The Impure Phenomenology of Episodic Memory[1]

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Abstract: Episodic memory has a distinctive phenomenology: it involves 'mentally reliving' or 're-experiencing' a past event. It's been suggested that if episodic memory is characterized in terms of this phenomenology, then it will be 'impossible to test' for episodic memory in animals – because this is to characterize episodic memory in terms of its 'purely phenomenological features', which cannot be detected in animal behaviour. I argue that this is a mistake. The phenomenological features of episodic memory are *impure* phenomenological features – they have both subjective and objective aspects, and so can be detected in nonverbal behaviour. If animals' memories exhibit these features, I argue, we should conclude that they have episodic memory. Insisting on a phenomenological characterization of episodic memory does nothing to damage the prospects for detecting it in nonhuman animals.

1. Introduction

All else being equal, scrub-jays prefer worms to nuts. This has been exploited in a series of experiments investigating their memory capacities. In one experiment, scrub-jays are given the opportunity to cache worms and nuts at different sites. Later, they have the opportunity to return to these caches, the food having been removed and the sand replaced to eliminate visual and olfactory cues. All else equal, they tend to return to the cache with the worms. One respect in which things are unequal is that worms decay at a faster rate, quickly becoming inedible. Scrub-jays are sensitive to this: if the worms have been cached long enough to decay, the scrub-jays will tend to return to the nuts instead. This is taken to show that scrub-jays remember not just what is buried where, but also when it was buried (Clayton & Dickinson, 1998).

Episodic memory is the form of declarative memory enabling one to recall events from one's 'personal past' – events experienced first-hand. It's typically contrasted with semantic memory – memory for facts. When Endel Tulving (1972) first described episodic memory, he characterized it as the ability to recall what happened where and when. On this way of thinking about episodic memory, the experiment just described provides evidence that scrub-jays have

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episodic memory – so it is not, as some have suggested (Suddendorf & Corballis, 2007), uniquely human.

This 'what-where-when' view of episodic memory has been challenged, though. Its critics claim that it fails to distinguish episodic memory from semantic memory – since semantic memory can also record the what-where-when of a past event (Klein, 2013; Suddendorf & Busby, 2003). What really distinguishes episodic and semantic memory is not that episodic memory has this content, but that episodic memory essentially involves an experience of 'mentally reliving' the remembered event, which is absent in semantic memory. We may remember when and where we were born – but these memories are semantic, not episodic, since (mercifully) we cannot 'mentally relive' our births. Characterizing episodic memory in terms of 'what-where-when' content consequently neglects episodic memory's most essential feature. So, the thought goes, we should instead characterize episodic memory in terms of its distinctive phenomenology: to episodically remember an event is to have an experience of 'mentally reliving' it (Tulving, 2005). If this is what episodic memory is, though, the experiment just described does not bear on whether nonhuman animals have episodic memory.

The problem is that this renders it obscure what sort of evidence *could* bear on that question. We know that humans have experiences of 'mentally reliving' because they tell us so – but animals are not in a position to report on the felt qualities of their experiences. For this reason, a phenomenological characterization of episodic memory is widely agreed to be useless, when it comes to investigating episodic memory in animals. As critics of phenomenological characterizations point out, determining whether animals have episodic memory requires characterizing it in terms of its 'objectively defined features as opposed to purely phenomenological ones, such as the type of information encoded' (Clayton, Russell, & Dickinson, 2009). Since a phenomenological characterization fails to do this, it is 'straightforwardly inapplicable' to animal behaviour (Michaelian & Sutton, 2017); it makes it 'impossible to test [for episodic memory] in nonverbal animals' (Clayton & Dickinson, 2010). For this reason, many researchers proceed by endorsing a variant on the 'what-where-when' account but labelling the sort of memory it describes 'episodic-like' memory – where 'episodic-like' is intended to indicate agnosticism about whether the form of memory in question is 'accompanied by conscious recollection' (Clayton, Salwiczek, & Dickinson, 2007).

My goal in this paper is to show that this is a mistake: characterizing episodic memory in terms of its phenomenology does not make it impossible to test for in non-human animals.

There is consequently no need for scientists to limit their ambition to the detection of 'episodic-like' memory. The mistake here is in thinking that a phenomenological characterization of episodic memory must characterize it in terms of 'purely phenomenological features', rather than in terms of 'objective' ones. I take the objective features of a cognitive state or progress to be ones which could show up in behaviour – ones which can be 'behaviourally defined' (Clayton & Dickinson, 2010). These include its representational features, and its functional role. I take 'purely phenomenological features', on the other hand, to denote phenomenological features which cannot be so defined, because they do not show up in behaviour – the non-representational, non-functional felt qualities of experience which philosophers call 'qualia'. In short, the idea underlying this criticism of the phenomenological view is that the phenomenological features of episodic memory are representationally and functionally impotent.

I argue that this is not the case for any of the distinctive phenomenological features of episodic memory. I begin in §2 by characterizing the phenomenology of episodic memory in terms of five distinctive phenomenological features. In §3, I argue that each of these five features is an 'impure phenomenological feature' – a term I introduce to denote a phenomenological feature which makes a functional or representational difference. These impure phenomenological features, I argue in §4, can be detected in non-verbal behaviour. So, it is possible to both characterize episodic memory in terms of its distinctive phenomenology and detect it in nonhuman animals.

2. Five Phenomenological Features

A phenomenological characterization of episodic memory takes the phenomenology of episodic memory to be among its defining features – such that to ask whether an individual has episodic memory is to ask whether they have this phenomenology. There is no canonical account of what the relevant phenomenology is, however. Typically, it is glossed using metaphors like 'mentally reliving', 're-experiencing' or 'replaying in the mind's eye', and by highlighting that 'mentally reliving' distinctively involves time-consciousness and self-consciousness in some way (e.g. Tulving, 2005). The purpose of this section is to characterize the phenomenology of 'mentally reliving' more concretely. In preview, I will propose that 'mentally reliving' comprises the following five phenomenological features:

(1) It involves mental imagery representing the remembered event.

(2) It has an apparent temporal structure.

(3) It is accompanied by a 'sense of pastness'.

(4) It represents events as self-involving.

(5) It is (usually) accompanied by a 'sense of ownership'.

Before arguing for this, I should note a potential worry. In what follows, I assume without argument that (1)-(5) are phenomenological features. But one might reasonably wonder whether these are all features are indeed phenomenological – whether they make a difference to episodic memory's felt quality. This is a legitimate question, but I set it aside, since my goal in what follows is simply to show that the features comprising an experience of 'mentally reliving' are not *purely* phenomenological features. If any are not even phenomenological features, this is simply grist to my mill: they cannot possibly be purely phenomenological features if they are not phenomenological at all.

