

Perspectives on Time and Memory

An Introduction

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What is the connection between the way we represent time and things in time, on the one hand, and our capacity to remember particular past events, on the other? This is the substantive question that has stood behind the project of putting together this volume. The methodological assumption that has informed this project is that any progress with the difficult and fascinating set of issues that are raised by this question must draw on the resources of various areas both in philosophy and in psychology.

Our aim in this introduction is to draw upon the various contributions to this volume in articulating the intuition that there is a deep connection between the capacity to remember particular past events and certain kinds of capacities for temporal representation or reasoning. In doing so, we cannot cover all the theoretical and empirical issues raised by the various authors. Instead, we hope to spell out some guiding ideas which are of common concern to their work.

One way of spelling out the intuition that there is a fundamental connection between our understanding of temporal reality and our capacity to remember past events can be found in Bertrand Russell's (1912: 66) remark that we should not be able to understand what it is for things to have happened in the past if it weren't for our ability, on occasion, to have 'immediately before the mind [something] which is recognized as past'. Yet, any such claim should lead us to ask just what kind of temporal understanding and what kind of memory ability is supposed to be in question here. Just what are the representational abilities involved in thinking about other times that are supposed to depend on our capacity to remember the past? And, equally, just what does it mean to say that the past can come before our minds when we remember—how does time enter into memory itself?

In short, the two terms that make up the title of this volume may be combined in two core questions:

- (1) What role does memory play in our understanding of time?
- (2) How is time represented in memory?

These two questions correspond to two directions from which the question about the relationship between memory and temporal understanding can be approached. One starting point would be a study of the ways we have of thinking about and representing things in time, leading us to ask which features of our understanding of temporal reality rely on our possession of memories. Conversely, we can start from the question as to the information about temporal reality which memory makes available to us, leading us to ask what it is about memory that gives it its role in temporal reasoning.

Within both philosophy and psychology, time and memory are each typically dealt with under quite different headings. In psychology, work on the mechanisms underlying timing abilities and temporal judgements has proceeded largely separate from work which has tried to distinguish different kinds of memory systems. In philosophy, debates on metaphysical questions regarding the reality of time have gone on in parallel to, and often independently of, work on the epistemology of memory and its role in accounts of the mind. There are indeed quite separate concerns for each of these various lines of research to address in their own right. However, an important challenge that faces any attempt to spell out in detail the connection between temporal understanding and memory is to clarify the relationships between those lines of research, both within each discipline and across them.

The force of that challenge is probably most obvious when it comes to the question as to what is involved in ascribing certain forms of temporal understanding or memory to a given individual. Constitutive philosophical claims about the different ingredients involved in having, say, a concept of the past or the idea of a chronological order of events often seem to postulate what, on the face of it, are quite sophisticated types of knowledge and reasoning abilities. As such, they seem to give us little to go on when it comes to deciding whether animals or children should be credited with similar temporal notions, or how to develop empirically plausible models of the representational mechanisms involved in mature temporal understanding. Conversely, cognitive and neuropsychological models describing different ways in which temporal information about events can be encoded, retained, and retrieved are cast in the technical vocabulary of the scientist. Further work is needed to show how such psychological models might illuminate our intuitive conception of what it is for someone to have a particular past event before her mind, and how such models might contribute to accounts of the phenomenology of memory, its role in our understanding of time, and our grasp of temporal concepts in general.

Clearly, an important task for any attempt to approach and clarify these issues is to distinguish different levels at which they can be addressed. There are many different senses in which someone can be said to remember something, just as there are many different ways in which someone can be said to be sensitive to, be aware of, or think about time. More to the point, both philosophy and psychology have their own reasons for talking about different types of memory and temporal understanding. In philosophy, such distinctions are motivated by epistemological, phenomenological, and thought-theoretic concerns; in psychology, they may ultimately involve the idea of different information-processing mechanisms which serve different functions, are located in different parts of the brain, emerge at different developmental stages, or can be selectively impaired. One task for this introduction is therefore to put some of the key issues discussed in the contributions to this volume into context by clarifying the grounds on which they draw such distinctions between different types of memory and temporal understanding. Another is to draw out in more detail in what sense different contributions may indeed be seen as addressing the same key issues.

