Business School, UM6P, Rabat, Morocco

Corresponding Author :

Michael Murez, Centre Atlantique de Philosophie, Nantes Université

Chemin de la Censive du Tertre - BP 81227

44312 Nantes Cedex 3 – France

Email: michael.murez@univ-nantes.fr

We have no conflicts of interest to disclose.

Event Completion: A Test Case for Theories of Reference in Memory

Abstract: Although we encounter objects from a particular perspective, what we perceive and remember are typically whole objects. In 'amodal completion' our mind automatically fills in objects' spatially occluded parts, and our memory then often discards information about the orientation from which the objects were perceived. An analogous phenomenon of 'event completion' has been demonstrated, which may be understood as the mind automatically filling in temporally occluded parts of events. Exemplifying typical experiments in this paradigm, Strickland and Keil (2011) showed participants videos depicting a causal event (e.g., someone kicking a ball), which was edited so that a crucial part was missing (e.g., the moment of contact between foot and ball). Subjects were more likely to falsely remember having seen the moment of contact if (and only if) it was strongly implied by subsequent footage. We use this phenomenon of event completion as a test case for comparing different theories of reference in memory. We argue that event completion puts pressure on both *pure causal* and *pure descriptive* theories of reference, and favors more nuanced hybrids of causal and descriptive theories, which integrate insights from *cognitive* and *epistemic* approaches.

Although we encounter objects from a particular perspective, what we perceive and remember are typically whole objects. In 'amodal completion' our mind automatically fills in objects' spatially occluded parts, and our memory then often discards information about the orientation from which the objects were perceived. An analogous phenomenon of 'event completion' has been demonstrated, which may be understood, as a first pass, as the mind automatically filling in temporally occluded parts of events (Strickland & Keil, 2011; Kominsky et al, 2020; Papenmeier, Brockhoff, & Huff, 2019). Exemplifying typical experiments in this paradigm, Strickland and Keil (2011) showed participants videos depicting a causal event (e.g., someone kicking a ball), which was edited so that a crucial part was missing (e.g., the moment of contact between foot and ball). Subjects were more likely to falsely remember having seen the moment of contact when it was implied by subsequent footage compared to when there was no causal implication. One interpretation of these results is that the mind spontaneously performs bridging inferences which enable us to package temporally continuous streams of experience into discrete, cohesive units. These units are efficiently 'compressed' to be sent to memory. By contrast with cases in which efficiency in memory requires extraneous detail to be deleted, event completion involves new content being added. Though this content does not derive from past perception of the event itself, it may nevertheless accurately reflect reality in most instances.

A good theory of memory should be able to account for event completion. We will use the phenomenon, which (to our knowledge) has yet to be discussed in the relevant philosophical literature, as a test case for comparing different theories of reference in memory[1].

Our aim is not to decide conclusively between all competing theories, but to map out some of the main available positions, to clarify their commitments, and to better understand how they compare in light of these recent findings. A point of divergence between them is whether or not they predict that there can be successful reference to 'completed' events, i.e., events which were not initially perceived by the subject but were nevertheless implied. For example, some theories predict that subjects can successfully refer in memory to the event of contact between foot and ball in the

[1] These are adapted from the main accounts of reference in language and thought.

example above, whereas other theories predict the opposite. Another important difference between theories is *why* they predict referential success or failure. The take home message will be that event completion puts pressure on both *pure causal* and *pure descriptive* theories of reference, and favors more nuanced hybrids of causal and descriptive theories, which integrate insights from *cognitive* and *epistemic* approaches.

The plan of the paper is as follows. First, we will introduce the topic of reference in memory, and provide a brief overview of competing accounts: we will distinguish between three main families of views – *descriptive, causal,* and *cognitive*/*epistemic*. Then, we will present in more detail the empirical phenomenon of event completion, contrasting it with neighboring phenomena, such as amodal completion and representational momentum. Next, we will apply the different theories of reference (and some hybrids) to event completion, highlighting when and why they diverge, and the main choice points between them. In closing, we will draw what we consider to be some plausible lessons for the future shape of a theory of reference in memory.

1. What is a theory of reference in memory about?

A theory of reference in memory aims to explain what makes it the case that a memory is about a certain particular thing in the world, rather than about something else or nothing at all. To be 'about' a thing, is for that thing to be part of the memory's truth or accuracy conditions. Here, we focus on reference in episodic memory (Tulving, 1983).

Episodic memory has traditionally been characterized, following Tulving, as picking out particular past events with unique spatiotemporal coordinates, and by its characteristic phenomenology, whereby the subject experientially relives what they recollect (so-called "autonoetic consciousness"). Tulving (1972) noted that retrieval from episodic memory can affect its contents and accessibility. Research since has increasingly emphasized the reconstructive nature of episodic memory (Roediger & McDermott, 1995; Schacter, Guerin & St. Jacques, 2011). Notably Tulving characterized episodic memory as part of a more general capacity for "mental time travel", which enables one to simulate hypothetical events, including possible future and counterfactual episodes, in addition to past ones (see also i.a. Schacter & Addis, 2007; De Brigard, 2014b). Neuroscientists have emphasized that the brain networks engaged in recalling episodic memories mirror those involved in future thinking, navigation, theory of mind, and fictitious imagining (Hassabis & Maguire, 2007). This has led to suggestions that shared processes of "scene construction" (Hassabis & Maguire, 2007), "event simulation" (Addis, 2020) or "self projection" (Buckner & Carroll, 2007) which are engaged in these different activities, may best explain the overlap in brain areas involved across these tasks. Yet other researchers have additionally claimed that visual imagery (Rubin et al., 2003), subjective familiarity (Wagner et al., 2005), the retrieval of semantic information (Wheeler et al, 1997), and narrative framework (Rubin et al., 2003) are also involved in episodic memory.

Given these different perspectives, exactly how to define episodic memory and whether it constitutes a natural kind is obviously controversial (Cheng & Werning, 2016; Andonovski, 2018). We hope to remain as neutral as possible regarding any of its putatively *essential* features. A theory of reference in episodic memory is different from a general account of what, if anything, distinguishes it from other states, such as belief, imagination, or other kinds of memory. A theory of reference is also only part of a more complete theory of what determines the content of memories. *Reference* is to *particular* individual things, in a broad sense (objects, people, places, events, etc.). A memory's content also includes general predicative elements, which are ascribed to its referents: features, properties, categories, kinds, etc.

We remember hierarchically structured events at various levels of granularity, ranging from coarse-grained, repeated or extended episodes to particular fine-grained ones (Renoult et al., 2016, Andonovski, 2020). "Memory demonstratives" (Campbell, 2002) can pick out the objects and things which participate in such events. For example, one might remember "that ball" which one remembers "that guy" kicking every day after school for a year (repeated event), over the course of a match (extended event), or when he scored the second goal (particular fine-grained event).

We will not be concerned with reference to events' participants, but to *particular fine-grained events* as such[2]. For example, one can refer in memory to the unique event of a particular goal being scored, at some particular place and time. Our working assumption is thus that *some* memories are *prima facie singular* in content: there are memories which are accurate if, and only if, a certain particular event *e* has such-and-such characteristics. This is less controversial than the thesis Andonovski (2020) labels "Singularism about Episodic Memories", according to which episodic memories are essentially singular. Our weaker assumption is compatible with there being "graded transitional forms" between singular fine-grained memories and coarser-grained or more general ones, as Andonovski stresses[3].

We distinguish, following Cummins (1996), between referents and *targets*. A memory is representational, and thus can *mis*represent. This implies a distinction between what it is *supposed* to represent – its target – and what it actually does represent – its content, which may include its referent. If content and target never came apart, then memories could not be erroneous.

States with the same content but different targets can differ in that one is erroneous and not the other. For example, a belief that FC Nantes won the championship last year is incorrect, because its content is false relative to the actual world (in 2023). But there would be nothing wrong with a regret with a similar content. Regret does not target the world as it is, but as it could have been.

[2] Openshaw (2022) argues we may remember objects from our past without remembering events in which they featured.

[3] While we grant the existence of episodic memories of coarse-grained, repeated and extended events, we leave open whether what we say about memories of particular fine-grained events also extends to them.

Episodic memories target events in the subject's personal past[4]. An episodic memory which accurately represents the world as it is when the memory is retrieved is often incorrect, though a belief with the same content would be true.

There are two ways for an episodic memory to misrepresent, which can be cashed out by distinguishing two sorts of targets. A typical episodic memory is supposed to represent what actually happened in the *world*, and it is also supposed to represent a past *experience* of the subject. Corresponding to this difference, one can evaluate memories along two dimensions. Memories have 'worldly' correctness conditions, with respect to an objective event in mind-independent reality. They also have correctness conditions with respect to a past 'source experience' of the subject[5]. Following Bernecker (2010), one can distinguish between a memory's being *true or false,* in the sense of matching or failing to match a worldly target, and its being *authentic or inauthentic,* in the sense of matching or failing to match its source experience.

Authenticity is *graded* and *multidimensional:* a memory may match its source experience more or less, along various dimensions. A *pure* confabulation is an apparent memory in which *none* of the information about the event actually derives from past experience of it (Robins, 2016). If the confabulated memory fits a worldly event, then the confabulation is veridical: though the memory accurately represents reality, it is inauthentic.

Some memories are from an external 'observer' perspective, as opposed to a 'field' perspective, corresponding to the original, internal point of view of the subject as they underwent the source experience (Dranseika, McCarroll & Michaelian, 2021). Observer memories are inauthentic, along this perspectival dimension. However, the shift from a field to an observer perspective, when based on reliable information already implicitly present in the source experience, is arguably not really an error. Our folk concept of memory tolerates such change (Dranseika et al., 2021). This illustrates that success in memory may not require (perfect) resemblance to the source experience.

The issue of what makes a memory successful relates to another distinction, between two notions of 'reference'. Some philosophers use 'reference' as a success-term, which implies that whatever is referred to actually exists. Reference so conceived occurs when the mind achieves contact with a denizen of mind-independent reality. But in a looser sense, there is reference whenever a state

[4] The notion of target is similar to Recanati (2007)'s notion of "circumstance of evaluation". Recanati distinguishes between episodic memories' *complete* correctness conditions, which include their "circumstances", and their contents, which he claims are neutral with respect to time and place, like those of perception.

[5] Various authors have argued in different ways for the controversial claim that episodic memories are sometimes or always metarepresentational (e.g., Perner, 1991; Dokic, 2001; Mahr & Csibra, 2018). Carruthers (2018) objects that the tendency to report or conceptualize memories in metarepresentational terms does not entail that the memories themselves are. It remains plausible that *some* episodic memories are somehow metarepresentational (as Carruthers might grant). Nothing we say in this paper turns on the outcome of this debate.

'purports' to refer, or functions internally *as if* it refers. In this looser sense, reference is possible to nonexistent things like Vulcan, or FC Nantes' winning the Champions' League[6].

Is reference to nonexistents *genuine* (Evans, 1982; Crane, 2011)? To sidestep this issue, we will henceforth focus mostly on cases in which there *is* an event in the world which memories are (in some sense) about. The cases we will primarily discuss involve memories which are arguably *true,* though not *authentic*.

2. Three main theories of reference in memory

According to a naïve model of memory, an episodic memory is like a mental video of a past episode[7]. Memory *encoding* corresponds to making a recording of a perceived event. The video/memory is *stored* over time, and persists relatively unchanged in a dormant state. *Retrieval* gives rise to a distinctive experience, which is like *replaying* the video mentally: the subject relives the episode. The video/memory has an experiential/phenomenal character, as well as a representational content. The things (in a broad sense, including events) *depicted in* the video are what the memory refers to.