To begin, one thought naturally suggested by the metaphor of mentally reliving a past event is that an experience of episodically remembering is in some way phenomenologically similar to one's experience at the time of the remembered event. But whilst there is something intuitively correct about the idea that having an episodic memory feels similar to one's experience at the time of the remembered event, this claim needs some qualification if it is to be plausible. Importantly, it cannot be the claim that one's experience in episodically remembering is phenomenologically identical to one's original experience, for two reasons.

Firstly, perceptual experiences are, and experiences of mental reliving are not, characterized by a feeling of 'presence'. It is characteristic of perceptual experience that its objects seem to be '*present* or *there*', such that the character of one's experience seems to be 'immediately responsive to the character of its objects' at the time of the experience (Crane & French, 2017 emphasis in original). To put the point another way, perception seems to be causally sustained by its object; it strikes one as the kind of mental event that cannot occur without the current presence of the object. By contrast, 'one aspect of the phenomenology of episodic recollection is the current *absence* of its object' (Soteriou, 2008, p. 475, n.4 emphasis added). So, we should not say that episodic memory literally has perceptual phenomenology, although it involves experiences which 'correspond to our use of the five senses' (Martin, 2002, p. 403; see also Debus, 2007). Instead, episodic memory involves 'quasi-perceptual' phenomenology – experiences which are similar to ones of seeing, hearing etc., but which differ in respect of presence. To put it another way, episodic memory involves what is often called 'mental imagery' – especially *visual* mental imagery (Hoerl, 2001).

Second, the constructive processes underpinning episodic memory ensure that, frequently, what is remembered differs from what was experienced (Michaelian, 2016). This means that episodic memory does not simply preserve past experience and strip it of the feeling of presence: it differs in other ways, too. For instance, memories are often experienced in 'observer perspective', rather than 'field perspective' – from the point of view of a third party looking on, rather than from one's own perspective at the time of the event. So, when remembering an event in observer perspective, one might be able to 'see' oneself (Nigro & Neisser, 1983). There are good reasons for thinking that these observer perspective memories are nevertheless genuine episodic memories (Debus, 2007; McCarroll, 2018; Michaelian, 2016). It follows from this that episodic memories can differ phenomenologically from one's original experience.

To see this, imagine a case in which I experience giving a lecture, and later remember this lecture 'from the outside'. Both the original experience and the memory have a visual component. At the time of the event, I have certain visual experiences; in the memory, I visualise the lecture in my 'mind's eye'. At some level of description, these experiences may be similar: they represent the same event, and may represent many of the same things *about* that event. Indeed, my observer perspective memory may be constructed largely out of information that was available to me at the time of the event (McCarroll, 2018, Chapter 2). But there are important differences between the two experiences – besides the fact that one involves the feeling of presence, and the other does not. In one of these experiences but not the other, I am visibly presented, and since objects are presented from different points of view, different *parts* of objects are visibly presented in the two experiences. Corresponding to these differences are differences in the low-level visible features the two experiences present: they present distinct arrays of colours, shapes and so on. On the plausible assumption that, in ordinary circumstances (i.e. ones not involving colour inversion and the like), two visual experiences will differ phenomenologically if they present distinct arrays of colours, shapes and so on, my experience of the lecture and my memory will differ phenomenologically in this way, as well as in respect of presence.

These points together suggest that episodic memories are phenomenologically similar to experiences of remembered events in that they involve mental imagery which represents those events – though this imagery may not present events just as they were presented in perception originally. So, we can extract the following phenomenological feature of episodic memory:

(1) Mental Imagery: episodic memory involves mental imagery representing the remembered event.

Next, episodic memory is widely held to involve a sort of time-consciousness – such that to lack episodic memory is to be 'mentally stuck in time' (Roberts, 2002). Tulving (2002) has coined the term 'chronesthesia' to refer to the sort of time-consciousness involved in episodic memory - but the meaning of this term is obscure. At one point, Tulving characterizes chronesthesia in terms of 'attaching a temporal marker' to a memory (2005, p. 18); at another, as involving an 'ever-present awareness of one's being existing in a subjective sea of time, always in transition from what is now becoming the past to what was once the future' (2005, p. 29). These ideas are non-equivalent – and as Michaelian (2016, p. 210) notes, the second seems to describe the sort of temporal awareness present in ordinary unfolding experience, rather than anything distinctive of episodic memory. Moreover, Tulving frequently characterizes chronesthesia as an awareness of 'subjective time' – something 'related to but not identical with physical time' (2005, p. 16). He glosses subjective time variously as the time 'in which we exist' (2002, p. 311), the time through which we 'mentally travel' (2002, p. 311), and 'the thought-about time in which one's personal experiences take place' (2002, p. 313). But none of these describe a subjective temporal dimension. Most obviously, we exist in physical time. But the time in which we 'mentally travel' is also physical time: in episodically remembering, we mentally revisit some moment in the (physical) past.[2] Relatedly, whilst memories themselves unfold in the present, the 'thought about' time is the physical past. Consequently, the terms 'chronesthesia' and 'subjective time' seem to add unnecessary obscurity. More importantly, introducing a term to refer to 'the' form of time-consciousness involved in episodic memory masks the possibility that it involves time-consciousness in more than one way – which, I suggest now, is the case.

One difference between episodic and semantic memories is that episodically remembering involves an experience with a felt duration and temporal structure. In that sense, episodically remembering seems to share important temporal features with the objects of

[2] This is not to say that we *literally* travel back in time when we remember. But there is no need to account for this by introducing non-physical time; we do not travel in time because we do not *literally* 'travel' at all.

episodic memory, namely *episodes*.[3] Following Sen Cheng and Marcus Werning (Cheng & Werning, 2016), we can think of an episode as a complex event, comprising an ordered sequence of more primitive events running earlier to later. For instance, they write, '[John has dinner] is an episode, because it is the ordered sequence of events [John sits down at his dining table] < [John drinks red wine] < [John eats a tomato soup] < [John eats a steak] < [John drinks coffee]' (where 'x < y' means that x occurs before y).[4] When we episodically remember, we have an experience with a similar temporal structure: an experience of episodically remembering comprises a temporally ordered series of more primitive experiential parts, such that the memory itself seems to *unfold* over time, just as an episode does. Suppose I episodically remember a time when I came home to a dark house, turned on the light, and was greeted by a surprise party. The memory is not presented all at once, but unfolds in a particular way: [I relive coming home] < [I relive hitting the lights] < [I relive seeing the guests] – and so on. This marks a phenomenological contrast between episodic and semantic memory. Semantic recall occurs in time, like everything else. But in semantic recall, it may appear to the subject that the memory is given to her 'all at once', rather than seeming to unfold. This suggests a second phenomenological feature of episodic memory:

(2) Temporal Structure: Episodic memory has apparent temporal structure.