TIME, REALITY, AND REPRESENTATION

Consider two commonplace perceptual situations: watching a ship sail down a river, and looking up and down the façade of a house. Immanuel Kant (1929: A189/B233 ff.) mentions these two examples to bring out how certain forms of temporal thought are basic to our thinking about the world around us. His point may be put like this. Fundamental to the way we represent the world is the ability to conceive of a temporal order of events which sometimes determines the course of our perceptions and sometimes does not. Without such an ability, we would be unable to distinguish between perceiving successive states of affairs (e.g. as the ship sails down the river) and successively perceiving coexistent states of affairs (e.g. as we glance at different parts of a house). Yet, without such a distinction, our perceptions would simply give way to one another without being integrated into a view of a mind-independent world ‘out there’ in which things are one way or another (see also Campbell, 1984). More generally, time provides us with a framework not just to order the events we know of, but also to wonder about what happens when we are not looking, what happened while we were asleep, or what will happen in the future. It is in this sense that temporal thought might be said to be a crucial part of thinking of the world as *objective*, as being the way it is independently of our interaction and engagement with it.

At the same time, temporal thought might also be said to be a crucial part of thinking about the world as something we have a certain *perspective* on, as the world we inhabit and in which our lives unfold. Just as we call things near or far from our point of view in space, we call things near or far from our point of view in time. And, from our point of view in time, certain things have already happened, others are currently taking place, and more are yet to come. More to the point, it would seem that we do not conceive of an event as real unless we conceive of the time of that event as having a particular bearing on our own point of view in this sense. Consider, for instance, the way we represent the events we read about in a piece of fiction (cf. McTaggart, 1927). Part of the force of saying that we do not represent them as real events is that we represent them in a way that is independent of our own point of view, as neither past, present, or future, near or far in time. By contrast, to think of events as real is, in part, to think of them as events in the world we inhabit—as events which have a specific bearing on us depending on whether they have already happened, are currently taking place or are yet to come (see also Cockburn, 1997).

Contemporary discussion on the role of temporal reasoning and concepts of time in our knowledge of the world owes much to a distinction first introduced by J. Ellis McTaggart (1927). He observes that there are two quite different ways we have of representing how events are positioned in time. First, we can think of the temporal position of an event purely in terms of its relations to other events. We do this, for instance, when we use notions such as ‘before’, ‘after’, or ‘simultaneous with’ to order two events, when we specify the length of the interval that separates them, or when we assign a date to an event. Thinking of the temporal

position of an event in this way, however, still leaves open the question as to whether the event thus thought about lies in the past, the present, or the future, or how near or far in the past or future it lies. There is thus a second way of thinking of the temporal position of an event, and what is distinctive about it is that it brings in our own temporal perspective on the event in question. The answer to the question as to where in time an event lies, in this sense, depends crucially on when the question itself is asked, as an event which is now present, say, was once in the future, and will soon be past.

McTaggart's distinction has sparked an intense debate on the role these two ways of thinking of the temporal positions of events play in our reasoning about time as a feature of objective reality. In particular, a large amount of work in both epistemology and metaphysics has gone into attempts at spelling out the idea of a temporal perspective that manifests itself in our use of the past, present, and future tenses (see e.g. Chs. 14 and 13 by Moore and Peacocke in this volume). However, distinctions akin to that drawn by McTaggart are also made in the literature on psychological mechanisms underlying our ability to make temporal judgements. For instance, William Friedman (Ch. 5, this volume; see also Block and Zakay, Ch. 2) appeals to McTaggart in introducing a distinction between what he calls 'location-based' and 'distance-based' processes in memory for the time of past events. Starting with Friedman's distinction, we now wish to sketch three ways in which questions about the nature of memory may be connected with questions about temporal representation.

Memory for time

The question that Friedman addresses in his chapter is how we make 'when' judgements about remembered events. That is, how do we make judgements about the time at which past events occurred? He distinguishes between two processes on which judgements about the time of remembered events might be based. Location-based processes rely on information laid down at the time of encoding. That information either specifies or can be used to infer the location of an event in a conventional, natural, or personal time pattern. Distance-based processes, by contrast, rely on information which specifies or can be used to infer the recency of events (how long ago they happened) or the relative order of two remembered events with respect to the present.

The issue as to how 'when' judgements are made has typically been addressed quite separately from other work on memory. One potential reason for this may be that memories of events do not, on the face of it, appear to include 'when' information. In this sense, temporal information contrasts with other types of contextual information, which sometimes (although not always) seem to be given to one in the memory itself. For example, the way in which one remembers a word presented in a list-learning task may allow one to make judgements about the modality of presentation, or aspects of the surroundings in which the word was presented. However, one's memory does not in the same way seem to yield

information about the temporal context in which one encountered the word. Given this, how do we make ‘when’ judgements? In answering this question, there is a second distinction that cuts across the distinction between distance- and location-based processes. We can distinguish between answers which appeal to specialized memory mechanisms that encode temporal information and answers which appeal to other, non-specialized, memory mechanisms which might be exploited in making ‘when’ judgements (see Block and Zakay, Ch. 2, this volume).