According to the video model, reference in memory derives from reference in past perception. Since perception is causal, there is a causal relation both between the referent and the source experience, and between the memory representation and the source experience. There is thus a mediate causal-historical relation between the memory and its referent. In addition, the video model suggests that episodic memories somehow resemble – or depict – their referents. The video model is thus a recent incarnation of the ancient theory of memory representation as an 'eikon': "An *eikon* of X is both similar to, and derived from, X." (Sorabji, 2006: cited in De Brigard, 2014a). If their phenomenology is a reliable indication of their format, memory representations are *iconic*[8]. To the extent that it involves representing particular things *as* possessors of certain *properties*, iconic representation is broadly-speaking *descriptive*. By 'descriptive', we do not mean to suggest that representations with a format similar to linguistic descriptions play any essential role. Instead, we mean representation that is 'satisfactional', in the sense of Bach (1987): some particular entity *e* satisfies some representation *R* just in case *R* represents certain qualitative

[6] The distinction between targets and referents (Cummins, 1997: 19) remains whether "reference" is understood strictly or loosely. A target is what a representation is supposed to represent, on some occasion, given its function within a system that uses representations for various purposes. Imagine a searchable database of nonexistent entities, each represented by some card. If what the system outputs in response to a query for the card for the most famous British detective is the card for Pegasus, then the purported referent (Pegasus) does not match the intended target: the system ought to have produced a representation that *purported to* refer to Holmes.

[7] On the relation between scientific and common-sense models of memory, see e.g., Tulving (2001). We find it fruitful to draw on commonsensical ideas about memory, at least as an initial point of departure, to highlight how empirical phenomena such as event completion may challenge naive models.

[8] On iconicity and depiction, see Quilty-Dunn (2019) and Greenberg (2013).

properties, features, general kinds, etc. $P_1...P_n$ and e instantiates $P_1...P_n$. To represent something via satisfaction is to represent it indirectly, as whatever has certain properties.

Like any folk model, the video model may not fit how memory actually works empirically, especially in atypical circumstances. Moreover, it combines distinguishable aspects, corresponding to different ways in which a video can be said to be 'about' or 'of' something (Kaplan, 1968; Evans, 1982). Different philosophical theories abstract from the model in different ways. Focusing on some of its aspects to the exclusion of others, they differentiate between different varieties of reference. *Descriptivist* theories focus on the satisfactional aspect of the video model. *Causal* theories focus on the causal aspects. There are also *hybrid* theories which combine both. In addition, there are *cognitive* and *epistemic* theories, which focus on the cognitive or epistemic state the subject has to be in, in order to refer. Because they focus on the state of the subject, rather than on the relation between their mind and the world, such theories have slightly different explanatory aims than causal and descriptive theories of reference, with which they can be combined. We will now briefly present these three families of views.

Descriptivist theories. According to descriptivism (Jackson, 2011), a memory refers to its *satisfier*, i.e., whatever in the world has the properties represented by the memory. Campbell (2002: 178) says that a memory "image" provides "pictorial conditions on what the object must be like for [the memory representation] to refer to it – the sort of object, its colour, size, shape and so on". A *pure* descriptivist theory says that a memory refers to whatever best matches such "pictorial conditions", and excludes causal relations from determining reference. Such an account might be extended to events: whatever goings-on have the qualities depicted in the memory would be what it refers to.

Campbell notes that descriptivism could apply to future things. Pure descriptivism is thus compatible with a *simulationist* view, according to which memory is part of a broader capacity for 'mental time travel', which includes the representation of possible, counterfactual, or future events (Suddendorf & Corballis 2007; De Brigard, 2014b; Michaelian, 2016a; Addis, 2020). For simulationists, representations of unencountered events need not always correspond to memory *errors*: non-past and non-actual events are among the targets of memory representations (or of the broader capacity which includes memory).

Simulationists view memory as constructive. They take the construction of a memory representation to occur (in significant part) at the stage of retrieval, rather than encoding (echoing Tulving, 1972). Constructive views of memory oppose the idea that memories are passively stored, and often include *relearning* (i.e., memories based on external prompts) in how memory normally works (Michaelian, 2016b). A simulationist approach suggests that the referent of a memory need not correspond to its actual cause.

Causal theories. The classic alternative to descriptivism is the *causal theory,* according to which a representation (e.g., a memory) refers to whatever stands in an appropriate causal-historical relation to it ('historical' because the causal chain reaches back in time) (Kripke, 1980). This

relation need not be *represented*. According to *pure* causal theories, all that is required for reference is that there be, objectively, the appropriate connection to some aspect of reality. No descriptive element plays a reference-determining role. This causal account of reference goes naturally with *causal* theories of memory in general (Martin & Deutscher, 1966; Perrin, 2022)[9].

Pure causal theories of reference predict that *unencountered* things, which the thinker has not directly perceived or experienced and to which they lack the appropriate causal relations, cannot be successfully referred to. Causal theorists accept that satisfactional/descriptive representation of unencountered (including future) things is possible, of course. What they deny is that genuine *singular* reference, in which *particular* things are represented as such, is descriptive.

Cognitive and epistemic theories. This family of views has recently been popular as a way to sidestep, or subsume, the dispute between causal and descriptive theories (Genone, 2014; Dickie, 2015)[10]. According to cognitive theories, part of what singular reference requires is a special kind of representational *vehicle* – e.g., a 'mental file' (Recanati, 2012; Murez & Recanati, 2016; Goodman, Genone & Kroll, 2020; Murez, 2023). Mental files are representations which enable us to refer to particular things, and to represent those things as numerically the same over time as our conceptions of them change. Files also enable information about referents' properties – corresponding to 'entries' inside the file – to be collected, accessed, and updated[11]. 'Event files' offer a possible model of singular memory representations of events (Murez et al., 2020).

The file construct helps to distinguish between the capacity to represent features or properties of a thing or event, and the capacity to refer persistently to *it*, as a particular. According to an influential 'indexical' version of the file model, files need not refer to their *satisfiers* (whatever best matches their entries, if anything) (Recanati, 2012). Instead, a file refers via an 'epistemically rewarding relation' which feeds information into the file. Epistemically rewarding relations are generally construed as a kind of 'acquaintance', which is itself construed as broadly causal[12]. Although the notion of a file is thus compatible with causal theories, there is nothing in the notion *per se* that rules out *descriptive* files, which refer to their satisfiers (Goodman, 2016). Appeal to 'event files' is thus compatible with several accounts of reference, including non-causal theories.

Unlike many causal theories, epistemic theories do not aim to provide a reductive account of mental reference in more basic terms, but to illuminatingly connect reference to epistemic notions such as knowledge, evidence, or justification (Dickie, 2015: ch. 2). Some are framed in terms of the sort of epistemic state a subject must be in to token a mental file about some referent, and for

[9] In this topical collection, Openshaw & Michaelian (2024) stress the distinction between a causal theory of what memory is, and a causal theory of how memories refer.
[10] In this topical collection, Barkasi (2024) and Openshaw & Michaelian (2024) defend such views of reference in memory.
[11] File entries come in various formats and from various sense-modalities (Gordon & Irwin, 1996; Jordan, Clark & Mitroff, 2010).
[12] We will later distinguish epistemically rewarding relations from causal ones.

that file to refer. As a representative example, one epistemic theory (Genone, 2014) appeals to an *evidential* connection to the referent: one can think singularly about a particular thing so long as one has appropriate (though defeasible) evidence that it exists. The evidential theory is less permissive than a pure descriptive theory according to which all it takes to refer to some individual is to come up with a description/depiction it happens to satisfy. But it is more permissive than a causal theory. One might have adequate evidence that there is or will be some thing – hence refer to it, according to the evidential theory – despite never encountering it[13].

Having summarily outlined the three main theories of reference, we will now introduce in more detail the phenomenon of event completion, which we will use to put them to the test.

3. *The empirical phenomenon of event completion*

Work on event completion thus far has concentrated on causal events (akin to causal launching events; Michotte, 1946/1963) whereby an actor or object causes another object to move in some way. This can be accomplished via contact, as when a person kicks a ball, causing it to fly off. It can also be accomplished by a throw, where the ball is propelled by the hand prior to the release and launch of the object.

Strickland and Keil (2011) established a false memory paradigm where participants were exposed to videos which displayed most or all parts of such causal events (e.g., a person shooting a basketball or kicking a football). In "incomplete" events, participants failed to witness a crucial moment in the causal sequence (i.e., either release or contact). This was achieved via well-timed video cuts which would cut away just prior to the moment of release or contact and shift to the next scene depicting the object's resulting trajectory. In control conditions, participants saw the complete events (which contained the moment of contact/release) or they saw incomplete events but where the subsequent video footage failed to causally imply release or contact. So instead of seeing a ball flying towards a goal, they would instead see, for example, a person walking in the background. In all conditions, participants were shown a series of pictures and asked to say for each one whether they had witnessed the depicted moment in the video. Participants who had witnessed incomplete events with a causal implication false-alarmed (i.e., incorrectly indicated having seen the event) significantly more often on pictures displaying the crucial moment of contact or release than participants who had witnessed incomplete events lacking a causal implication. The increased false alarms in the causal condition compared to non-causal condition were limited to the moments of release and contact, and did not extend to other causally irrelevant images that the participants had failed to witness (e.g., a character standing on a brightly colored mat not present in the original video).

[13] The most sophisticated epistemic theory is Dickie's (2015) *cognitive focus* theory. Here, we discuss Genone's evidential theory, which is similar in spirit, and simpler.

Subsequent work has investigated the mechanisms underlying these effects. Kominsky et al. (2020) showed that event completion persists even when the launched object undergoes radical category changes. For example, if a video shows a person launching a basketball, and that basketball visibly transforms into a football in the second part of the video, participants will still show high false alarm rates to pictures showing an (unseen) release of a basketball. This holds despite the fact that people robustly report noticing the change from basketball to football. This study showed however that *continuity* violations were much more disruptive of event completion. So, after an apparent (but unseen launch) if the object appeared too far along its trajectory (giving the impression of teleportation as opposed to launching), participants no longer filled in missing moments in memory at the same rate. Finally, this same study showed that overall event familiarity and the presence of human actors is not crucial to these effects. Thus, if participants viewed videos whereby unfamiliar mechanical objects launched objects via unfamiliar motion patterns (e.g., a hammer-like object turning around the body of a screw to strike an object), participants nevertheless continued to fill in missing moments of contact.

Papenmeier et al. (2019) replicated the basic event completion effects in another set of videos and demonstrated that they persist even when participants are explicitly informed that in half the videos the crucial moment of contact was removed. This demonstrates that causal filling in can happen even when attention is locked in on the event in question, suggesting a certain level of automaticity and informational encapsulation in the relevant processes. Finally, Raykov, Varga, and Bird (2023) recently showed that event completion effects may generalize to non-causal events. In their study where participants were asked to freely recall event details, they found that interrupting a clip just before a salient action was completed resulted in participants falsely recalling details about how the event might have ended. However interrupting clips just after one event had ended and before another started actually resulted in omitting details about the true ending of the clip.

Event completion is related to De Brigard's (2014b: 155) idea that memory is "part of a larger system that supports not only thinking of what was the case and what potentially could be the case, but also what could have been the case." In other words, memory is embedded in a constructive apparatus that allows for the construal and re-construal of this world as well as other possible neighboring worlds. In carefully crafted lab-based experiments, these reconstructive mechanisms may lead to error, while during their normal functioning, they may typically lead to accurate representations (a point to which we return in Section 4 below). The major difference between our own view and De Brigard's pertains to the particular underlying mechanisms we would postulate to be responsible for completion. On De Brigard's view, following other researchers like Hemmer and Steyvers (2009), Huttenlocher et al., (1991), and Steyvers et al. (2006), "remembering consists in the optimal reconstruction of a previous experience, whereby 'optimal reconstruction' is understood as a retrieval process probabilistically constrained both by schematic knowledge and the frequency of prior encounters with the target memory" (De Brigard, 2014b: 171). While this Bayesian-compatible account almost certainly explains important aspects of memory distortions and reconstruction, we are skeptical that it accounts for the entirety of the event completion effects.