In addition to this, episodic memories seem to be accompanied by a sense of 'pastness'. When we episodically remember, it seems as though the episode being relived 'belongs' to the past (Clayton et al., 2007; Tulving, 1984). This feature is distinct and dissociable from having an apparent temporal structure. Earworms, for instance – experiences of song fragments or musical phrases repeatedly 'playing' in the mind – appear to unfold, but do not seem to belong to the past. By contrast, the thought goes, when we episodically remember an event, it seems to us that what we are remembering is something which happened at some moment in the past. This gives us the third phenomenological feature of episodic memory:

[3] Elsewhere in this paper, I refer to the objects of episodic memory as events. Episodes are a species of event; I use the term 'episode' only where it is necessary to distinguish complex events from their more primitive constituents.

[4] As Cheng and Werning note, the events making up an episode need not be temporally or spatially proximate, or involve the same actors. So, although episodes are the objects of episodic memory, not all episodes are memorable.

(3) Sense of Pastness: episodic memory is associated with a 'sense of pastness'.

Finally, in addition to involving time-consciousness and mental imagery, episodic memory is widely agreed to involve self-consciousness. Once again, Tulving (1985) has coined a term to refer to the type of self-consciousness in question – 'autonoesis' or 'autonoetic consciousness'. But again, the term obscures that there are at least two ways in which episodic memory is a self-conscious affair. Typically, 'autonoesis' is introduced by appeal to the authority of William James – in particular to two claims he made about memory. But plausibly, each of these claims highlights a distinct variety of self-consciousness.

First, James (1890, loc. 12492) wrote that memory 'requires more than the mere dating of a fact in the past. It must be dated in my past'. A natural interpretation of this claim is that episodically remembered events are presented as ones belonging to my 'personal past' (Michaelian, 2016) – my personal timeline, comprising those events in which I was involved, or which happened to me. This suggests a fourth phenomenological feature of episodic memory:

(4) Self-Involvement: episodic memory presents events as self-involving.

James also wrote that memories are accompanied by a feeling of 'warmth and intimacy' (1890, loc. 12492). To illustrate what this amounts to, it is helpful to introduce a clinical case reported by Stanley B. Klein and Shaun Nichols, in which it appeared that this feeling of 'warmth and intimacy' went missing from the patient's episodic memories. Following a head trauma, the patient, R.B., was able to remember particular incidents from his past, complete with 'temporal, spatial and self-referential' information, but said that he 'did not feel that the memories he experienced belonged to him' (Klein & Nichols, 2012, p. 684). In other words, he apparently lacked a 'sense of personal ownership' over his memories (Klein & Nichols, 2012, p. 685). For instance, of one memory he said

> 'I can picture the scene perfectly clearly […] I can 'relive' it in the sense of re-running the experience of being there. But it has the feeling of imagining [as if] re-running an experience that my parents described from their college days. […] Intellectually, I suppose I never doubted that it was a part of my life.'
>
> (Klein & Nichols, 2012, p. 686)

Based on these reports, Klein and Nichols conclude that R.B. was able to remember where and when events took place and that he was involved in them. But, they suggest, there was something missing from his memories. This 'something missing' must be distinct from 'self-involvement', as Klein and Nichols acknowledge (2012, pp. 689–690): R.B. did represent his own involvement in the remembered events, and so was plausibly able to date them in *his* past. What was missing, rather, was the sense of ownership – James' 'warmth and intimacy' – in virtue of which in ordinary circumstances we feel that our memories 'belong' to us. This suggests a final phenomenological feature of episodic memory:

(5) Sense of Ownership: episodic memory is (in non-pathological cases) accompanied by a sense of ownership.[5]

In sum, a phenomenological characterization of episodic memory claims that it essentially involves an experience of 'mentally reliving'. 'Mental reliving', I have argued, comprises five distinctive phenomenological features: (1) Mental Imagery; (2) Temporal Structure; (3) Sense of Pastness; (4) Self-Involvement; (5) Sense of Ownership.

3. Impure Phenomenological Features

I will now argue that each of the phenomenological features (1)-(5) outlined in §2 is an 'impure phenomenological feature'. An impure phenomenological feature is a phenomenological feature which 'does something for us'.[6] More precisely: some feature of a mental process is an impure phenomenological feature iff (a) it contributes to the felt quality of the process and (b) it contributes to the functional or representational features of the process.

As an example of an impure phenomenological feature, consider the felt unpleasantness of pain. This obviously contributes to pain's overall phenomenology. It also appears to contribute to its functional role: it is because pain feels unpleasant that it motivates

[5] A reviewer expressed some concern about how much weight R.B.'s case can be expected to bear. Readers with similar concerns should rest assured that I use the case simply for illustrative purposes. If the description of the case is coherent, it motivates the idea that a sense of ownership is an element of episodic memory phenomenology distinct from self-involvement, by illustrating the conceivability of the former, but not the latter, 'going missing' from one's memories..

[6] I owe this helpful phrase to a conversation with Matt Soteriou.

us to behave in certain ways. We consequently find it reasonable to take certain behaviours to be evidence of pain. For instance, motivational trade-off, in which an animal appears to trade-off its preference for avoiding a harmful stimulus against its other preferences, is taken to be a 'credible indicator' of pain (Birch, 2017) because the hypothesis that the animal is in pain provides the best explanation of its behaviour (Tye, 2017). The unpleasantness motivates the animal to avoid the harmful stimulus, at the cost of foregoing other goods. Conversely, individuals with pain asymbolia report feeling pain, but are not motivated to stop it. On one interpretation of the condition (Grahek, 2011), these individuals feel 'pain without painfulness' – they feel some aspects of pain, but not its unpleasantness. Because of this, they are not motivated to avoid or stop pains. Felt unpleasantness, then, does something for us: its presence or absence makes a difference to pain's functional role.