If there are specialized temporal encoding mechanisms in memory, it is necessary to characterize the content of the temporal information that such mechanisms specify. Friedman’s distinction might provide us with two different ways in which this question can be addressed. A location-based account, on this view, would involve describing a ‘time-tagging’ process which specifies the temporal context in which the event occurred. A distance-based account would involve some mechanism by which temporal information about distance from the present was available in memory. Such information might somehow be available directly, but it might also result from computing the similarity between the temporal context in which the event occurred and the current temporal context (see Brown and Chater, Ch. 3, this volume).

The alternative is to assume that ‘when’ judgements involve inferences based on memory processes that are not specialized to encode temporal information. A location-based version of such an account would assume that information about ‘when’ an event occurred must be *reconstructed* by a chain of reasoning relating features of the remembered event to knowledge about time patterns (see Friedman’s chapter, for example; note that on such an account it is necessary to give a separate explanation of how such time patterns are represented in memory). A distance-based version of such an account might claim that how long ago an event occurred is inferred from a memory property which happens to be correlated with the passage of time (such as the vividness of the memory).

The issue of how ‘when’ judgements are made, in this sense, involves considering a very particular way in which time and memory are related: Are there special memory mechanisms for remembering temporal information? Psychologists have tried to address this question in experimental studies, by modelling memory performance and by considering neuropsychological evidence. The different accounts that have emerged are debated in the chapters by Brown and Chater, Block and Zakay, and Friedman. Yet, the question may also be of philosophical relevance. A central claim in Peacocke’s chapter is that our understanding of the past tense actually relies, in part, on the existence of mechanisms which are responsive to the passage of time.

Memory and chronology

A second issue regarding the way in which time and memory are related concerns descriptions of the organization of memory. As Friedman puts it, our intuitive conception of memory takes for granted that it is ‘infused with chronology’.

However, there is considerable debate as to whether there are any substantive grounds for saying that memory itself is chronologically organized. Indeed, there also appear to be different descriptions of what it might mean to say that memory is chronologically organized.

On the one hand, Conway has argued that we possess abstracted personal histories, in which our lives are divided up into life-time periods (such as ‘when I was at university’), which may themselves be nested within a hierarchy below extended periods or time eras (such as ‘the twelve years in which I was married to Bob’). According to Conway, this knowledge about our past often serves to organize memory retrieval, in that we may often direct memory searches by accessing information from particular periods. Whether or not retrieval is conducted in this way is an empirical question (see Conway, 1993, for review). The point here is that Conway’s claims constitute only one sense in which our memories could be described as infused with chronology. In particular, other authors imply that to claim that memory is chronologically organized is to make a stronger claim than this.

Friedman implies that it is only correct to describe memory as chronologically organized if there is a specialized memory mechanism that associates each memory with a temporal code. Thus, for him, to establish that memory is chronologically organized is a matter of establishing the existence of such a mechanism. He argues that there is no reason to believe that ‘when’ judgements depend upon such specialized temporal encoding mechanisms. Given that research on ‘when’ judgements seems to suggest that long-term memories are not consistently associated with a temporal code, he suggests that memory cannot be chronologically organized.

The general thrust of Brown and Chater’s argument appears to work in the other direction: that there are reasons to believe that memory is chronologically organized, and therefore perhaps ‘when’ judgements are based on the output of specialized temporal encoding mechanisms. At the heart of Brown and Chater’s argument is a mathematical model that assumes that the probability of remembering an event is related to its ‘temporal distinctiveness’ (see Ch. 3 below for more detail of their temporal distinctiveness model). In their model, the temporal distinctiveness of an event is calculated on the basis of how long ago it happened and how temporally close it was to other events. Very roughly speaking, the idea is that an event will be easy to retrieve if it occurred recently and if there were few temporally close neighbouring events.

The extent to which Brown and Chater’s position conflicts with that of Friedman depends upon whether it is assumed that the principle of temporal distinctiveness is psychologically instantiated by means of a specialized temporal encoding mechanism. It is at least conceivable that this principle holds true because of emergent properties of memory storage and consolidation processes, rather than because memories are associated with temporal codes. If this were correct, then there may be a weak sense in which memory might be described as chronologically organized which does not hinge on establishing the existence of

specialized temporal encoding mechanisms. In fact, however, Brown and Chater have in mind a stronger claim. They do describe the underlying psychological mechanisms governing memory retrievability as specialized temporal mechanisms (Brown, Preece, and Hulme, 2000; see also Boucher's Ch. 4 below). And part of their story is that it is precisely these mechanisms which are also sometimes used in making 'when' judgements.