Importantly, event completion occurs even for scenes which violate schematic expectations (e.g., where a soccer ball is kicked into a basketball hoop or where a basketball seemingly transforms into a football mid-flight). Event completion also occurs for unfamiliar scenes involving novel objects and object flight paths (see Kominsky et al., 2020 for more details). Automatic completion in the case we focus on likely involves some mixture of schematic background knowledge (as De Brigard and others claim) as well as more basic perceptual "assumptions" about the fundamental behaviors of physical objects (e.g., such as that objects obey the "continuity" principle) (Spelke, 2000).

Overall, these event completion effects are similar to amodal completion (Nanay, 2018; Lee & Vecera, 2005) with the obvious difference being that amodal completion relates to missing parts of *objects* while event completion relates to missing *events*. Like event completion, amodal completion appears to happen quickly, be sensitive to very specific stimulus properties, and displays some degree of imperviousness to top-down influences (Nanay, 2018; Hazenberg et al., 2014; Hazenberg & Van Lier, 2016; Lee & Vecera, 2005, 2010; Van Lier & Gerbino, 2015). Event completion is also qualitatively similar to "boundary extension" (Intraub et al., 1996) whereby people systematically remember more of a scene than that to which they were originally exposed.

Event completion differs substantially from some other well-known memory distortion effects. For example, it is qualitatively dissimilar to 'representational momentum' (Freyd & Finke, 1984). In representational momentum, an object is seen moving along a trajectory and is typically misremembered as being further along that trajectory. This effect differs from event completion in the sense that in event completion people misremember a type of action (i.e., contact or release) that they had not witnessed, whereas in representational momentum they simply misremember a difference in degree (i.e., of location) of a type of action (i.e., object motion) they have seen. Finally, event completion differs from other types of memory creation such as confabulation in that event completion typically operates over very short time scales (on the order of seconds or milliseconds).

4. Descriptive theories assessed with respect to event completion cases

We are interested not so much in reference to events in the specific context of the lab-based experiments we've just described, but in what can be inferred from those experiments about typical real-world circumstances in which event completion would be operational. In the experimental setup, the event that the memory is supposed to refer to is a *video sequence,* which fails to include the moment of contact/release. Subjects' memories are false, if we consider this gappy video as their target. Henceforth however, we will instead mostly focus on an analogous real-world situation in which, instead of seeing an incomplete video, a subject has an incomplete experience of a similar sequence of worldly events as those depicted in the video – except, crucially, that the real-world sequence of events is, by hypothesis, complete. In that real world episode, we will suppose, there actually was a moment of contact/release, which the subject happened not to directly

perceive. Completion allows the subject's memory to include this missed event. In the real world, such completion processes are useful, since we suffer from inattention, environmental noise, interruptions, and other elements that disrupt continuous experience. As De Brigard (2014b: 172) suggests, "filling the missing pieces" can actually help us to correctly remember actual scenarios.

Is it possible for subjects to successfully refer to 'completed' target events, like the event of contact being made with the ball in the realistic scenario we've just described[14]? Descriptivist theories appear to allow for referential success in such cases. They predict that there *can* be reference to an event, even without a causal/historical relation to it. In event completion cases, the existence and characteristics of the target event (e.g., the contact) are inferred from surrounding events which stand in causal relations to it. According to a pure descriptivist theory, the fact that the target event has not in fact been witnessed in past perception does not prevent reference, so long as completion yields a descriptive/pictorial content it satisfies.

Indeed, completion *could* yield a pictorial content which the target event satisfies. Nevertheless, standard worries with descriptivism can be brought to bear on event completion cases (Kripke, 1980; Devitt, 1981). Descriptivism faces the problems of *ignorance and error*, both of which connect to the problem of *singularity*. As a version of the problem of ignorance, consider that it might be difficult to reconstruct an unperceived event via completion precisely enough to arrive at an *identifying* content, i.e., one that specifies properties that pick out exactly one event – the target. Imagine, for example, that there have been several similar kicks of the same ball towards the same goal around the same time and place as the kick that actually featured in the broader episode which the subject saw. All these different events might equally match the pictorial content of the completed memory. It seems perfectly possible, and even typical, for the subject to only remember the gist of the event. If the subject is ignorant of identifying properties of an event which would distinguish it from others of the same gist, then it is unclear how reference to that *particular* event as such is achieved. What accounts for the fact that the memory still presents itself as *singular*, despite being so underspecified?

The problem of error is analogous. Memories can be distorted and end up representing properties possessed by something other than their target. Descriptivism wrongly predicts that such memories are true of whatever actually has those properties. Consider, for example, the fact that any real event of kicking a ball involves contact made either with the inside of the foot or its neck. Suppose that the subject completes a memory of a kick made with the inside of the foot, but the real kick which occurred as part of the more encompassing episode they saw was made using the neck. As it happens, another contact event occurred, as part of a separate neighboring episode, in which the agent kicked the ball with the neck of his foot, *exactly* in the manner which the subject happens to picture. The pure descriptivist view predicts that the memory *correctly* refers to this other kick, because that event better satisfies the memory's 'pictorial conditions'. Intuitively, however, the

[14] Note that we are focusing here on reference to the event *of contact,* which was not experienced, and not reference to the more encompassing event of which contact is a proper subpart.

memory actually (partially) misrepresents the kick that was part of the episode actually experienced.

A straightforward reply to this anti-descriptivist argument would consist in denying that memories are in fact *singular*. It might be argued that episodic memories only ever represent gists, or types of events. This requires abandoning our working assumption that episodic memories indeed pick out singular events, which is a cost. A more nuanced position might be that the *contents* of episodic memories are entirely general, but that their *targets* are singular. According to such a proposal, descriptive contents get *applied* to particular objects and events (Cummins, 1996; Bochner, 2021)[15]. Whenever subjects themselves could not tell the difference between memories of qualitatively similar events (as one might be incapable of distinguishing between videos of perfect twins), then the contents of the memories would be identical. However, indistinguishable memories' *complete* correctness conditions could still differ, as these involve more than contents. A memory would be correct so long as the particular things *targeted* by it have the properties making up its content. What would determine the (singular) target of a memory could be causal – just as what a video is *of* depends on which individual reflected light into the camera so as to affect the film, etc.

One problem with this view – pure descriptivism with respect to content, combined with a causal theory of the determination of singular targets – is that it does not capture the phenomenological and psychological fact that memory content itself seems to be about particular things (at least sometimes). The singularity of memory *content* reflects itself not merely in memory's phenomenology, but also in its internal cognitive role. We noted that in Kominsky et al. (2020) subjects were comparatively tolerant with respect to changes in properties and even categories of objects. This supports the view that memory content is singular. Even when we do not remember their identifying properties, we may still take ourselves to remember unique *individual* events as such – not just whichever has such-and-such general properties. There is a difference, from the subject's own perspective, between remembering a particular event imprecisely, having forgotten all but its gist, and remembering an abstract type of event perfectly.

Moreover, we can get *the particular event* a memory is about wrong, and not merely attribute *the wrong properties* to the right event. For example, attempting to recall N'Doram's first goal against PSG in 1995, I may recall (perfectly) what is actually his second goal. It seems possible to describe such a case as one in which I remember the wrong event – and not just one in which I misattribute properties, which the second goal happened to have, to the first. If such errors *of reference* are possible in memory, this tells against relegating the singularity of memory outside of its content. Memories' having singular referential contents, in addition to singular targets, explains that two different sorts of memory errors are possible: a memory can refer to a particular event which does

[15] Recanati (2007) argues that episodic memories' contents get applied to "circumstances of evaluation" to yield their *complete* correctness conditions, but does not consider the contents to be purely descriptive. Here, we argue for a similar position.

not match its target (the referent $e \neq$ the target e'), or it can refer to the right event, yet represent its properties inaccurately (properties $P_1 ... P_n$ are misattributed to e, where the referent = the target = e)[16].

Hybrid versions of descriptivism are traditionally invoked to address the sorts of objections we've considered. According to *causal-reflexive descriptivism,* contents are something like: "the cause of this current (e.g., memory) representation" (Searle, 1983; García-Carpintero, 2000; Higginbotham, 2003). Causal-reflexive descriptivism can account for the fact that memories intuitively pick out singular events to which the subject stands in causal-historical relations[17]. Causal-reflexive descriptivism is designed to pattern with the causal theories from which they draw. If causal theories predict reference failure in event completion cases (see section 5), then so do their descriptivist analogs.

As we've seen, one objection against descriptivism is that if all reference is *purely* satisfactional, it is unclear how there can be singular reference to particular things (Lewis, 1984; Bach, 2010; Recanati, 2012). *Anchored* descriptivism attempts to address this problem: reference is in general determined satisfactionally, but at least one thing is picked out directly, which 'anchors' content as a whole to particular things in the world. According to *egocentric* descriptivism (Lewis, 1979), for example, the thinker herself is picked out nondescriptively via some special acquaintance relation everyone bears to themselves, while everything else is represented as standing in some relation to the thinker. Because egocentric descriptivism requires some relation to the self to be represented whenever there is singular reference, it has difficulty accounting for the contrast between observer and field memories, and the fact that retaining the same memory may be compatible with a switch between the two[18]. Moreover, in cases of event completion, the subject is mistaken about the relation they bear to the event: they wrongly take themselves to have *seen* it. If so, egocentric descriptivism predicts reference failure.

Another version of *anchored causal* descriptivism nevertheless seems promising. An initially unperceived event might be referred to as *the cause/effect of such-and-such other events*, the latter of which have been perceived. For example, reference to the contact event might be achieved by its being represented as an effect of the event of the agent moving towards the ball, and as causing

[16] Cummins (1996: 19-20) emphasizes the importance of not conflating targets and referents in order to account for this sort of error. In his framework, "[a]n attitude is the result of giving a cognitive role to an application of a representation r to a target t" (Cummins, 1996: 14). The complete long-arm role of a memory (application) depends on multiple factors, including its target. This is compatible with our claim that the memory's singularity depends at least partly on its content being singular. A referee raises the contrary possibility that any singularity displayed by a memory's role may be due only to its target, corresponding to its "aim" (Michaelian, 2016b). While this position is not incoherent, there would in that case be a systematic mismatch between a memory's (general) content and its (singular) target. Supposing instead that the singular aim of the episodic system is sometimes accomplished, this corresponds to its tokening representations with singular *contents*, which match its targets.

[17] Recanati (2007) argues that the causal-reflexivist theory mislocates memories' reflexivity in their content, rather than in their *mode*, which determines their "circumstance of evaluation" (their target).

[18] See section 1, and see Recanati (2007), for detailed discussion.

the event of the ball moving towards the goal. This is an attractive position, since it is plausible that event completion involves the construction of a representation which results from a bridging inference from perceived events to their causes/effects. The version of anchored causal descriptivism we are considering takes the representational material involved in the inferences that plausibly underlie event completion, and hypothesizes that its satisfaction by some worldly event is what determines reference.

According to such a view, causal descriptions of *completed* events specifically would be anchored via their relations to other events, which were actually directly experienced or perceptually processed. Reference to these other events would be determined via causal-historical relations, accounting for the singularity of the memory of the broader episode as a whole. An advantage of such a theory is that neither these other events, nor the completed one, need to be identified purely qualitatively: causal anchoring to some subpart of the broader episode to which the completed one belongs would be sufficient.