This is not to say that this felt unpleasantness is not conceivably separable from pain's functional features; it is. But I am not concerned here with metaphysical possibilities, but with how things actually are. As a matter of fact, perhaps of nomological necessity, the unpleasantness of pain seems to contribute both to the felt quality of pain and to its functional role. The felt quality explains why individuals in pain behave as they do; where that felt quality is missing, they behave differently. So, although we can conceptually isolate the felt quality of unpleasantness from the role it plays in our mental economy, unpleasantness is nevertheless an impure phenomenological feature of pain.

So too, the phenomenological features listed in §2 are impure phenomenological features of episodic memory. Each of them does something for us, contributing something to the representational and functional features of our episodic memories. To show this, I consider each of these features in turn.

First, mental imagery. That episodic memory involves mental imagery contributes something to its phenomenal character. But it is implausible on its face to take this to be a *purely* phenomenological feature of episodic memory – since mental imagery has distinctive representational features, in addition to its distinctive phenomenology. What these representational features are is a matter of debate. But whatever they are, if episodic memory involves mental imagery, these are representational features of episodic memory too. So mental imagery is one of episodic memory's impure phenomenological features.

Of course, this is unhelpful without knowing what the representational features of mental imagery are. But without entering into controversies about the nature of mental imagery – for instance, about whether it represents in a genuinely image-like way – we can make a

number of plausible claims about its representational features. I focus primarily on the case of visual mental imagery – though what I say should generalise. As a first pass, we can say that visual mental imagery represents roughly what visual experience represents. It should be relatively uncontroversial that visual experience represents scenes by attributing certain visuo-spatial features to parts of those scenes – certainly features like colour, shape, size, location and spatial arrangement, and perhaps other features too. The features attributed may be more or less determinate; on one view, visual experience attributes a range of determinable properties to parts of a scene, and by attending to those properties, one can make them more determinate (Nanay, 2010). So, when my radio is in my peripheral vision, my experience may represent it as green or as light-coloured; when I attend to the radio directly, my experience attributes to it a more determinate shade of green. As Bence Nanay (2015) argues, it seems plausible that mental imagery represents the same things in much the same way – by attributing a range of determinable perceptible features to parts of the imagined scene. By attending to part of the scene, we can attempt to make the properties attributed more determinate. Where we succeed, Nanay suggests, the increase in determinacy comes not from sensory stimulation, as it does in perceptual experience, but from our memories, beliefs or expectations.

Since episodically remembering involves visual mental imagery of the remembered scene, we should expect episodic memories to be quite rich in visuo-spatial detail. The visual mental imagery involved in episodic memories represents remembered events by attributing a range of visuo-spatial features to their various parts. The attributed properties may be determinable, but there must be sufficient determinacy to generate an experience naturally described in terms of visualising the event, bearing in mind that the events we episodically remember typically involve a number of discriminable individuals occupying a contiguous spatial environment. For instance, the experience need not attribute a super-determinate colour to every part of the scene – but it must attribute to different parts of the scene different determinates of the determinable *coloured*. Otherwise, the result will be more like visualising an undifferentiated mass than reliving an event. Similarly, whilst the experience need not represent entirely determinately the spatial arrangement of the scene, it cannot represent all of its constituents as *there but arranged in no particular way*: without taking a more determinate stand than this on spatial arrangement, it is difficult to see how the experience could be characterised as one of visualising a scene at all. So, the involvement of mental imagery seems to mark a representational contrast between episodic and semantic memories. Episodic memories record detailed information about an event's visuo-spatial features; by contrast, semantic memories

need not represent visuo-spatial features, and can represent in a highly general and determinable way.

The idea that episodic memory stores information about the visuo-spatial features of events is hardly new. Tulving (1972, p. 388), for instance, suggests that in episodic memory, events are represented 'in terms of (a) its perceptible properties, and (b) its temporal-spatial relation to other experienced events'. And a more recent 'minimalist' account of episodic memory, developed by James Russell and colleagues (Clayton & Russell, 2009; Russell & Hanna, 2012), emphasises the spatial content of episodic memory – this time on Kantian grounds. What I am suggesting, though, is that episodic memory represents visuo-spatial features precisely because it involves mental imagery – because it is in the nature of mental imagery to have such content. So, mental imagery is an impure phenomenological feature of episodic memory: as well as contributing to its phenomenology, it makes a difference to its representational features.

Similarly, the apparent temporal structure of episodic remembering contributes to its representational features. Just as episodic memories represent the visuo-spatial features of events through mental imagery, they represent the temporal structure of remembered episodes by way of their own temporal structure. In fact, it is helpful to characterize the way in which a memory appears to unfold by saying that the mental imagery it involves is *dynamic*: this imagery is not static, but changes over time. We can thus think of the imagery involved in an experience of episodically remembering as comprising a temporally ordered series of more primitive mental images M1 < M2 < … < Mn, each of which represents a proper temporal part of the episode being remembered. The temporal ordering of the mental images in an experience of episodic remembering is representationally significant: 'the temporal succession of events in the object domain is represented itself by a temporal succession of events in the representational domain' (Cheng & Werning, 2016).[7] So, supposing M1 represents an event E1, M2 represents E2 and so on, if one's experience of episodic remembering comprises the ordered sequence M1 < M2 < M3, it represents that E1 happened first, followed by E2 and finally E3. One's recollection is veridical just in case these three events did in fact occur in that order; otherwise, one *misrepresents* the temporal structure of the episode.

This is not to suggest that the order in which experiences of remembering *themselves* occur has such representational significance. If remembering Trump's inauguration

[7] Cheng and Werning use this phrase in characterising the representational features of mnemonic simulation, rather than dynamic mental imagery.

immediately prompts me to remember Obama's inauguration, I don't thereby represent that the former occurred before the latter. Rather, the idea is that for a given recollective *experience*, the order in which its constituent mental images occur is representationally significant. I use 'recollective experience' to refer to an experience of recollection in which successive mental images appear unfold or flow continuously, in the way that each experiential part of the experience of watching a dance seems to flow continuously from the last. We can distinguish a recollective experience in this sense from a succession of memory-based mental images which do not unfold or flow in this way, but appear disjoint, like a series of photographs. So, it is not sufficient for two images to be parts of the same recollective experience in this sense that one immediately follows the other. Nor is it sufficient that they represent temporal parts of the same episode – since recalling one part of an episode might prompt one immediately to remember an earlier part, with the resulting succession of images appearing disjoint, rather than seeming to flow continuously. Such a case would involve two distinct recollective experiences in my sense. Since the order in which recollective experiences occur is not representationally significant, this sort of case need not involve misrepresenting the temporal structure of the episode.[8]

The apparent temporal structure of an experience of episodically remembering, then, should be counted among its impure phenomenological features – since such experiences represent the temporal structure of events by means of their own temporal structure. That episodic remembering involves representing temporal order is again not new (see, e.g. Clayton & Russell, 2009). But again, precisely the reason for thinking that episodic memory represents temporal order is that this is what the apparent temporal structure of a recollective experience represents. So, apparent temporal structure is an impure phenomenological feature of episodic memory.