Episodic memory

As we have outlined, several chapters in the volume discuss the psychological processes underlying 'when' judgements. The issue of how 'when' judgements are made would seem to arise only for certain kinds of memories. For example, when we recall facts such as titles of films, details of recipes, or what the capital of China is, what we recall is not something that we could make a 'when' judgement about. By contrast, when we recollect an event from our past lives, we can always raise the question as to when that event took place (even if we are actually unable to give an accurate answer to this question). For many years, the psychologist Endel Tulving has worked on the distinction between memory for facts and recollection of events, terming the latter type of memory *episodic memory*. Tulving describes episodic memory as a distinctive psychological system dealing with memories of events as particular past occurrences, which is distinct from the system that allows us to remember facts. Central to Tulving's way of setting up the distinction is the idea that remembered facts do not exist in time in the same way as remembered events do. He describes episodic memory as essentially memory for datable occurrences (Tulving, 1983). When we are episodically remembering, the question as to when the remembered event took place always at least makes sense to us, irrespective of how, or how well, we might go on to make 'when' judgements concerning that event.

Of course, some factual memories involve events for which one can raise 'when' questions. For example, one could remember the fact that there was a civil war in America, and then ask when that war actually happened. According to Tulving, the type of 'when' questions that one can raise about episodic memories are quite different in character to those that one raises about such factual memories. In characterizing this type of memory, Tulving quotes William James, and points out that an episodic memory 'requires more than the mere dating of a fact in the past. It must be dated in my past. In other words, I must think that I directly experienced its occurrence' (James, 1890: 650). Exactly what this requirement comes to is a question that is discussed by a number of contributors to this volume. The central claim which they share with Tulving, however, is that episodic memory is essentially memory for events that were 'personally experienced' (Tulving, 1972: 387) and thus occurred in one's personal past.

Tulving's description leads us on to a second sense in which episodic memory seems to lead to a special type of 'when' question. There is also a difference between judging 'when' an event normally happens, in the sense of remembering

at what time of the day it usually occurs, and judging ‘when’ a past event happened. The latter type of ‘when’ judgement seems to involve thinking of an event as having a specific, unique temporal location in the past, whereas the former does not. Even when we are remembering a past event that may have repeated many times (for example, holidays to the same destination), we can still think of each individual occurrence of the past event as separate and distinct, and as having a unique temporal location. It is in this sense that episodically remembering seems to involve thought about particular past times (Campbell, 1994). Remembering what usually happens at a given time does involve some type of temporal competence, but episodic memory, as Tulving puts it, ‘is the only form of memory that, at the time of retrieval, is oriented towards the past’ (Tulving and Markowitsch, 1998). That is to say, episodic remembering essentially involves ‘thinking back to’ (ibid.) the time when the remembered event was experienced, in a way which is not the case for other forms of making use of previously acquired information and knowledge.

The distinction Tulving draws between episodic memory and memory for facts shares much with distinctions found in the philosophical literature, where what is sometimes called ‘direct’, ‘personal’, or ‘experiential’ memory is contrasted with ‘factual memory’ or ‘remembering information’ (cf. e.g. Ayer, 1956; Malcolm, 1963; Evans, 1982). Philosophers’ starting point, in this context, has usually been the observation that we find it natural to distinguish between two sorts of memory ascription. In our use of the term ‘remember’ we typically distinguish between instances in which we would say that someone remembers that something is the case and instances in which we would say that she remembers a certain past event. One way of understanding Tulving’s work is by saying that he wants to provide psychological grounds for this distinction, which philosophers have tried to analyse in terms of its epistemological and phenomenological significance. In what follows, we draw on material by psychologists and philosophers represented in this volume to discuss in more detail the specific ways in which temporal representation and temporal understanding might be involved in thinking back to particular events we have personally experienced.

TEMPORAL REPRESENTATION

At one point in his contribution to this volume (Ch. 13), Christopher Peacocke asks the following question. What is the difference between, on the one hand, being merely responsive to the temporal interval which has elapsed since a particular event occurred and, on the other hand, assigning to that event a position in one’s history, and, correlatively, in the history of the world? When waiting in front of a familiar traffic light which had just turned red as we approached it, we may have a certain expectation as to when it will turn green again and ready ourselves to accelerate again just before it actually does so. Arguably, however,

being thus sensitive to the typical length of the red phase of the traffic light is something quite different from recollecting the event of it turning red as a particular episode that just happened. What this example brings out is that episodically remembering a particular event seems to require the ability to think of this event as part of a sequence of events that make up, as Peacocke calls it, the history of the world. Several of the chapters in this volume attempt to spell out in detail some of the abilities that go into thinking about events in this way.