An additional advantage of this theory is that it is compatible with the state-of-the art on event perception and cognition, according to which the mind naturally parses dynamic flows of incoming sensory data into coherent and discrete event units (Zacks et al., 2007; Newtson et al., 1977). Such units are demarcated by boundaries which are spontaneously placed at the time points when one event ends, and another begins. These boundaries can be hierarchically structured, such that coarser-grained events subdivide into finer grained subevents (e.g., making a sandwich subdivides into buttering the bread, placing the lettuce, the meat, etc.). Event boundaries have powerful and automatic effects on memory and attention. For example, people are more likely to notice interruptions in the middle of an ongoing event as opposed to at the boundaries of such events (Ji & Papafragou, 2020). Moreover, people are less likely to remember recently presented information when they have experienced an event boundary between the moment of encountering this information and the moment in which they may recall it (compared to conditions in which there is no such boundary, but where time between presentation and recall is equated; Ongchoco et al., 2023; Swallow, Zacks, & Abrams, 2009; Radvansky & Copeland 2006). The best explanation of such effects is that event representations serve as a buffer to support the integration and processing of incoming information in working memory, and when a boundary is drawn, this flushes out a working memory 'cache' so that new information can be buffered and assimilated (Ongchoco & Scholl, 2019). The precise mechanisms that determine how people demarcate the temporal boundaries of events remains an open topic for debate[19]. Regardless of which particular theory prevails, such discrete event units, many of which actually stand in causal relations to external

[19] The dominant view is the *prediction error* account (Zacks et al., 2007; Zacks et al., 2001). According to this view the mind is constantly making predictions about likely upcoming sensory information. One event is completed and a new one begins whenever prediction accuracy drops below a certain point. An alternative theory states that salient context or state changes (even if highly predictable) are the drivers of event segmentation (DuBrow & Davachi, 2016; Wang & Egner, 2022; Güler, Serin, Günseli, 2023).

worldly events, can serve as natural anchor points for reference (Swallow, Zacks, & Abrams, 2009).

A potential objection remains. If reference to completed events is determined via representations relating them causally to others, why should subjects wrongly report remembering *having seen* the completed events themselves, rather than merely having seen their causes or effects, and *inferred* they took place? To account for this fact, the descriptive contents that determine reference might be taken to involve the completed event's having been *seen* by the subject, rather than inferred from others. Yet then reference would again be predicted to fail, since completed events were *not* in fact seen.

A possible reply would be that the belief that the event was seen need not be part of what determines reference. Not *all* of what a subject believes about an event they remember has to play a reference-determining role. That the event was actually seen by the subject could correspond to some peripheral aspect of the subject's overall conception of it[20]. Still, the objection highlights that the anchored causal descriptivist view introduces an asymmetry between how reference is determined in 'normal' cases, and in completion cases. This might account for what is intuitively special about the latter. Yet such an asymmetry is hard to reconcile with the fact that subjects themselves are often unaware of any difference between the two sorts of cases. From the subject's perspective, completion cases work the same as memories of surrounding events. They seem equally singular to the subject, and play similar cognitive roles. The anchored causal descriptivist theory gives a descriptive account of reference for completed cases, by contrast with surrounding events, reference to which is causal. If so, shouldn't subjects treat their memories of directly experienced events as more singular than those of completed events?

Perhaps a memory can be descriptive, though from the subject's perspective, it seems singular and causally grounded. Still, the objection highlights a cost of the anchored causal descriptivist view. The internal cognitive role and phenomenology of memories becomes divorced from their *actual* mode of reference. This amounts to rejecting the thesis – so-called *meta-internalism* – according to which how reference is determined (whether causally or descriptively) is determined by individual psychological states to which subjects themselves have access (Cohnitz & Haukioja, 2013). Such a view, though debatable, is less controversial than *first-order* internalism, according to which reference itself is determined by accessible internal states. There are thus reasons to explore alternatives to descriptivism.

5. Causal theories assessed with respect to event completion cases

A pure causal theory predicts reference failure in event completion cases, because there is no actual direct causal-historical relation between the subject and the target completed event itself. What counts as a direct causal relation is debatable. Arguably, theories of reference should avoid

[20] See also section 6.

committing to any specific account. What matters for present purposes is that adopting a *pure* causal theory excludes any mediating inferential process involving representation of the referent's properties, from playing a constitutive role in the determination of reference[21].

Nevertheless, as a referee notes, perception itself is fragmentary and involves reconstructing scenes and objects from lacunary data. Doesn't this cast doubt on the claim that completed events are less directly perceived than scenes or objects normally are? We agree with the claim that event completion is in some respects similar to ordinary perception, and that both involve constructive processing. What this shows, however, is simply that standard purely causal theories of reference may also face challenges in accounting for ordinary perception.

A related worry the referee raises is that if one adopts an interventionist theory of causation (Woodward, 2005), one might maintain that the event of contact with the ball *is* causally necessary for the perception and subsequent memory of that event. This relates to the previous worry, insofar as it suggests that apparent difficulties in applying purely causal theories of reference to perception or memory can be dealt with by adopting a better theory of causation. We agree that adopting an undemanding notion of causation might initially appear to support describing the contact with the ball as causing its launch towards the goal, as well as the perception and memory of the contact. This appearance only persists, however, so long as one considers only cases in which there actually *is* a contact event. Yet the experiments we have described suggest precisely that intervening so that there is no such event does *not* preclude the formation of memories that represent contact as having occurred. The experiments thus appear to falsify the counterfactual claim that (as the referee puts it) "if there had been no kick then the ball would not have flown towards the goal and there would have been no perception of the ball having been kicked". This counterfactual instead captures a presupposition underlying the constructive aspects of memory, which is falsified in an experimental setting. Supposing it is legitimate to draw on the experimental data to establish which causal relations hold in ecological settings, interventionist causal theories thus arguably do predict reference failure in event completion cases.

One might maintain, however, that reference failure is the right result. Event completion cases could be considered cases in which memory only purports to refer. That there is an event in the world whose properties the memory appears to largely capture, and that other surrounding events are successfully remembered, does not entail that the memory is 'of' that unencountered event. One might thus insist that completed memories are not merely inauthentic, but also referentially *empty*.

Alternatively, a causal theorist might argue that there *is* successful reference to the completed event, just not reference *in memory*. Reference to unencountered events might be claimed to take place (say) in belief, or in imagination, or via mental imagery. This would mean reference in these

[21] What is meant by "direct" is also to be understood by contrast with "trace based" causal accounts, which we discuss below.

other states does not require an actual causal connection, which is controversial (especially for belief). Moreover, it is unclear why completed events should be considered to be merely believed in or imagined. Subjects distinguish between completed events, which they take themselves to remember seing, from events which they simply believe, imagine, or hypothesize to have taken place. The automatic, efficient, unconscious, and rapid character of completion, and its seamless integration with representations that are uncontroversially memories, suggest that completion is part of memory. The idea that completion involves 'imagery', a view which Nanay (2010, 2016) defends for perception, is not implausible. But it does not offer so much an alternative to the view that reference to completed events occurs *in memory*, as a proposal about the processes that it involves.

Event completion also raises a version of the *qua problem*, which is one of the main objections against *purely* causal theories of reference (Devitt & Sterelny, 1999). One version, the 'mereological *qua* problem', is that any causal encounter with some individual X is an encounter with some proper part of X. So why is reference to the *whole* X, rather than only to its encountered part? Other versions of the problem stem from the fact that any X is a token of multiple types, or a member of multiple kinds, at various levels of generality. Why is reference to X as a token rather than to the type it instantiates? And when reference is to a type or kind, why is it to *that* type or kind, at that specific level of generality, rather than another?

The *qua* problem is particularly pressing for events (Perner, forthcoming). Suppose you remember someone kicking a ball. Why does your memory refer to the *event* of kicking, as opposed to the agent (the person kicking), or the patient (the ball)? Why is there singular reference to that *particular* event, as opposed to generic reference to events of that type (which is possible even when one has only encountered the type in one instance), or to a repeated event of that kind? And why is reference specifically to (e.g.) the event as one of someone *kickin*g a ball, as opposed to (say) as of someone *playing sports*, both of which may occupy the same spatiotemporal region (Devitt & Sterelny, 1999)?

In event completion cases, the subject entertains actual *direct* causal relations not to the completed event itself, but to other events, which are related to it either as a whole to its parts (e.g., the event of scoring a goal encompasses the subevent of kicking the ball), or as causes to effects (see section 4). Standing in a causal relation to some entity does not entail standing in a causal relation to all its parts, nor to others to which it stands in causal or parthood relations. This raises a version of the mereological *qua* problem: why is it that reference is not (only) to the other events, which were causally encountered?

Purely causal replies to the *qua problem* have recently been popular (Reimer, 2020; Deutsch, 2021). One of these appeals to a metaphysics of causation according to which causal relations involve particular individuals only *qua possessors of certain properties*. For instance, if kicking a solid red bowling ball breaks someone's foot, the causally *relevan*t properties of the ball include

its solidity, but not its color. Likewise, a memory representation may be tokened in response to its causes having certain properties and not others. Why a memory refers to an event of kicking, as opposed to the person doing the kicking or the ball being kicked, might be explained by the fact that what actually was causally relevant to that specific memory representation being formed was the instantiation of the property of being a kicking event, rather than the encounter of a person or a ball (which might have caused other representations).

Regardless of whether or not it successfully addresses other versions of the *qua* problem, this move doesn't help much with event completion, for a simple reason. If there is *no* causal relation between the representation and the contact event itself, there is no opportunity for the instantiation of the property of being a contact to be causally relevant.

A different purely causal reply to the *qua* problem has been proposed by Reimer (2020), for proper names. Reimer argues that the fact that names refer to objects, and not to their parts, is explained by a 'whole object' bias. She claims that it is simply a fact about the human practice of naming that, by default, whole objects are named. Because there is such a bias, there is no need, she argues, to involve descriptive content in the explanation of how the reference of names is determined.

This bias in naming plausibly derives from a more basic psychological 'whole object bias' in core cognition/perception, for which there is much empirical evidence (Bloom, 2000). Might Reimer's solution to the *qua* problem for proper names be applied to memory reference to particular events? Not without some adaptation. We are interested in reference to particular *events* in memory. Any theory which predicts that by default reference is to whole *objects* fails to account for the fact that referents in the relevant cases are *events*.

Still, it might appear that an analogous move to Reimer's might be made for events. What empirical psychological research into event completion shows is arguably that there is a bias towards representing whole (completed) events – in particular, teleological processes or achievements. Our cognitive system tends to represent entire processes that have terminated at their 'natural' endpoint or goal-state, which memory construes to have been reached when evidence is adduced. It seems plausible to posit a 'whole event' bias in memory, similar to (and in addition to) a 'whole object' bias in other areas of cognition and language. Indeed, as we have noted in section 4, and as we have argued in other work, events are natural units for cognition, alongside material (Spelke) objects (Murez et al., 2020)

There are limits to such an appeal to a 'whole event bias' as a solution to the qua problem. If there were just one default bias, say towards objects, then it might suffice to explain why reference tends to be to (whole) objects, which are given priority over their parts. But if there is more than one bias, one towards whole objects and another one towards whole events, then some story remains to be told about which one is operative, in any given case. This is not a knockdown objection: maybe subjects tend to always remember *both* whole objects and whole events. Probably some story can be told about how various biases compete, and how they can be modulated by attention,

by the context, or other cognitive states. Still, merely appealing to biases towards wholes does not suffice to explain how reference to *events* specifically occurs, in completion cases[22].

A more serious issue remains. 'Whole event bias' fails to account for the difference between event completion cases, and amodal completion cases in perception, or representational momentum cases in memory. As previously noted, in event completion, we are not dealing with a mere extension or stretching of the boundaries of the referent from subparts to whole. Instead, a whole new referent – an occurrence of a distinct type of event – is introduced. Rather than having to explain merely how reference to the whole event *e* is achieved via an encounter with part of *e*, what needs explaining is why reference to *e* is achieved via encounter with some other related events $e^1...e^n$ *which are not e*. In particular, why is it that despite the causal relation being to the more inclusive event that encompasses the completed subevent, there can still be reference to *both* the inclusive event as a whole, *and* to its unencountered subevent (e.g., the contact) in its own right? Given that there is no causal-historical relation to the subevent that is 'completed', bias towards reference to the whole event which encompasses it cannot be what explains reference to *it*.