Third, the 'sense of pastness'. This is often explicitly characterized in representational terms – as a matter of attaching a 'temporal marker' to an event (Tulving, 2005, p. 18), or representing when it happened (Michaelian, 2016, p. 216). But it is doubtful that episodic memory constitutively involves representing when an event happened: it is not uncommon to recall a past event without representing when it occurred (Russell & Hanna, 2012; Suddendorf & Busby, 2003). Nevertheless, unlike imagined events, remembered events do not seem to be entirely free of the temporal order – they still seem to 'belong' to the past, even when the

[8] Thanks to a reviewer for pressing me on this.

subject does not know *where* in the past they belong. So, the feeling of pastness is not simply a matter of representing when something happened.

Hoerl (2008) suggests that the sense of pastness consists in having a kind of 'tensed thought'. Episodic memories do not represent the present state of the world; they represent past states of the world *as such*. To represent a past event *as* past is to represent it as standing in a certain causal relationship to the present. Hoerl characterizes this in terms of appreciating that the event has been 'superseded […] by other events or situations' – and so cannot be revisited or repeated (2014, pp. 370–317). This does seem to be part of what is involved in representing something as past. Besides this, another important causal connection between past and present events is this: that an event occurred in the past has a certain causal and practical relevance for what happens now and in the future. That a particular event occurred may raise the probability of another event occurring, and it may make it rational to *do* certain things now or in the future. Representing a past event as such involves appreciating this – that despite having been superseded by the present, the event is causally and practically relevant to present and future events.

So understood, the sense of pastness is an impure phenomenological feature. For episodic memory to have the 'sense of pastness' is not only for it to have a felt quality, but for it to represent past events as such. As a result of constitutively involving this sort of representation, the sense of pastness contributes to the functional role of episodic memory – because it is only in virtue of representing past events as past that episodic memories can rationally play the role that they do in practical reasoning. Suppose that I episodically remember my friend Henry heading into Sally's party, and I have just learned that a co-worker contracted chicken pox at that same party. My memory, together with what I have just learned and my desire not to get chicken pox, ought to motivate me to avoid Henry until I find out whether he is infected. My memory plays this role in my practical reasoning only because it represents the event – Henry heading into the party – *as* a past event. If it did not represent this event as one which had actually occurred, but as belonging to some imagined or future time, it could not rationally motivate me to avoid Henry. So, the sense of pastness, is doubly impure: it contributes to both the representational and functional features of episodic memory.

The fourth feature, self-involvement, is a relatively clear-cut case. For an episodic memory to present an event as one in which I was involved, or for which I was at least present, seems straightforwardly to imply that it must have some self-referential content. It is hard to see how a memory could present an event as self-involving without having such content –

without representing something about one's own involvement in or presence at an event. Consequently, self-involvement is not a purely phenomenological feature of episodic memory.

Finally, the sense of ownership is often glossed in metarepresentational terms. Tulving (2005, p. 16) characterizes it in terms of the subject's representing 'that one had a particular experience […] in a particular place at a particular time'; Michaelian (2016, p. 214) suggests that it involves 'representing an experience of that [remembered] event that belongs to me'. Similarly, Klein and Nichols propose that R.B. lacked a sense of 'numerical identity' with the person who had the original experiences: he failed to represent '*I* had these experiences' (2012, pp. 689–690). This metarepresentational construal gels with some of R.B.'s introspective reports. For instance, Klein and Nichols report that after his accident, he said that his memories felt like events that had been 'described by someone else' (2012, p. 687) – but once he recovered, they seemed like things he 'had done and experienced' (2012, p. 688).

But a simple metarepresentational construal does not really capture what the sense of ownership contributes to episodic memory. An individual like R.B. might well remember that he had certain experiences – just as my memory of a friend's wedding may represent that she witnessed certain things or was happy. Indeed, as Jordi Fernandez (forthcoming) points out, several of R.B.'s reports indicate that his memories *did* represent him as having had certain experiences – for instance, he claimed to remember 'walking into the room and other things that I did and felt'. So, a memory might have metarepresentational content, even whilst lacking the sense of ownership. Instead, what distinguishes memories unaccompanied by a sense of ownership from typical episodic memories is that they do not seem, from the subject's perspective, to have their *source* in experience. Take R.B. again: his memory may have represented that he witnessed an event, but it did not seem to him that he had this memory for that reason. Rather, he said, it was as though he had this memory because the event was described to him. This suggests that what the sense of ownership contributes to an episodic memory is not (or not simply) metarepresentational content, but *source information*.[9]

In this vein, Jerome Dokic (2014, p. 416) suggests that episodic memory involves a feeling that the memory is 'first-hand', i.e. that it 'originates directly from my own experience'. Similarly, Michaelian (2016) proposes that the sense of ownership might be thought of as the result of 'process monitoring' mechanisms – signalling that the memory is the result of a memory process, rather than an imaginative one. And Johannes Mahr and Gergely Csibra

[9] Again, the appeals to R.B.'s case in this section are intended to be illustrative only (see note 8).

(2018, p. 3) suggest that 'autonoesis marks those events of which one had first-hand experience as opposed to some other source'. There are differences between these views, but the broad suggestion is that the sense of ownership is the product of source monitoring, and enables a subject to discriminate between first- and second-hand information – in order to 'reduce uncertainty about whether the remembered events actually occurred' (Michaelian, 2016, p. 238). If this is right then the sense of ownership, like the sense of pastness, modulates the role episodic memories play in practical reasoning. The absence of this feeling may decrease the likelihood of the subject endorsing and acting upon the memory. Consequently, the sense of ownership is an impure phenomenological feature of episodic memory: its presence or absence has significant consequences for the role that a memory plays in practical reasoning and the production of behaviour.