An echo of Peacocke's question can, for instance, be found in Teresa McCormack's contribution (Ch. 11) when she raises the empirical issue as to whether animals can be said to possess episodic memories. McCormack discusses at length an experiment in which it was shown that jays did not tend to search for worms they had cached if several days had elapsed since they had cached them, whereas they did search for the worms if the caching had taken place only a few hours before (see Clayton and Dickinson, 1998). According to McCormack's interpretation, this study shows that the birds were in some way sensitive to the length of the interval that had elapsed since the worms had been cached. This is important for the birds as the length of this interval affects whether the worms are still edible. Yet, for McCormack, demonstrating such a sensitivity to elapsed intervals falls short of demonstrating something equivalent to the human capacity to recall particular past events.

John Campbell has introduced a terminological distinction that might be used to capture the difference both Peacocke and McCormack are getting at. Drawing on Gibson's notion of an affordance, Campbell (forthcoming) describes a primitive level of engagement with the world that simply consists in the knowledge of affordances. Affordances, roughly, are behavioural options the environment offers us. Thus, for instance, a physical object may provide us with a variety of opportunities for moving around it, picking it up, putting something else on top, etc., in virtue of the shape and location it has. Yet, what Campbell argues is that it would be wrong to think of our ordinary perceptual experience of the object as providing us merely with knowledge of affordances in this sense. Instead, he says, we should think of perception as providing us with knowledge of the grounds of these affordances. Thus, for instance, in as far as the object's shape and location are themselves things we can be said to perceive when we look at the object, we can be said to be aware, in experience, of the reasons why various courses of action are open to us.

In the example we have just used to illustrate Campbell's distinction, the grounds of affordances are spatial. However, the examples we have mentioned in connection with the questions raised by Peacocke and McCormack seem to indicate that there are also affordances with what we might call temporal grounds. That is to say, behavioural options are sometimes also a matter of the amount of time that has elapsed since a certain event happened, given the amount of time certain kinds of processes normally take. Adopting Campbell's terminology, we might thus also speak of a knowledge of certain affordances when an individual shows a sensitivity to such temporal features. Yet, still following Campbell, we

also have to distinguish knowledge of such affordances from knowledge of the grounds of such affordances.

Consider again the case of a driver who puts his foot on the accelerator just before the traffic light turns green again. The reasons why it is now the right time for him to put his foot back on the accelerator (i.e. the grounds of the affordance he responds to) are that the red phase of the traffic light normally lasts a certain amount of time, and that roughly this amount of time has now elapsed since the traffic light turned red. Those reasons would be apparent to him if he recalled previous occasions on which he has stood in front of that traffic light and also recalled the traffic light switching to red a certain amount of time ago. Yet, intuitively, something much less sophisticated is typically going on when we usually show this kind of behaviour. What is apparent to the driver might simply be that this is the suitable moment for putting the foot back on the accelerator (i.e. an affordance), and he may be quite oblivious to the question of why it is the right time to do so. If this is the right way of characterizing our own case, however, there is indeed a question as to whether the studies on animals discussed by McCormack should be seen as demonstrating the presence of episodic memory capacities in those animals. Here, perhaps the best way of describing the situation is that, after a certain time has elapsed, the opportunity to recover the buried worms no longer presents itself to the birds as an affordance. However, they might simply be sensitive to the interval that has elapsed since they buried the worms, and the interval of time it takes for worms to decay, in such a way that, after a certain point in time, it no longer occurs to them to look for those worms. We would only be justified in ascribing episodic memories to them if we could also say that they know the reasons why there is no longer any point in looking for those worms, since that would seem to require that they can remember the particular event of burying them.

There are a number of facets to this connection between episodic memory and the capacity to engage in certain forms of reasoning, which raise important questions about the requirements for possession of episodic memories. Some of the chapters in the volume can be seen as addressing such questions as they arise at various different levels of explanation. In what follows, we wish to discuss particularly questions relating to the temporal mechanisms, the types of temporal representation, and the temporal reasoning and understanding involved in episodic memory.

Episodes, phases, and intervals

The claim that there is a specific link between episodic memory and the representation of temporal information has entered the memory literature primarily through the idea that episodic remembering involves the retrieval of information about the context in which the remembered event was encountered (see McCormack Ch. 11, this volume, for a discussion of the notion of contextual information). Tulving's original definition of episodic memory, for instance,

described it, among other things, as memory for events along with information about their temporal and spatial context. And the idea that episodic memory involves remembering specifically temporal contextual information can also be found in some contributions to this volume. One of the aims of Brown and Chater's chapter is to argue that the fundamental dimension of organization in episodic memory is a temporal one, and Boucher develops the claim that episodic memory deficits in autism can be explained in terms of impairments in temporal processing.

Very loosely speaking, something like the following seems to underpin some of the research in this area: episodic memories are memories for events which are associated with, linked to, or contain some kind of representation of the point in time at which the event occurred. There are various ways in which this claim could be assessed. For example, much hinges on the nature of the temporal information assumed to be involved, and the extent to which we want to say that episodic memory itself involves the encoding and storage of such temporal information. As we discussed above, several chapters address the issue of whether it is correct to describe event memories as routinely associated with temporal codes. For present purposes, the question is whether such an account of episodic memory could go some way towards describing what is interesting and distinctive about this type of memory.