Contra pure causal theories, what solves the *qua* problem may involve the subject representing the referent *as an event*, or as a certain *type* of event, etc. At any rate, it seems worth exploring departures from a *pure* causal theory.

According to *hybrid causal theories*, causation is necessary but insufficient for reference. To solve the *qua* problem, a descriptive content is taken to partially determine reference. Usually, such content is identified with a representation of the *sort* of thing the referent is (Strawson, 1959). Thus, according to causal *sortalist* theories, reference is primarily based on causal relations, yet the subject still needs to know s*omething* about the referent's nature – a category to which it belongs, which determines its conditions of individuation.

This connects with psychological theories which suggest that event category knowledge may play an important role in individuating events. For theorists committed to the prediction error model of event segmentation, schematic background knowledge about the type of event in question helps formulate ongoing predictions about expected upcoming inputs (and when prediction error goes past a certain threshold, this triggers the closing of one event file and the opening of another; see Elman & McCrae, 2019; Franklin et al, 2020). For theorists who consider that change rather than prediction error is the primary driver of event segmentation, category shifts could serve to define the *types* of change that would be relevant for delimiting events (see Ji & Papafragou, 2020; Ji &

[22] We maintain that there are memories as of particular events, rather than only memories as of particular objects. This claim is compatible with models according to which events are, at some level, represented as "intersecting object histories" (Altmann & Elves, 2019). As we understand such models, representations of events are not eliminated in favor of representations of changing objects, so much as *abstracted* from them. As a referee helpfully remarks, such detailed models of the relations between event-memories and object-memories may clarify the interactions between whole object and whole event biases.

Papafragou, 2022; Güler et al., 2023 for evidence that shifts in event category can create event boundaries, and that event category structure influences attention and memory).

Different hybrid causal theories are possible, according to which descriptive element is introduced, and whether or not it needs to be perfectly satisfied for reference to succeed. According to one version of sortalism, a subject may successfully refer to something, though they are wrong about precisely the sort of thing it is (Lowe, 2007). Reference only fails if the referent is not of a more abstract sort which subsumes the one actually ascribed. For example, suppose you represent something as a dog, though it is actually a cat. Here, reference does not fail, because a more abstract sortal like *animal* still applies. But if the 'dog' turns out to be a smudge on your glasses, or an event like a flash of light, then reference fails. Although you can refer to something without knowing the basic-level category to which it actually belongs, you cannot be wrong about its fundamental ontological category.

Adopting a version of sortalism according to which we remember *events* by classifying them as such addresses some versions of the *qua* problem for memory, such as the difference between remembering an event and its participants. Yet if hybrid causal theories require a causal relation *and in addition* a sortal categorization of the referent, then in the absence of the necessary causal relation, they too predict reference failure.

The other main option for causal theorists is to abandon the requirement that causal relations be direct[23]. According to *trace-based causal theories,* reference can be based on an *indirect* causal relation via some trace the referent leaves (Sawyer, 2012). For instance, seeing some footprints, the subject thinks 'He has huge feet', though they've never perceived the person who left the footprints. According to the trace-based theory, the subject can still succeed in referring to that person, because they are indirectly causally related to him by the trace he has left. The claim is not merely that the subject can descriptively represent 'whoever left those footprints', as a causal descriptivist would have it. Rather, the causal trace provides a non-satisfactional relation which grounds *singular* reference to the individual who left it.

Adapting this account to event completion cases seems promising. Events (such as the crash of a meteor) also leave traces (a crater). The availability of traces could sustain singular reference to unencountered events. Applying this general idea to event completion, one might consider subjects to be acquainted with the 'traces' left by a completed event, inasmuch as they are acquainted with some of their effects – including other events. Here, rather than memory of an encountered *object* grounding memory of an unencountered event, memory of encountered *events* would ground memory of unencountered ones.

[23] *Tracking* theories (Mendelovici, 2013) also relax the requirement that nonsatisfactional relations be directly causal, and instead appeal to natural information or reliable covariation (often coupled with functional or teleological notions).

There is however an important difference between typical cases of trace-based reference, and event completion. One does not, in thinking 'He has huge feet', wrongly take oneself to have actually seen the feet's owner. One is fully aware that reference is trace-based. By contrast, just as subjects do not consciously infer that the objects they perceive have backsides, subjects do not consciously infer that completed events have taken place. They do not take themselves to remember those events by having perceived their traces, but because they have directly seen them. Like anchored causal descriptivism, trace-based causal theories thus raise the issue of the extent to which subjects can be wrong about how memory reference is actually determined, and whether we should adopt a view of reference in memory according to which they are.

6. Cognitive and epistemic theories assessed with respect to event completion cases

Cognitive theories claim that in order to represent in a singular manner, one must deploy a characteristic cognitive vehicle, such as a mental file. It is a further issue how such vehicles acquire singular content: the question of how subjects refer to particular events in memory can be rephrased as the open question of how (e.g.) 'event files' refer.

Still, the mental files model potentially helps address the problem of the *singularity* of memory, insofar as it concerns what makes it the case that a memory presents itself as being about a particular event, from the subject's or their cognitive system's perspective. 'Singularity' in the relevant sense concerns a memory's format and internal cognitive role, how it interacts with other representations and cognitive processing, rather than only its reference-determining relation to the outer world.

A file is a complex representation, which in a simple version of the file model has two components (Recanati, 2012). On the one hand, there is an *atomic* element, sometimes called 'the file itself', which represents the referent's numerical identity by its own numerical identity *qua* 'mental particular'. On the other hand, the 'entries' represent the referent's qualities from the thinker's perspective – i.e., the properties which the subject ascribes to the event, which may change. In computational terms, one may conceive of a file as a 'pointer' to a functional location at which an evolving body of information is stored (Gallistel and King, 2011; Quilty Dunn, 2021; Murez, 2021, 2023).

According to accounts which individuate files by an atomic element such as a pointer[24], files function like singular terms or variables in the language of thought (Fodor, 2008; Recanati, 2016; Murez, 2023; Mandelbaum et al., 2023). What constitutes the identity of the file is not the information inside it. Representing a referent as numerically the same requires deploying the same pointer to a functional memory location. This is compatible with change in whatever happens to be stored at that location. This conception of files may help account for the fact that, from the

[24] According to alternative accounts, 'dossiers' reduce to bundles of feature-representations (Grice, 1969; Lee, 2018). Dossiers are nondescriptive representations only in the weak sense that no *specific* entry is essential to their identity (Goodman, 2016).

subject's perspective, what is represented is just some particular referent, all of whose properties are implicitly treated as contingent, in two senses: In an *epistemic* sense, the subject realizes that they may be wrong about which properties the referent has. In deploying a file whose entries may evolve, they are disposed to revise and correct their conception of the referent, while keeping *it* in mind. In a *metaphysical/modal* sense, the subject tacitly acknowledges that for any property F which they ascribe to the referent x, it is possible that x could fail to be F in another possible world[25].

According to an elaboration of the files model by Perner (forthcoming), files also have *labels*, corresponding to the sortal category ascribed to their referent. This amounts to a hybrid sortal/cognitive model. Unlike mere entries inside the file, the label is taken by the subject to be essential. Whether or not a file can refer to something to which its label does not correctly apply, the notion of a label may account for the difference between remembering an entity as belonging to the ontological category of objects vs. events, or for representing the difference between different sorts of events (say contacts vs. launches). Whether such classifications correspond to mere entries inside files, or have the status of labels, depends on whether subjects can envisage that the very same referent could turn out to be an object rather than an event, or that the very same event could turn out to be a launch rather than a contact.

The file model, like the video model, has been criticized as too "wooden" to account for the constructive and generative aspects of memory (e.g., Woodfield, 1991). Memory, it has often been noted, is not like a file cabinet in which documents are placed at particular locations and passively collect dust until they are retrieved. However, files are compatible with constructive and generative views of memory. Massive changes can take place in the entries 'inside' a file, and transfer of entries can occur between different files, at any stage. Rather than being passively stored, new entries might be added or deleted, and 'merges' be made between files. There is no reason why files should remain unaffected by retrieval (or relearning). Moreover, talk of files does not entail localist memory representations: a file-vehicle may be distributed. A file is a location at which information is stored and from which it can be retrieved in a *functional* rather than in a physical or neurophysiological sense (though see Quiroga, 2012, for evidence of relatively localized representations of particular individuals in the brain; see also Cheng, Werning & Suddendorf, 2016)[26].

[25] We are grateful to Shaun Nichols for highlighting for us the value of files in accounting for modal intuitions. In a more detailed version of the files model, files can be 'indexed' to other worlds, while coreference with 'regular files' for things in the actual world is represented by 'linking' (Recanati, 2012, Perner, forthcoming).

[26] Talk of 'event files' does suggest that *something* – an atomic pointer to some dynamically evolving body of information – gets stored and preexists retrieval. Positing files amounts to endorsing the existence of memory traces, which is controversial (De Brigard, 2014a). Suffice it to note that a rejection of purely 'ephemeralist' views of memory (Casasanto & Lupyan, 2015), according to which nothing is *stored*, remains plausible. Indeed, as a referee points out, files are fully compatible with standard constructivist models, according to which more than mere pointers are stored (e.g, Addis, 2020). See also Murez (2021) and Barkasi (2024).

The most empirically studied kind of files are 'object files', representations that pick out particular objects in perception/core cognition. Object files may persist for some duration, but are not long-term memory representations (Noles, Scholl & Mitroff 2005). At the perceptual level, the duality of files (files themselves/pointers vs. entries) accounts, among other things, for our visual capacity to represent a particular thing we see as the same enduring individual, although its properties appear to change. This occurs, for example, when one visually tracks an object while changing impressions about what *it* is (Kahneman, Treisman & Gibbs, 1992). In visual working memory, co-filing corresponds to multiple features being bound to the same object (Yu & Lau, 2023). Empirical evidence for representations with file-structure in working memory is provided by the fact that the capacity of visual working memory (VWM) seems to be defined (in part) by how many individual objects/files are represented at one time, rather than simply by how many features are. Subjects who are incapable of remembering 16 different features distributed across the same number of objects are able to represent 16 features, if these correspond to 4 different objects each of which instantiates a conjunction of 4 features (Luck & Vogel, 1997; Luck & Vogel, 2013; for discussion of debates about VWM structure, see i.a., Murez et al., 2020). In previous work, we have argued that there are systematic analogies between such file-like representations of objects, and how certain simple events are represented in VWM (Murez et al., 2020). These analogies empirically justify, in our view, the postulation of 'event files' in VWM, whose signature characteristics are similar to those of object files, though they are dedicated to the representation of events.

Philosophers and some psychologists have extended the notion of 'file' from perception to higher-level cognition (Jeshion, 2010; Recanati, 2012; Perner, forthcoming; see Murez et al., 2020; Murez, 2023, for discussion). Co-filing of entries, at the conceptual level, is taken to implement mental co-predication: if "was glorious" and "took place a year ago" are entries co-filed in the same event file, then the thinker is in a position to judge that some particular event instantiates a conjunction of both properties, i.e., that some glorious event took place a year ago (Campbell, 1988; Recanati, 2012). Such dispositions to 'trade on coreference' are often taken to relate to the capacity to represent *singularly* (though see Goodman, 2022, for discussion). Some effects in memory, such as the so-called 'differential fan effect', suggest that at least some long-term memory representations have a file-like structure (Radvansky, 1999). The *classic* fan effect is that the more facts one associates with a concept, the more difficult it is to retrieve any one of them (Anderson, 1974). The *differential* fan effect is that the classic fan effect diminishes or disappears when the different facts can be easily interpreted as all pertaining to one and the same situation (Radvansky, Spieler, & Zacks, 1993). This might correspond to its being easier to retrieve information stored as entries inside the same file for a situation, rather than dispersed across multiple files (Murez et al. 2020: 131). If there are situation or event files in long-term memory, including episodic memory, this may provide at least a partial answer to what makes those memories singular with respect to their vehicle/internal cognitive role.