This demonstrates that the sense of ownership is an impure phenomenological feature. It also calls into question whether we should expect episodic memory to be accompanied by a sense of ownership in all species. If the sense of ownership plays a 'source monitoring' role, it seems unlikely that animals would have any use for it. The utility of source monitoring in the case of human memory is clear. Humans receive information through both testimony and experience, and construct subjectively similar memory representations on the basis of both sorts of information. This means it is not uncommon for us to have states which are subjectively like episodic memories, but whose content derives from a source other than our experience of an event. But animals, presumably, do not receive information through testimony, or any source other than experience, so a source monitoring mechanism would be of little use to them.[10] This makes it reasonable to think that if there is nonhuman episodic memory, it may not have an associated sense of ownership: the sense of ownership may be a feature distinctive of *human* episodic memory, adapted to distinctively human needs. So, we should not treat the sense of ownership as an essential feature of episodic memory, if our goal is to detect episodic memory in animals.

I have argued that each of the phenomenological features of episodic memory highlighted in §2 is an impure phenomenological feature. That is to say, each of these features contributes to the representational and functional features of episodic memory, as well as to its phenomenology. So, each of these features has both an objective and a subjective aspect.

[10] Note that when Jonathon Crystal and colleagues (Crystal & Alford, 2014; Crystal et al., 2013) claim that rats have source memory, their use of 'source monitoring' differs from mine, referring instead to memory for contextual information.

Mental imagery and apparent temporal structure are the means by which episodic memories represent the visuo-spatial and temporal features of events. The sense of pastness constitutively involves representing a past event as such, grounding episodic memory's role in practical reasoning. For a memory to present events as self-involving is for it to have some self-referential content. And the sense of ownership, where it exists, functions to provide the subject with source information.

As in the case of the unpleasantness of pain, the subjective and objective aspects of (1)-(5) conceivably come apart. We can imagine a kind of 'zombie memory' having all the objective features I have described but lacking any of episodic memory's phenomenological features. So, one might be tempted here to accuse me of sleight of hand – to say that there *are* purely phenomenological features in the vicinity, namely the felt qualities missing in this thought experiment, which I have simply run together with some contingently associated objective features. If this is right, we cannot (as I will propose in §4) investigate whether animals have episodic memory by investigating whether their memories exhibit the objective aspects of (1)-(5). Even if they do, the objection might go, it will be a further question whether the relevant phenomenology is present.

This objection misses the mark, since the question at hand – whether animals have episodic memory – concerns only what is actually the case. Answering this question requires only addressing empirical possibilities, not merely metaphysical ones. But there is no reason for supposing that the phenomenological aspects of (1)-(5) come apart from their objective aspects, or that zombie memory is an empirical possibility. Quite the opposite: I have been arguing that the objective features of episodic memory go hand in hand with its phenomenology. So, whilst we can in *thought* dissociate the felt qualities of (1)-(5) from their contribution to the functional and representational features of episodic memory, we should doubt that they are in *fact* so dissociable. Consequently, it is not sleight of hand to insist that these are impure phenomenological features. Here, as in other areas where objective features and phenomenology march in step, functional equivalence should be regarded as evidence of phenomenology.

4. Behavioural Detection

'Mental reliving' comprises five phenomenological features, which I have argued are impure phenomenological features. So, in characterizing episodic memory in terms of the phenomenology of mental reliving, we indirectly highlight a number of objective features of

episodic memory. In particular (and disregarding the sense of ownership for the reasons outlined in §3), episodic memory:

(A) stores detailed information about visuo-spatial features of an event
(B) represents the event's temporal structure
(C) represents a past event as past
(D) stores some self-specifying information about the subject at the time of the event

My proposal, then, is that we investigate whether animals have episodic memory by investigating whether they have memories exhibiting these features. This proposal can be implemented only if these features can be detected in nonverbal behaviour. In this section, therefore, I make some suggestions about how this might be done.

First, though, note that in making this proposal, I do not mean to imply that (A)-(D) *exhaust* the nature of episodic memory. (A)-(D) are simply the objective features which fall out when we characterize episodic memory in terms of its phenomenology. There is consequently an evidential connection between having memories with these features and having episodic memories. Most obviously, if an individual does not have a memory of an event with features (A)-(D), this indicates that she does not have episodic memory. Conversely, I suggest, if a person does have a memory of an event with features (A)-(D), this should be counted as evidence that she episodically remembers it.

One might take issue with my claim that this evidential connection holds in the second direction, as well as the first. To see why, recall that the challenge to the 'what-where-when' view of episodic memory was that semantic memory can encode what-where-when content, just as episodic memory can. So, evidence that animals recall what-where-when content does not support the episodic memory hypothesis. In this respect, one might object that the what-where-when view and the phenomenological view, as I have presented it, are companions in guilt. I have suggested that episodic memories have features (A)-(D). But, the objection goes, a semantic memory could have these features too: a semantic memory might store detailed information about a past event's visuo-spatial and temporal features, and self-specifying information about one's own involvement in the event. So, if animals could retrieve such information, this would not indicate that they had episodic memory. If their memories lack these features, that may well count against their being episodic – but their exhibiting these features provides no reason to favour the hypothesis that they have episodic memory.

A semantic memory could conceivably have features (A)-(D). Klein (2013) suggests that semantic memory can, in principle, encode content of any kind. So, perhaps no content is necessary and sufficient for episodic memory. But the objection to the what-where-when view is not that it fails to articulate necessary and sufficient conditions for episodic memory.[11] Episodic memory might well not be characterizable in terms of necessary and sufficient conditions; even if it is, it no part of the project of detecting episodic memory in animals to provide them. The problem with the what-where-when view is rather that it characterizes episodic memory in terms of a content which many semantic memories have. There is nothing unusual about a semantic memory encoding what-where-when content. So, if animals do encode what-where-when content in memory, this does not obviously discriminate between the episodic and semantic memory hypotheses. The phenomenological view will be a companion in guilt with the what-where-when view only if the same is true for (A)-(D) – that is, only if these objective features are ones semantic memories commonly or easily have.