A useful question to ask in this context is whether such an account might provide criteria for research on animal memory, which has been concerned with the thorny issue of attribution of episodic memory on the basis of non-verbal behaviour. In the animal literature, researchers have typically been concerned with explaining how animals seem to be able to anticipate the availability of food at certain times. The question is whether the theories developed in this context can also help us address questions regarding temporal representation in episodic memory.

A number of animals have been shown to be sensitive to the fact that some events recur at fixed times of the day (Church, 1984; Gallistel, 1990). For example, if food is provided in a location at a certain time each day, bees will tend to return to that location at the correct time (Kolterman, 1974). This sensitivity is known as *phase sense*. It is normally assumed that this sort of animal behaviour is based on the output of one or more oscillators—internal signals that repeat at regular intervals. The occurrence of food is thought to become associated with a particular state of the oscillator or oscillators, and when this state reoccurs it will trigger the appropriate behaviour. By using such mechanisms, animals can adjust to naturally occurring or experimentally contrived temporal regularities in the world.

Animals are sensitive not just to fixed times of the day at which some events recur, but also to the amount of time separating two events. This second type of timing is contrasted with phase sense, and is known as *interval sense*. In a typical experimental study, a signal such as a noise is used to indicate the start of an interval, and the animal must learn that food is available after a certain amount of

time has elapsed (Gibbon, 1977; Killeen, 1975). Interval timing is discussed in detail in the chapters by Wearden and by Block and Zakay (Chs. 1 and 2). On the face of it, interval timing would appear to involve something like the ability to measure intervals of time and to store representations of such intervals in memory.

The chapter by Wearden in the present volume gives a detailed description of current psychological theorizing regarding such internal mechanisms. As applied to foraging behaviour of the type just described, the basic idea is this. Descriptions of the underlying mechanisms are typically in terms of oscillators which repeat their signals at regular intervals and pacemakers which produce a certain number of pulses per second. When the oscillator signal is in a certain state, or when a certain number of pulses have been accumulated, particular types of behaviour are triggered.

As sophisticated as behaviour based on such kinds of internal mechanism may possibly be, there are still powerful reasons to distinguish between the temporal representation involved in such behaviour and that involved in episodic memory. These are to do with the type of temporal information such timers may be said to provide (an issue developed in more detail in Campbell, 1994). Simply going on the description of the workings of such mechanisms we have just given, there seems to be nothing that would allow the animal to distinguish between events happening at different times, but corresponding to the same state of the internal timer. Indeed, the functioning of these mechanisms relies on the timer's being in the same state on what we would regard as quite different occasions, such as a certain time of day on different days, or each time a certain interval has elapsed since a certain type of event happened. On the face of it, therefore, explaining an animal's behaviour in terms of its possession of such timers is something quite different from explaining behaviour in terms of the possession of episodic memories, that is, memories of particular occasions on which a certain type of event happened (see also McCormack and Hoerl, 1999, where a similar type of point is made regarding children's early timing and sequencing abilities).

Episodic memory and temporal information

We now turn to considering whether the way time is represented in episodic memory can be explained in terms of the workings of particular kinds of temporal encoding mechanisms. Can the point made in the previous sub-section be met by introducing the idea of a temporal coding process which can, at least in principle, specify the temporal location of each event uniquely? (Brown and Chater, and Boucher, this volume, seem to assume that such a process potentially exists.) For example, there may be oscillator-based mechanisms which provide an output that is different for each point in time across the lifespan of the individual (see O'Keefe's, 1994, description of how this could be achieved without requiring oscillators with very long periods). There are several reasons, however, why one might cast doubt on the idea of such a mechanism, or at least argue that appeal to

such a mechanism is not sufficient to explain what is interesting and distinctive about episodic memory.

One interesting issue raised by the suggestion that there might be mechanisms providing a unique signal for each point in time across one's lifespan is what type of use such information could be put to (see Friedman, 1993, and present volume). Recall that the contexts in which theorists typically appeal to the notion of an internal timer are contexts in which such timers serve to adjust the individual's behaviour to the regular recurrence of a certain type of event at a certain phase within a cycle, or a certain amount of time after another type of event has happened. In these contexts, the function of the timer is tied to the fact that it always provides the same signal on these different occurrences. Thus, the function of a mechanism that always provides different signals at different points in time, and never the same signal twice, would have to be explained in other terms (though see Brown and Chater's chapter for an attempt to provide such a function by drawing on work within the rational analysis framework).