Two influential views of 'singular thought' – the *indexical* model (Recanati, 2012) and the *significance* model (Jeshion, 2010) – are stated in terms of constraints on tokening mental files. According to the significance model, a file is tokened on an individual only if that individual "is significant to the agent with respect to her plans, projects, affective states, [and] motivations" (Jeshion, 2010: 136). However, events do not need to be significant in this sense to be episodically remembered. In event completion experiments, the contact event becomes relevant to the subject's goals when they are tasked with indicating whether they have seen it. Prior to this, there is no clear sense in which it was significant to them. Jeshion's view thus appears to predict that files in these cases are constructed upon retrieval, when the question is raised. Further evidence would be needed to confirm this hypothesis.

Although there are obviously connections between significance and memory (as illustrated by flashbulb memories, Brown & Kulik, 1977), we also remember insignificant things. In particular, it is probably not an event's importance with respect to one's plans, etc. that triggers completion processes, which appear to be largely automatic, and resistant to many forms of top-down influence. This suggests that an event file being opened for (e.g.) a contact event, is not well explained by the significance model.

Another possibility is to combine mental files with an *epistemic* account of the conditions under which they may be tokened and/or refer (Genone, 2014; Dickie, 2015). At first glance, epistemic theories allow for reference to completed events[27]. Consider Genone's (2014) evidential theory, for example. Subjects in event completion cases have plenty of evidence that a contact event has occurred[28]. It is precisely by drawing on such evidence that they 'open a file' for the event, which they have not directly perceived[29]. The evidential theory is compatible with such files successfully referring – even in the absence of any causal relation.

The evidential theory only predicts referential success, however, when evidence is "adequate". What constitutes adequate evidence is, according to Genone, "highly context-dependent". But it needs to rule out "referential luck" (see also Dickie, 2015, and in this topical collection, Openshaw & Michaelian, 2024). Genone gives the example of someone who believes in a Loch Ness monster, based on having seen a vague shape in the fog, a puppy on the shore, a bump on a boat, etc. As it happens, there *is* a monstrous creature in the lake. Yet it is a lucky guess that led the person to believe correctly in the monster. So even if the person has a file for the Loch Ness monster, that file fails to refer to it, according to the evidential theory.

[27] In this topical collection, Openshaw & Michaelian (2024) argue, in a similar spirit, that a reliabilist epistemic account of singular reference can account for cases of "referential confabulation" in memory.

[28] The evidential view comes in either externalist or internalist forms: either there just needs to be evidence, or one needs to be aware of the evidence (or aware that there is evidence). We ignore such subtleties here.

[29] Genone (2015) suggests that having adequate evidence of the existence of the referent is a necessary but insufficient condition for singular reference; he cautiously suggests an additional constraint of "cognitive practicality" (citing Crimmins 1992, pp. 86-89.) This additional constraint, whatever it amounts to exactly, seems satisfied in event completion.

Whether or not reference succeeds in event completion depends, according to the evidential theory, on whether there is referential luck. On the one hand, one might stress that given that no actual past experience grounds the memory, the subject could easily have been wrong. One might argue that there is *more* luck involved in event completion cases than in normal ones, and so that reference actually fails[30]. Yet it seems wrong to maintain that when event completion leads to largely correct representations of target events, these are merely lucky guesses. In the cases we've discussed, inferring that there actually was a contact event is perfectly justified, from a rational standpoint. Here, evidence is adequate. Other cases of completion involve more risk. Arguably, it is a benefit of epistemic theories that they potentially allow for different verdicts, which track our intuitions in different cases: the more we judge it to be a question of luck, in a given case, that a completed event actually did occur, the more we will tend to judge that reference to it fails.

It might be denied that referential luck can be eliminated, when a memory is based on an *error* about source experience. Doesn't the fact that the subject is wrong about their experience show that they are merely lucky not to also be wrong about the world? In reply, note that inauthenticity may in fact provide an epistemic advantage in event completion. Maybe, for instance, subjects forgetting or ignoring that they did not actually see the event helps them maintain more accurate memories of it – say, because having to remember which events were actually experienced as opposed to merely 'completed' would needlessly tax their limited memory capacities, diminishing overall performance. Or maybe correctly remembering that an event was not directly seen would cause useless doubts (false negatives), defeating potential knowledge, when in fact completion processes rarely yield misrepresentations of worldly events. Being inauthentic may thus be a means of securing accuracy, justification, or some other epistemic good.

Nevertheless, a problem remains with the evidential theory, which is similar to one that arose for trace-based causal theories. In the contexts in which event completion takes place, many *other* events are likely to have occurred, given the evidence the subject has. But the subject does not (mis)remember having *seen* all those other events. If all it takes to open an 'event file' in memory is evidence of some event, why do only some events for which there is evidence trigger 'completion'? In other words, it could be objected that while reference outside memory might be possible based on a *mere* evidential connection, it seems that it does not suffice to explain what is specific about reference *in episodic memory*. Contra the evidential theory, perhaps there needs to be more than mere (adequate) evidence that a referent exists for an episodic memory file of it to be opened or for it to successfully refer.

An alternative possibility is offered by the *indexical* model of mental files (Recanati, 2012; Recanati, 2016). Its core claim is that files' function as a representational type is to collect information acquired via 'acquaintance' or 'epistemically rewarding relations', somewhat analogously to how indexical terms in language have the function to refer on the basis of contextual

[30] One might similarly argue, in Dickie's (2015) framework, that cognitive focus is not achieved.

relations. Just as "here" refers to the place where that term is tokened, a corresponding mental file would have the function to collect information acquired about a place in manners made possible by one's being there, and also refer to the place on the basis of that relation to it.

Epistemically rewarding relations are sometimes considered causal (Hansen & Rey, 2016). If files required actual acquaintance, and if acquaintance required direct causation, then the indexical model would predict reference failure in event completion cases (see section 5). Yet the indexical model can reject both requirements, for several reasons which are independently motivated.

Firstly, the relations which determine the reference of linguistic indexicals and provide inspiration for the indexical model, are not always causal. When you think about "tomorrow", do you bear a *causal* relation to a day which does not yet exist? Presumably not. Yet you still stand in a *contextual* relation to it (Burge, 2009). In event completion cases, subjects plausibly also stand in a *contextual* (rather than causal) relation to the target event.

Secondly, the indexical model distinguishes between the relation which determines the reference of a file, and the relations which feed information into the file and accompany the reference-determining relation itself. This distinction can be illustrated using the case of the SELF file, which according to the indexical model subjects use to refer to themselves as such. Recanati (2012) claims, following Perry (2002), that the relation which determines the SELF file's reference is identity between the thinker in whose head the file is tokened, and the referent of the file. Identity, in the case of persons with cognitive systems like ours, is accompanied by informational relations corresponding to the various special ways we have of gaining information 'from the inside' about ourselves (e.g., introspection, interoception, etc.). Our SELF file serves as a repository for information accrued via such channels. Yet identity is not a *causal* relation, even if these other self-informational relations are. In general, the relations that determine the reference of files, though they are often sustained[31] by causal-informational relations, need not themselves be causal. Arguably, in event completion cases, causal inferences (rather than direct causal relations) enable an event file to be opened, and provide information that feeds into the file. A reference-determining contextual relation to the target event may be sustained via these other, non-causal relations.

Thirdly, and most importantly, the indexical model integrates a simulationist component. Recanati (2012) claims that all files are indexical, but only in the sense that there is a *de jure* requirement that files be based on epistemically rewarding relations[32]. This means that files may *de facto* be opened or deployed in certain cases where such relations are absent, without malfunction. According to Recanati, files can even, in some of these cases, successfully refer. In particular, a

[31] Here, we import within the indexical files model the distinction, made by defenders of the asymmetric dependence theory of reference, between the relation that determines the reference of a concept, and others which 'sustain' that relation, i.e., other facts or relations whose instantiation grounds the fact that the reference-determining relation itself holds (Fodor, 1990; Margolis, 1998).

[32] In this topical collection and in other recent work, Recanati (2024a; 2024b) has nuanced his earlier view that files are individuated by epistemically rewarding relations (Recanati 2012: 68).

file may refer *before* an epistemically-rewarding relation is established. Such "anticipated" acquaintance occurs for example in Le Verrier's thoughts about "Neptune", which for Le Verrier was a descriptive name for the cause of certain perturbations in Uranus' orbit. Most relevant to memory completion is the fact that, in the indexical model, acquaintance may also be *simulated*:

'[B]y, as it were, pretending to be acquainted with some object and referring directly to it – even though as a matter of fact we know it only by description— we manage to bracket the descriptive condition through which we think of the object and focus on it in imagination, keeping it fixed as we consider counterfactual circumstances (circumstances in which, possibly, it does not satisfy the description).' (Recanati, 2012: 172)

Recanati's main example of simulated acquaintance involves manipulating linguistic vehicles and introducing descriptive names. Yet event completion might also be considered to involve simulated acquaintance, on the basis of which event files are opened. Here is not the place to develop a detailed account of simulated acquaintance. But we may note some commitments of the notion, as we understand it. Although simulation may be widespread, and even involved in ordinary perception (Addis, 2020), not *every* first-order perceptual or cognitive state involves simulation: if *every* tokening of a file involved simulation, this would diminish the explanatory relevance of the notion. Simulation is a second-order phenomenon, at least in the sense that simulated states asymmetrically depend on ordinary ones (Recanati, 2021). Moreover, simulating an object or event is distinct from simulating a *relation of acquaintance* to it. Simulated acquaintance manifests the more general capacity to simulate the holding of certain relations, another example of which is simulating identity relations (Crimmins, 1998).

These minimal (though not uncontroversial) commitments leave open different views of simulation. Comparing the notions of simulation in Michaelian (2016a) and in Shanton & Goldman (2010), Andonovski (2019) draws a useful distinction between simulation as *reproduction*, and simulation as a kind of *modeling*. Different versions of the thesis that some event files are based on simulated acquaintance may be developed based on each notion. We tentatively hypothesize that simulated acquaintance involves reproduction, in the following sense: simulated acquaintance involves sufficiently similar[33] cognitive (and perhaps neural) processes to those which normally occur when a subject is acquainted with some referent also occurring in the absence of acquaintance, including perhaps under top-down influence. It is thus an open empirical possibility that the same, or closely related, "mental indexicals" involved in online perceptual tracking may also be recruited in other, offline, higher-level conceptual processes (Yu & Lau, 2023; see Murez et al., 2020, for discussion).

The notion of simulated acquaintance requires further empirical and conceptual investigation. Yet however exactly that notion ultimately gets cashed out, the indexical model of files seems better equipped than the evidentialist theory to account for the difference between events which the subject misremembers having seen, and those which they believe themselves to have inferred. In

[33] What counts as "sufficiently similar" is obviously a thorny issue.

the former case, acquaintance is simulated, and not in the latter. Because simulation is possible, event files can *de facto* be opened without actual acquaintance. Still, that files obey an acquaintance constraint *de jure* might explain why subjects falsely remember having *seen* completed events: subjects find (at retrieval) they have an event file in memory, and infer on that basis that they saw the event to which it purports to refer, since event files *as a type* normatively presuppose acquaintance. This explanation nevertheless requires subjects not to always realize when a file is based on simulated rather than actual acquaintance[34].

Another possibility would be that the filing system itself is indifferent to whether or not a file is based on (past) perception. Contrary to the indexical model, there would be no acquaintance constraint on files, even *de jure*. Subjects might misremember *seeing* a completed event only because they wrongly reconstruct the source of their memory representations, at some later stage. This might simply be due to the fact that subjects don't usually keep track of how or why files are opened, together with an assumption that events represented in episodic memory tend to have been perceived.