This does not seem to be the case: episodic and semantic memories appear standardly to have quite different contents. The 'autobiographical interview' protocol is a reliable and valid method for distinguishing episodic and semantic memory in humans. It distinguishes them by recording the number and type of details an individual can recall about a past event. Certain types of information are rated as episodic, others as semantic. Event related information, details about time and place, and self-regarding information (about one's position, for instance) are treated as episodic (Levine, Svoboda, Hay, Winocur, & Moscovitch, 2002). This test successfully distinguishes between episodic and semantic memory precisely by exploiting the fact that the two standardly *differ* in content: in particular, that episodic memory has the sorts of content highlighted by features (A)-(D), above, whilst semantic memory typically does not (at least, not to the same degree). Correspondingly, individuals with severe episodic memory deficits are impaired against controls in this test – they recall fewer of these details, and those they do recall are less specific (Palombo, Alain, Söderlund, Khuu, & Levine, 2015). Similarly, in tests of complex figure recall, episodically impaired individuals are impaired on recall of visuo-spatial information (Palombo et al., 2015). Again, that recall of this sort of information is impaired in individuals who rely largely or entirely on semantic memory suggests that semantic memory does not standardly have features (A)-(D). So, it is reasonable to conclude that semantic memory does not standardly deal in this kind of information – and

[11] At least, it shouldn't be for the reasons given here. In places though, e.g. (Suddendorf & Corballis, 2007), it is presented this way.

consequently, that the view presented here and the what-where-when view are not companions in guilt.

Having said that, individuals with severely deficient episodic memory can sometimes report on past events in some detail. Evidence regarding this phenomenon is scarce, but there are reasons for thinking that this is not overly troubling for the project of distinguishing episodic and semantic memory in non-humans. The individuals report that they achieve these feats of recall by 'rehearsing' the events to themselves or looking at photographs (Palombo et al., 2015). This suggests, first, that such 'quasi-episodic' semantic memories arise only where the subject makes a concerted effort to commit something to memory; they are unlikely to be formed by individuals who are not motivated, at the time of an event, to commit details about it to memory. Second, and more importantly, their reports suggest that forming and maintaining quasi-episodic semantic memories relies on mnemonic aids like language and photographs. Since these props are unavailable to nonhuman animals, it is doubtful that animals can form quasi-episodic semantic memories, even where humans can. So, although semantic memories conceivably can, and perhaps sometimes do, have features (A)-(D), the presence of these features in nonhuman memory should nevertheless be treated as evidence for nonhuman episodic memory.

How might we detect these features in non-verbal behaviour? Some existing tests already aim to detect some of these features. What-where-when studies seem at least partially to investigate (A) – recall of visuospatial features. Studies of sequence recall (e.g. Allen, Morris, Mattfeld, Stark, & Fortin, 2014) investigate whether nonhuman memories exhibit (B). But neither of these approaches addresses (C) – they do not speak to whether the subject represents a past state of the world as past. In what-where-when studies, subjects might simply represent (say) that there are some worms at a given location, and that they have been there for a day, without recalling the event during which they were placed there. In this way, the scrub-jay's memory may still represent the present state of the world, and not any previous event. Similarly, subjects might pass tests of sequence recall by representing 'how the sequence goes', rather than by recalling any past occasion on which they were exposed to the sequence (Hoerl, 2008; McCormack, 2001). At issue in both cases is how to distinguish representation of a past event as such from mere sensitivity to one.

Unexpected question tasks may be the key to solving this problem. In these tasks, the subject is required to recall information which, at the time of the event, was 'incidental' – which the subject was not expecting to need (Fujita, Morisaki, Takaoka, Maeda, & Hori, 2012;

Mercado, Murray, Uyeyama, Pack, & Herman, 1998; Singer & Zentall, 2007; Zentall, Clement, Bhatt, & Allen, 2001; Zentall, Singer, & Stagner, 2008; Zhou, Hohmann, & Crystal, 2012).[12] The underlying thought is that, if information appears unimportant at the time of the event, it is unlikely to be encoded in semantic memory – but if the event is episodically remembered, the subject should be able to 'revisit' her experience to retrieve the relevant information. Presumably, the reason we might expect episodic memories to contain such incidental information is that episodic memories constitutively involve mental imagery, have apparent temporal structure and present events as self-involving – so, it is in their nature to record detailed visuo-spatial information, represent an event's temporal features and have self-referential content.

Existing unexpected question tasks face two limitations. First, they require the establishment of a form of non-verbal communication – so that the subject can be asked and can answer a question. This can be achieved via conditioned discrimination, wherein subjects learn to pick one of two presented stimuli if they have just performed a certain action, and another if they have not (Zentall et al., 2001), or by training subjects on a command to 'repeat the last action' (Mercado et al., 1998). The concern is that the associated training could lead the subject to assign significance to the sort of information she is being asked to report on, and so to commit it to memory even where she is not expecting to be asked about it (Fujita et al., 2012). Second, these tests typically ask subjects about an event which occurred only seconds ago. Whilst it seems possible to episodically remember an event which happened mere seconds ago, it seems equally likely that such short term recall might be achieved using non-episodic working memory. So, it is not clear that these tasks can convincingly discriminate episodic from working memory in nonhumans (Zentall, 2013).

A recent study with dogs used an alternative methodology to avoid these problems (Fujita et al., 2012). The retention interval was longer, and the subjects were not trained. Instead, the dogs explored an environment containing baited and unbaited containers, and were able to eat from some but not others. When they were unexpectedly returned to this environment, they seemed to remember which containers were baited, and where they had previously been. Yet it seems that this study redresses the issues with the unexpected question format at the cost of failing to address (C). Since the dogs were required to recall only which

[12] See also (Cheke & Clayton, 2013, 2015) for examples of verbal unexpected question tasks.

containers *still* contained food, their behaviour could have resulted from representing the present state of the world.

Nevertheless, a variant on the unexpected question format could be used to investigate (C). In an unexpected question task, the subject must recall information which was incidental at the time of the event. But to represent a past event as such is to represent it as superseded by, but causally and practically relevant to the present. To determine whether the subject represents the past event in this way, the information to be recalled in our unexpected question task should meet two further conditions. First, it should no longer reflect the state of the world – it should have been superseded, and the subject should be aware of this. This ensures that if the subject recalls the information, it is not part of her model of the present state of the world. Second, since the event, the information should have become relevant to the pursuit of the subject's goals. This achieves two things. If, despite knowing that the information has been superseded, the subject recognises its present significance, this indicates that she represents the past event *as* past, in the sense outlined above. Moreover, by making the information unexpectedly relevant to the subject's pursuit of her current goals, we can essentially ask her an 'unexpected question' after the fact, without training her in any system of communication.