Another question we can ask is why introducing the idea of mechanisms which assign each experienced event a unique temporal code should be the right move to make at this point. The idea of such a temporal coding process may only be one way of making good the intuitive idea that episodic memory involves thinking back to a particular event. An alternative possibility is that episodic memory, in as far as it involves keeping track of the time of events at all, exploits the same mechanisms as those involved in phase and interval timing, but that these mechanisms are put to work in a different way.

This possibility has been raised by Bill Brewer (1994), who points out a potential analogy between memory and perception. His argument is that the temporal information provided by internal mechanisms of the type we have been talking about might be compared with the egocentric spatial information provided by visual perception. We normally take it that visual perception allows us to pick out a particular object in virtue of its egocentric location, even though it is conceivable that we could be faced with an identical scene in another place in which a numerically different object occupied the same egocentric location. Thus, it would seem that our ability to represent the particular object we are faced with is simply a matter of our being in a context in which it is that object we are faced with, rather than a matter of assigning a unique spatial address to that object which would distinguish it from the qualitatively identical object we would be faced with in the counterfactual scenario. If this is true, however, it is difficult to see why our representing a particular event can't equally simply be a matter of being in a context where it is this particular event we have kept track of by means of an internal timing mechanism. The idea would be that, in as far as episodic memory relies on such mechanisms, we use exactly the same timing mechanisms in exactly the same way on different occasions to keep track of numerically different events.

If Brewer is right, we should not necessarily seek an explanation in terms of different timing mechanisms for the difference between an individual's merely

being sensitive, say, to the time that has elapsed since a certain event happened, on the one hand, and his capacity to remember that event episodically, on the other. In fact, it is possible that the performance, in each case, relies on the same mechanisms, and that the difference lies in the way any information yielded by these mechanisms can be exploited by the individual. However, if this is true, we should be looking at other cognitive capacities necessary for episodic memory to explain the distinctive nature of episodic memory as a faculty for representing particular past events.

Temporal decentring

A number of contributions to this volume put centre stage questions as to the relation between a subject's past experience of an event and her present ability to think back to that particular event. For instance, an important set of questions in this context concerns the nature and significance of the causal link between the subject's past experience of an event and her present ability to make judgements about that event (cf. e.g. Chs. 8 and 7 below, by Dokic and Mayes). It may be argued, however, that purely causal notions do not suffice to explain the way in which our thinking is connected with the past in episodic remembering. To see what the problem here is, we can turn to an example used by John Campbell (Ch. 6, this volume). He considers the difference between a person remembering a past event and a person thinking, for instance, about the arrival of a cup of coffee as she orders it in a cafe. There may be very little difference between the kinds of information the person can give about that future event and the kinds of information we usually have about past events. Thus, she may know what the cup will look like and roughly when and where it will arrive. Furthermore, there is a causal connection between her ordering the coffee and its arrival, just as there is a causal connection between our memories of past events and our present recollection of them. Yet, intuitively, what this person knows about the arrival of the coffee falls short of the kind of knowledge we have when we remember a particular past event.

A central claim that can be found in Campbell's own contribution to this volume is that when we make judgements about past events on the basis of remembering them, our grasp of the meaning of these judgements possesses a diachronic aspect. That is to say, such memory judgements should be seen as being based on a kind of *temporally extended inference*, taking us from a judgement made at the time of witnessing the event to the judgement made at the time of recollecting the event, where the truth of the latter is implied by the truth of the former. (Though Campbell's model does allow for cases in which the memory judgement concerns aspects of our past experience which we did not think about at the time, as long as they would have provided grounds for making the relevant judgements then; see also Dokic, this volume (Ch. 8), and Martin, 1992.) If memory judgements do indeed involve something like a temporally extended inference in this sense, this might explain why they differ from judgements we can make about the future.

To bring out this point, Campbell focuses in particular on the kinds of demonstrative reference which might be involved in making judgements about the future and the past, respectively. He argues that in as far as we can use a demonstrative to refer to an object that will be encountered in the future (such as ‘that cup’), it is only by fixing descriptive conditions that something must meet in order to be that object (e.g. ‘the cup that will arrive at my table as a result of the order I have placed’). In this sense, grasp of the meaning of such demonstratives is underpinned by synchronic forms of reasoning, since it can only rely on the information we possess at the time of making the judgements in which they figure. By contrast, Campbell says, demonstrative reference based on an episodic memory of the circumstances in which a particular object was encountered does not rely on fixing a descriptive condition. Rather, it exploits a logical link between the present memory judgement and a past perceptual demonstrative judgement. And, as such, memory demonstratives can be said to be grounded in the same experience as that which provided grounds for perceptual demonstratives in the past.