One way this suggestion might be cashed out within the file framework is via Tałasiewicz's (2017; 2020) distinction between entries inside a file and "metadata". Metadata is information about a file's history and role in processing, as opposed to properties of its referent. Event completion cases lead to false or lacunary metadata: no information is retained about why the event file was initially opened that distinguishes normal cases from cases of completion. Asked whether they saw a certain event, subjects wrongly judge, in the absence of competing metadata, that they did[35].

There are thus several ways in which the files model might account for subjects' falsely remembering having seen a completed event: false presuppositions of acquaintance carried by files, false beliefs about memory's sources, or false/inaccessible metadata. Regardless exactly which of these proposals is favored, any version of the files model according to which false information about an event's having been perceived does *not* impact reference-determination is potentially compatible with successful reference to completed events.

An attractive positive hypothesis about when this occurs is the following: if the subject simulates acquaintance and tokens a file for a completed event on the basis of adequate evidence, then it is

[34] Crimmins' (1998) "shallow pretense" allows subjects not to realize pretense is occurring. Still, subjects' lack of awareness of event completion might be considered a limit to the analogy between completed memories and descriptive names, even if both involve simulated acquaintance. Subjects wrongly think they *saw* the completed event, whereas users of a descriptive name typically know it is descriptive. However, knowledge that a name is descriptive is often limited to those who introduce it (Evans, 1982). Just as later consumers of names may fail to realize the names were (originally) descriptive, memory files may no longer be realized to have been arrived at in any other way than through direct past perception. For further discussion of the distinction between consumers and producers of representations and its relevance to memory, see Barkasi (2024), in this topical collection.

[35] An alternative position would consist in distinguishing metadata available to subpersonal processing, from subjects' personal-level beliefs about the sources of their memories. Metadata about why a certain event file was opened might be correct, but inaccessible to the subject.

not mere luck if the file and its entries match the target event. We have argued that such a condition is often met in real-world completion cases. Completion processes, according to such a proposal, are part of how a well-functioning event file memory system operates, and achieves reference. Thus, a hybrid theory of reference in memory which combines aspects of a cognitive approach like the indexical files model, and aspects of an epistemic approach, like the evidential theory, seems to us to be promising, and worthy of exploration in future research.

7. Conclusion

We have examined several different possible accounts of reference in memory, and how each of them applies to the empirical phenomenon of event completion. In brief, the take home messages are the following. The phenomenon of event completion illustrates the constructive and generative aspects of memory, and the fact that we may remember events which we have not stood in actual direct causal/experiential relations to in the past. Yet a satisfactory account of this phenomenon also needs to countenance the fact that, at least from the subject's perspective, episodic memory seems to be singular in content and to involve past acquaintance with referents. Considering cases of event completion therefore puts pressure on both *pure* causal and *pure* descriptive theories, and tends to favor more nuanced hybrid versions of causal and descriptive theories which integrate insights from cognitive and epistemic approaches. In particular, we have suggested that a promising account views episodic memory of particular events as involving singular event files. Rather than requiring actual direct acquaintance, such files may sometimes refer on the basis of *simulated* acquaintance with a target event, which succeeds when it is based on adequate evidence. Thus, reference in memory may sometimes be sustained by forms of misrepresentation or inauthenticity, which are adaptive in ecologically valid conditions.

Acknowledgments Many thanks to James Openshaw and Joulia Smortchkova for helpful feedback and suggestions. We also thank three anonymous referees for this journal, whose comments improved the paper. This research was in part conducted at the Département d'Etudes Cognitives (ENS), which is supported by Grants ANR-10-IDEX-0001-02 PSL*, ANR-10-LABX-0087 IEC and ANR-17-EURE-0017 FrontCog.

References

Addis, D. R. (2020). Mental time travel? A neurocognitive model of event simulation. *Review of Philosophy and Psychology*, 11, 233-259.

Altmann, G., & Ekves, Z. (2019). Events as intersecting object histories: A new theory of event representation. *Psychological Review*, 126(6), 817.

Anderson, J. R. (1974). Retrieval of propositional information from long-term memory. *Cognitive psychology*, *6*(4), 451-474.

Andonovski, N. (2018). Is episodic memory a natural kind?. *Essays in Philosophy*, *19*(2), 178-195.

Andonovski, N. (2019). Is the simulation theory of memory about simulation? *Voluntas: Revista Internacional de Filosofia* 10 (3):37.

Andonovski, N. (2020). Singularism about episodic memory. *Review of Philosophy and Psychology*, 11(2), 335-365
Bach, K. (1987). *Thought and reference*. New York: Oxford University Press.
Bach, K. (2010). Getting a Thing into a Thought. In R. Jeshion (ed.), *New Essays on Singular Thought*. Oxford University Press. pp. 39-63.
Barkasi, M. (2024). Consumer-side reference through promiscuous memory traces. *Synthese* 203 (3):1-26.
Bernecker, S. (2010). *Memory: A Philosophical Study*. Oxford, GB: Oxford University Press. Bochner, G. (2021). *Naming and Indexicality*. New York: Cambridge University Press.
Burge, T. (2009). Five Theses on De Re States and Attitudes. In J. Almog & P. Leonardi (eds.), *The Philosophy of David Kaplan*. Oxford University Press. pp. 246--324.
Buckner, R. L., & Carroll, D. C. (2007). Self-projection and the brain. *Trends in cognitive sciences*, *11*(2), 49-57.
Campbell, J. (1988). Is sense transparent? *Proceedings of the Aristotelian Society* 88:273-292.
Campbell, J. (2002). *Reference and Consciousness*. Oxford, GB: Oxford University Press.
Carruthers, P. (2018). Episodic memory isn't essentially autonoetic. *Behavioral and Brain Sciences*, *41*, e6.
Cheng, S., & Werning, M. (2016). What is episodic memory if it is a natural kind?. *Synthese*, *193*, 1345-1385.
Cheng, S., Werning, M., & Suddendorf, T. (2016). Dissociating memory traces and scenario construction in mental time travel. *Neuroscience & Biobehavioral Reviews*, 60, 82-89.
Cohnitz, D. & Haukioja, J. (2013). Meta-Externalism vs Meta-Internalism in the Study of Reference. *Australasian Journal of Philosophy* 91 (3):475-500.
Crane, T. (2011). Singular Thought. *Aristotelian Society Supplementary Volume* 85 (1):21-43.
Crimmins, M. (1992). *Talk About Beliefs*. MIT Press.
Crimmins, M. (1998). Hesperus and Phosphorus. *Philosophical Review* 107 (1):1-47.
Cummins, R. (1996). *Representations, Targets, and Attitudes*. MIT Press.
De Brigard, F. (2014a). The Nature of Memory Traces. *Philosophy Compass* 9 (6):402-414.
De Brigard, F. (2014b). Is memory for remembering? Recollection as a form of episodic hypothetical thinking. *Synthese,* 191, 155-185.
Deutsch, M. (2021). Is There a "Qua Problem" for a Purely Causal Account of Reference Grounding? *Erkenntnis*:1-18.
Devitt, M. (1981). *Designation.* New York: Columbia University Press.
Devitt, M. & Sterelny, K. (1999). *Language and reality: an introduction to the philosophy of language. Cambridge, Mass.: MIT Press. Edited by Kim Sterelny.*
Dickie, I. (2015). *Fixing Reference*. Oxford, GB: Oxford University Press.
Dokic, J. (2001). Is memory purely preservative?. In C. Hoerl & T. McCormack (eds.),*Time and Memory. Issues in philosophy and psychology.* Oxford: Oxford University Press, pp. 213-232.
Dranseika, V., McCarroll, C. & Michaelian, K. (2021). Are observer memories (accurate) memories? Insights from experimental philosophy. *Consciousness and Cognition* 96 (C):103240.
DuBrow, S., & Davachi, L. (2016). Temporal binding within and across events. *Neurobiology of learning and memory*, 134, 107-114.
Elman, J. L., & McRae, K. (2019). A model of event knowledge. *Psychological Review*, 126(2), 252.
Evans, G. (1982). *The Varieties of Reference*. Oxford: Oxford University Press. Edited by J. McDowell.
Fodor, J. A. (1990). *A Theory of Content and Other Essays*. MIT Press.
Fodor, J. A. (2008). *Lot 2: The Language of Thought Revisited*. New York: Oxford University Press.

Franklin, N. T., Norman, K. A., Ranganath, C., Zacks, J. M., & Gershman, S. J. (2020). Structured Event Memory: A neuro-symbolic model of event cognition. *Psychological Review*, 127(3), 327
García-Carpintero, M. (2000). A presuppositional account of reference fixing. *Journal of Philosophy* 97 (3):109-147.
Genone, J. (2014). Evidential Constraints on Singular Thought. *Mind and Language* 29 (1):1- 25.
Goodman, R. (2016). Against the Mental Files Conception of Singular Thought. *Review of Philosophy and Psychology* 7 (2):437-461.
Goodman, R., Genone, J. & Kroll, N. (eds.) (2020). *Singular Thought and Mental Files*. New York, NY, United States of America: Oxford University Press.
Goodman, R. (2022). Trading on Identity and Singular Thought. *Australasian Journal of Philosophy* 100 (2):296-312.
Greenberg, G. (2013). Beyond Resemblance. *Philosophical Review* 122 (2):215-287.
Grice, H. P. (1969). Vacuous names. In W*ords and objections: Essays on the work of WV Quine* (pp. 118-145). Dordrecht: Springer Netherlands.
Güler, B., Serin, F., Gunseli, E., 2023. Prediction error is out of context: the dominance of contextual stability in segmenting episodic events [Preprint]. PsyArXiv.
Hansen, C. & Rey, Georges (2016). Files and Singular Thoughts Without Objects or Acquaintance: The Prospects of Recanati's "Actualism". *Review of Philosophy and Psychology* 7 (2):421-436.
Hassabis, D., & Maguire, E. A. (2007). Deconstructing episodic memory with construction. *Trends in cognitive sciences*, *11*(7), 299-306.
Hazenberg S. J., Jongsma M. L., Koning A., van Lier R. (2014) Differential familiarity effects in amodal completion: Support from behavioral and electrophysiological measurements. *Journal of Experimental Psychology: Human Perception and Performance* 40: 669–684.
Hazenberg S. J., Van Lier R. (2016) Disentangling effects of structure and knowledge in perceiving partly occluded shapes: An ERP study. *Vision Research* 126: 109–119.
Hemmer, P., & Steyvers, M. (2009). A Bayesian account of reconstructive memory. *Topics in Cognitive Science*, *1*(1), 189-202.
Higginbotham, J. (2003). Remembering, imagining, and the first person. In Alex Barber (ed.), *Epistemology of Language*. Oxford University Press. pp. 496--533.
Huttenlocher, J., Hedges, L. V., & Duncan, S. (1991). Categories and particulars: prototype effects in estimating spatial location. *Psychological review*, *98*(3), 352.
Intraub, H., Gottesman, C. V., Willey, E. V., & Zuk, I. J. (1996). Boundary extension for briefly glimpsed photographs: Do common perceptual processes result in unexpected memory distortions?. *Journal of Memory and Language*, 35(2), 118-134.
Jackson, F. (2011). *Language, names, and information*. John Wiley & Sons.
Jeshion, R. (2010). Singular thought: acquaintance, semantic instrumentalism, and cognitivism. In *New Essays on Singular Thought*. Oxford University Press. pp. 105-141.
Ji, Y., & Papafragou, A. (2020). Is there an end in sight? Viewers' sensitivity to abstract event structure. *Cognition*, *197*, 104197.
Kaplan, D. (1968). Quantifying in. *Synthese* 19 (1-2):178-214.
Kaplan, D. (1989). Demonstratives: An Essay on the Semantics, Logic, Metaphysics and Epistemology of Demonstratives and other Indexicals. In Joseph Almog, John Perry & Howard Wettstein (eds.), *Themes From Kaplan*. Oxford University Press. pp. 481-563.