Here is an example, to make things clearer. Suppose we are investigating whether scrub-jays have episodic memory. At *t1*, we present them with a target event to be remembered, in which they are allowed to cache food in an environment we have marked in some arbitrary way – where a wall in the background is covered in a particular pattern, say. At *t2*, they learn that the patterned wall is no longer present: the background wall is now plain. So, the information about the pattern on the wall has now been 'superseded'. At *t3*, we teach them a recovery rule to the effect that if a patterned wall was present at caching, their food will have disappeared from the cache by the time of retrieval. At *t4*, they are allowed to return to the original environment from *t1*, and their behaviour is observed. If they do not look for the food, this indicates that they recall the pattern was present at *t1*.[13] Since by *t3*, they already knew that the pattern was absent, they cannot have used what they learned at *t3* to update a present model of the world – since their present model of the world at *t3* does not represent

[13] Ideally, the task would involve a choice at *t4*, with subjects having learned differential recovery rules at *t3* corresponding to two patterns presented in distinct parts of the environment at *t1*. In the simpler version described above, the 'success' behaviour (not looking) is a negative behaviour which is multiply interpretable; a choice would be less ambiguous. I use the simpler version to sketch the task above for ease of presentation. Thanks to members of the Comparative Cognition lab in Cambridge for pressing me on this.

the wall as patterned, but as plain. The information learned at *t3* can inform subjects' behaviour at *t4* only on the assumption that subjects represent at *t3* what *was* the case at *t1*, and appreciate its practical significance.

This sort of task could show that animals recall information about a past event *as* past, addressing (C), since success requires representing that something *was* the case, which is known not to be the case now. What about (A), (B) and (D)? These pick out the type of information episodic memories typically store *about* a past event – information about the event's visuo-spatial features, its temporal structure and the subject's involvement in the event respectively. The sort of task I have proposed works by assigning arbitrary significance, after the fact, to some piece of information which the subject might be expected to recall if they can episodically remember – because the information is of a kind episodic memories store constitutively. In the above example, the information concerned the event's visuo-spatial features, thereby getting at (A) – but by manipulating and assigning arbitrary significance to other features, further tasks of the same general shape might be used to get at (B) and (D).

In a task addressing (B), for instance, we might allow subjects to cache in two locations, with each cache site being in front of a different wall. Before caching at the first site, a blue circle appears on the wall, followed by a red square. Before caching at the second site, the reverse occurs: a red square appears, followed by a blue circle. These events having unfolded, the background features of the two cache sites are identical – they differ only with respect to the sequence of events prior to caching. Later, in another environment, we teach the subject that one of these sequences at caching is associated with a much higher recovery rate than the other. We then observe, when they are returned to the original environment, whether they take this recovery rule into account when making a choice. If they do, this suggests that they remember the temporal properties of the original caching events. In a task addressing (D), we might instead begin by allowing both the subject and another bird to cache, each in the presence of the other. Then, in another environment, we teach might the subject that food she caches herself is recovered at a lower rate than food cached by the other bird. Finally, we return the subject to the original environment and observe whether she prefers to return to her cache or the one made by the other bird. If she prefers food cached by the other, this suggests that she remembers details of her own role in the original caching event.[14]

[14] Thanks to Dave Neale for suggesting the first of these variations. Both of these variations eliminate the need for a stage analogous to *t2* since in neither case can the subject discriminate

The proposal in this section resembles but differs from the methodology adopted in Clayton, Yu and Dickinson (2003), which found that scrub-jays can use information learned after caching to decide which cache to return to. The subjects in this study were not required to recall anything which was incidental at the time of encoding, nor did they need to recall anything which they knew to have been superseded in the interim. Experiment 1 in Crystal et al. (2013) comes very close to what I have in mind, however. In this experiment, rats were able to learn that food would replenish at a location only if they had originally discovered it there themselves, rather than having been placed there by an experimenter. That they were able to learn this rule suggests that, at the time of replenishment in the learning-phase, they recalled the circumstances under which they had originally found the food – perhaps in terms of the event's perceptible features, or in terms of their own role in the event. At the time of encoding, these circumstances may well have been incidental. The methodology differs from that proposed here only in that this rule was learned before the occurrence of the events to be recalled in the test phase. At this point, having learned the replenishment rule, information about experimenter-placement would have ceased to be incidental: the rats would have clear motivation to remember the feature on which replenishment depends. Despite this difference, that the rats were able to learn the rule prior to the test phase provides a promising indication that their memories have some of the impure phenomenological features outlined here.[15]

In short, the type of task proposed here could be used to investigate whether a subject recalls a past event *as* past, in terms of its visuo-spatial features, its temporal structure and the subject's own involvement in the event. So, each of the features (A)-(D) can be detected in non-verbal behaviour. If a form of non-human memory with these features is detected, we should take that to be evidence in favour of the hypothesis that animals have episodic memory. Such evidence would, naturally, be defeasible. But, I've argued, it could not be defeated merely by pointing out the conceivability of a form of memory which functionally resembles episodic memory yet lacks its phenomenology. Whilst such 'zombie memory' is conceivable, there is no clear reason to think it exists in fact – and it is not a condition of adequacy on empirical tests that they rule out merely metaphysical possibilities. What matters is discriminating episodic memory from other *actual* forms of memory, primarily semantic memory. Tasks of the kind proposed in this section could do that – and do it precisely by latching on to the

between the two caches in the test phase by relying on a model of the present state of the world.

[15] Thanks to Nicky Clayton for pointing out this similarity.

objective aspects of the impure phenomenological features that jointly comprise an experience of mental reliving. So, if nonhuman animals 'succeed' in tasks of the kind proposed here, we should take this to be evidence that they have episodic memory *proper*, phenomenologically understood.

5. Conclusion

I have argued that the phenomenological features of episodic memory are *impure* phenomenological features – they have both subjective and objective aspects. So, to characterize episodic memory in terms of these phenomenological features is, in part, to highlight that it has certain objective features: it represents past events *as* past, recording detailed information about their visuo-spatial features, as well as their temporal structure and their involvement of the subject. Consequently, this characterization does not make it impossible to test for episodic memory in nonhuman animals. Rather, it implies that we should investigate whether animals' memories have these objective features – and if they do, that we should conclude that animals have episodic memory.

These objective features, I've argued, can be detected in nonverbal behaviour using methodologies similar to those already employed in episodic-like memory research. So, whilst my defence of the phenomenological view of episodic memory in one sense challenges the orthodoxy in comparative psychology, in another it is vindicatory. The rejection of phenomenological characterizations of episodic memory suggests a kind of pessimism about the power of behavioural tests to reveal the phenomenological features of nonhuman experience – indicating that they can warrant nothing stronger than agnosticism. In arguing that we can characterize episodic memory as 'mental reliving', and nevertheless detect it in animal behaviour, I have indirectly been making the case for a more optimistic view: that from behavioural tests we can rationally draw conclusions not only about what animals remember, but about what their remembering is like.

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