Kominsky, J. , Baker, L. , Keil Frank, C. & Strickland, B. (2021). Causality and continuity close the gap in event representations. *Memory and Cognition*, 49, 518-531.
Kripke, Saul A. (1980). *Naming and Necessity.* Cambridge, MA: Harvard University Press.
Lee, P. S. (2018). Mental files, concepts, and bodies of information. *Synthese* 195 (8):3499- 3518.
Lee H., Vecera S. P. (2005) Visual cognition influences early vision: The role of visual short-term memory in amodal completion. *Psychological Science* 16: 763–768.
Lee H., Vecera S. P. (2010) Spatial short-term memory assists in maintaining occluded objects. *Psychonomic Bulletin & Review* 17: 846–852.
Lewis, D. (1979). Attitudes de dicto and de se. *Philosophical Review* 88 (4):513-543.
Lewis, D. (1984). Putnam's paradox. *Australasian Journal of Philosophy* 62 (3):221 – 236. Loftus, E. F. (2003). False memory. In L. Nadel (ed.), *Encyclopedia of Cognitive Science*. Nature Publishing Group.
Lowe, E. J. (2007). Sortals and the Individuation of Objects. *Mind and Language* 22 (5):514-533. Luck, S. J., & Vogel, E. K. (1997). The capacity of visual working memory for features and conjunctions. *Nature*, 390(6657), 279-281.
Luck, S. J. & Vogel, E. K. (2013). Visual working memory capacity: from psychophysics and neurobiology to individual differences. *Trends in Cognitive Sciences* 17 (8):391-400.
Mahr, J. B., & Csibra, G. (2018). Why do we remember? The communicative function of episodic memory. *Behavioral and brain sciences*, 41, e1.
Margolis, E. (1998). How to acquire a concept. *Mind and Language* 13 (3):347-369.
Martin, C. B. & Deutscher, M. (1966). Remembering. *Philosophical Review* 75 (April):161-96.
Mendelovici, A. (2013). Reliable Misrepresentation and Tracking Theories of Mental Representation. *Philosophical Studies* 165 (2):421-443.
Michaelian, K. (2016a). Confabulating, misremembering, relearning: The simulation theory of memory and unsuccessful remembering. *Frontiers in Psychology* 7:1857.
Michaelian, K. (2016b). *Mental Time Travel: Episodic Memory and Our Knowledge of the Personal Past*. Cambridge, Massachusetts: MIT Press.
Murez, M. & Recanati, F. (2016). Mental Files: an Introduction. *Review of Philosophy and Psychology* 7 (2):265-281.
Murez, M., Smortchkova, J. & Strickland, B. (2020). The Mental Files Theory of Singular Thought: A Psychological Perspective. In R. Goodman, J. Genone & N. Kroll (eds.), *Singular Thought and Mental Files*. Oxford: Oxford University Press. pp. 107-142.
Murez, M. (2021) Belief Fragments and Mental Files. In Borgoni, C., Kindermann, D., & Onofri, A. (Eds.) *The Fragmented Mind*. Oxford: Oxford University Press. pp. 251-277.
Murez, M. (2023). The transparency of mental vehicles. *Noûs*, 00, 1-28.
Nanay, B. (2007). Four theories of amodal perception. *Proceedings of the 29th Annual Conference of the Cognitive Science Society.*
Nanay, B. (2010). Perception and imagination: amodal perception as mental imagery. *Philosophical Studies* 150 (2):239-254.
Newtson, D., Engquist, G. A., & Bois, J. (1977). The objective basis of behavior units. *Journal of Personality and social psychology*, *35*(12), 847.
Ongchoco, J. D. K., & Scholl, B. J. (2019). Did that just happen? Event segmentation influences enumeration and working memory for simple overlapping visual events. *Cognition*, *187*, 188-197.

Ongchoco, J. D. K., Yates, T. S., & Scholl, B. J. (2023). Event segmentation structures temporal experience: Simultaneous dilation and contraction in rhythmic reproductions. *Journal of Experimental Psychology: General*.
Openshaw, J., (2022) Remembering objects, *Philosophers' Imprint* 22: 11.
Openshaw, J., Michaelian, K. (2024) Reference in remembering: towards a simulationist account. *Synthese* 203, 90.
Papenmeier, F., Brockhoff, A., & Huff, M. (2019). Filling the gap despite full attention: The role of fast backward inferences for event completion. Cognitive Research: Principles and Implications, 4(1), 1-17.
Perner, J. (1991). *Understanding the representational mind*. The MIT Press.
Perner, J. (forthcoming) Mental Files in Perspective Oxford University Press.
Perrin, D. (2022). La causalité du souvenir épisodique. Un débat récent en philosophie de la mémoire. *Revue de Métaphysique et de Morale* 113 (1):85-108.
Perry, J. (2002). *Identity, Personal Identity, and the Self.* Hackett Publishing.
Quilty-Dunn, J. (2019). Perceptual Pluralism. *Noûs* 54 (4):807-838.
Quilty-Dunn, J. (2021). Polysemy and thought: Toward a generative theory of concepts. *Mind and Language* 36 (1):158-185.
Quilty-Dunn, J., Porot, N. & Mandelbaum, Eric (2023). The Language of Thought Hypothesis as a Working Hypothesis in Cognitive Science. Behavioral and Brain Sciences.
Quiroga, R. Q. (2012). Concept cells: the building blocks of declarative memory functions. *Nature Reviews Neuroscience*, *13*(8), 587-597.
Radvansky, G. A., Spieler, D. H., & Zacks, R. T. (1993). Mental model organization. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *19*(1), 95.
Radvansky, G. A., & Copeland, D. E. (2006). Walking through doorways causes forgetting: Situation models and experienced space. *Memory & cognition*, *34*, 1150-1156.
Radvansky, G. A., & Zacks, J. M. (2017). Event boundaries in memory and cognition. *Current opinion in behavioral sciences*, 17, 133-140.
Raykov, P. P., Varga, D., & Bird, C. M. (2023). False memories for endings of events. *Journal of Experimental Psychology: General.*
Recanati, F. (2007). *Perspectival Thought*. Oxford: Oxford University Press.
Recanati, F.(2012). *Mental Files*. Oxford, GB: Oxford University Press.
Recanati, F. (2016). *Mental files in flux*. Oxford: Oxford University Press.
Recanati, F. (2021). Fictional Reference as Simulation. In Maier, E. & Stokke, A. (eds.) *The Language of Fiction*. Oxford: Oxford University Press.
Recanati, F. (2024a). Memory-based modes of presentation. *Synthese* 203, 116.
Recanati, F. (2024b). Individuating (and Typing) Mental Files. In A. Grzankowksi & A. Savile (eds.) *Thought: Its Origin and Reach. Essays for Mark Sainsbury.* London: Routledge.
Reimer, M. (2020). The Qua-Problem for Names (Dismissed). In A. Bianchi (ed.) *Language and Reality from a Naturalistic Perspective*. Springer. pp 137-154.
Renoult, L., Tanguay, A., Beaudry, M., Tavakoli, P., Rabipour, S., Campbell, K., ... & Davidson, P. S. (2016). Personal semantics: Is it distinct from episodic and semantic memory? An electrophysiological study of memory for autobiographical facts and repeated events in honor of Shlomo Bentin. *Neuropsychologia*, 83, 242-256.
Robins, S. K. (2016). Misremembering. *Philosophical Psychology* 29 (3):432-447.

Roediger, H. & McDermott, K. (1995). Creating false memories: Remembering words not presented in lists. J*ournal of experimental psychology: Learning, Memory, and Cognition*, 21(4), 803.
Rubin, D. C., Schrauf, R. W., & Greenberg, D. L. (2003). Belief and recollection of autobiographical memories. *Memory & cognition*, *31*, 887-901.
Sawyer, S. (2012). Cognitivism: A New Theory of Singular Thought? *Mind and Language* 27 (3):264-283.
Schacter, D. L., & Addis, D. R. (2007). The cognitive neuroscience of constructive memory: remembering the past and imagining the future. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *362*(1481), 773-786.
Schacter, D. L., Guerin, S. A., & Jacques, P. L. S. (2011). Memory distortion: An adaptive perspective. *Trends in cognitive sciences*, *15*(10), 467-474.
Shanton, K., & Goldman, A. (2010). Simulation theory. *Wiley Interdisciplinary Reviews: Cognitive Science*, *1*(4), 527-538.
Searle, J. R. (1983). *Intentionality: An Essay in the Philosophy of Mind*. New York: Oxford University Press.
Shin, Y. S., & DuBrow, S. (2021). Structuring memory through inference-based event segmentation. *Topics in Cognitive Science*, 13(1), 106-127.
Spelke, E. S. (2000). Core knowledge. *American Psychologist* 55 (11):1233-1243.
Strickland, B. & Keil, F. (2011). Event completion: Event based inferences distort memory in a matter of seconds. *Cognition* 121 (3):409-415.
Steyvers, M., Griffiths, T. L., & Dennis, S. (2006). Probabilistic inference in human semantic memory. *Trends in cognitive sciences*, *10*(7), 327-334.Strawson, P.F., 1959, *Individuals*, London: Methuen.
Swallow, K. M., Zacks, J. M., & Abrams, R. A. (2009). Event boundaries in perception affect memory encoding and updating. *Journal of Experimental Psychology: General*, *138*(2), 236.
Suddendorf, T., & Corballis, M. (2007). The evolution of foresight: What is mental time travel, and is it unique to humans?. *Behavioral and brain sciences*, 30(3), 299-313.
Tałasiewicz, M. (2017). Mental Files. Triggering Mechanisms, Metadata and 'Discernibility of Identicals'. *Studia Semiotyczne* 31 (2):13-34.
Tałasiewicz, M. (2022). Files are mental particulars: a rejoinder to the relationist challenge. *Synthese* 200 (6).
Tulving, E. (1972). Episodic and semantic memory. In Tulving, E. & Donaldson, W. (eds.) *Organization of memory*. London: Academic Press.
Tulving, E. (1983). *Elements of Episodic Memory*. Oxford University Press.
Tulving, E. (2001). Episodic memory and common sense: how far apart?. *Philosophical Transactions of the Royal Society of London. Series B: Biological Sciences*, *356*(1413), 1505-1515.
Van Lier R., Gerbino W. (2015) Perceptual completions. In: Wagemans J. (ed.) *The Oxford handbook of perceptual organization*, New York, NY: Oxford University Press, pp. 294–320.
Wagner, A. D., Shannon, B. J., Kahn, I., & Buckner, R. L. (2005). Parietal lobe contributions to episodic memory retrieval. *Trends in cognitive sciences*, *9*(9), 445-453.
Wang, Y. C., & Egner, T. (2022). Switching task sets creates event boundaries in memory. *Cognition*, *221*, 104992.
Wheeler, M. A., Stuss, D. T., & Tulving, E. (1997). Toward a theory of episodic memory: the frontal lobes and autonoetic consciousness. *Psychological bulletin*, *121*(3), 331.
Woodfield, A.(1991). Conceptions. *Mind* 100 (399):547-72.

Woodward, J. (2005). *Making things happen: A theory of causal explanation*. Oxford: Oxford University Press.
Yu, X. & Lau, E. (2023). The Binding Problem 2.0: Beyond Perceptual Features. Cognitive Science 47 (2):e13244.
Zacks, J. M., Tversky, B., & Iyer, G. (2001). Perceiving, remembering, and communicating structure in events. *Journal of experimental psychology: General*, *130*(1), 29.
Zacks, J. M., Speer, N. K., Swallow, K. M., Braver, T. S., & Reynolds, J. R. (2007). Event perception: a mind-brain perspective. *Psychological bulletin*, *133*(2), 273.