The idea of a logical link between past and present is also a main theme of David Cockburn’s contribution to this volume (Ch. 15). Cockburn’s approach is to consider epistemological questions as to what is involved in our grasp of the past tense in the wider context of questions concerning the significance past events have in our lives. His strong claim is that a person’s grasp of the past tense cannot be divorced from her grasp of the, broadly ethical, appropriateness of certain feelings and actions in the present. A person who consistently refused to see past events as providing her with reasons to be, say, ashamed, hurt, or proud could not be said to ‘understand what happened’ in the sense we normally assign to that phrase.

In this context, Cockburn also draws a distinction between thinking of one’s current state as the present trace of a past event and thinking of it as the knowledge of a past event. For instance, to think of the shame with which one remembers a particular past deed merely as the present trace of a past event may involve thinking of it as an unpleasant condition which we would better be out of. Yet to think of it in this way, for Cockburn, falls short of a recognition of what has happened. Quite on the contrary, it may be seen as a method of refusing to acknowledge a certain understanding of what has happened. By contrast, to think of one’s shame as an expression of one’s grasp of what one has done requires seeing a logical, rather than a purely causal, connection between what is happening now and what has happened. It involves seeing the past as providing us with reasons to feel or do certain things now. In other words, what it is to think of one’s memory in this sense, in as far as it involves a grasp of the appropriateness, now, of certain feelings and actions, cannot be spelled out without essential reference to the past.

If Campbell and Cockburn are right, then, it would seem that a theory of episodic memory must recognize the obtaining of a rational connection, through memory, between a subject’s current mental state and her earlier experiences. Yet, as Cockburn himself draws out, we can also, at least sometimes, think of that

connection in purely causal terms, conceiving of our memories as mere effects or traces of past events, in order to distance ourselves from any perceived demands the past may make on us (say, to avoid being prejudiced by our personal experience or to counter the forces of habit). It therefore seems appropriate to ask what constitutes the difference, for the subject, between thinking of a present mental state as the effect of a certain past event and seeing that past event as a reason for saying, doing, or feeling certain things.

Part of an answer to this question may be found in Campbell's contribution. For him, the ability to make what he calls 'temporally extended inferences', that is, to exploit a rational connection with the past in making memory judgements, is closely tied up with a capacity to engage in a certain form of imaginative exercise. He describes what he calls a certain form of 'decentring'. In decentring one adopts the pretence that it is now the time when the remembered event happened and, in doing so, simulates the making of certain perceptual judgements. To engage in such decentring requires some ability to keep track of the temporal or causal relation between the present time and the past time one reaches out to in one's imagination. Crucially, however, within the context of the imaginative project, judgements are made in the present tense. In other words, the judgements made within the context of the imaginative project exploit the same kind of understanding as goes into making perceptual judgements in the present. What Campbell argues, specifically, is that a subject's grasp of memory demonstratives referring to particulars encountered in the past rests on her ability to engage in this form of decentring. The subject's knowledge of the reference of such a demonstrative is provided by her ability to decentre to a past time and, in doing so, to conceive of it as the reference of a past perceptual demonstrative.

One way of understanding the point Campbell makes is by saying that our ability to make judgements about the past, on the basis of episodic memory, rests on the capacity to bring past events to mind by imaginatively adopting the temporal perspective of the time at which they happened. As such, ascribing an episodic memory to someone goes beyond ascribing to them a mere disposition to have certain beliefs, due to certain experiences they have had. Also, it is not the same as saying that they possess a theoretical understanding of the causal connections between their past experiences and their current mental state. Rather, as Campbell argues, the link between past and present is apparent to the subject through the capacity for decentring, in as far as it makes apparent a link between past perceptual judgements and present memory judgements.

The notion of a temporal point of view

There is an interesting question as to whether Campbell's theory, which puts a particular kind of imaginative ability at the core of our ability to make memory judgements, is compatible, for instance, with the kind of theory put forward by Martin (Ch. 10, this volume), which explicitly contrasts episodic memory and imagination. However, what Campbell says about memory also connects up with

traditional concerns about temporal reasoning and the nature of time. The link between past perceptual judgements and present memory judgements which Campbell speaks of implies, at least on the face of it, a certain form of commensurability between judgements made at different times denied in some current accounts of the truth-conditions of tensed representations. Central to these accounts is the claim that tense is real, which is clarified and discussed in detail in A. W. Moore's contribution to this volume (Ch. 14). According to Moore, claiming that tense is real amounts to saying that there is something in reality that corresponds in a special way to the tense of any given representation. In other words, a tensed representation represents reality from a temporal point of view in such a way that the truth-conditions of that representation can only be given from that very same temporal point of view.

Moore traces back the motivation behind the claim that tense is real to a picture of reality as fractured into different worlds. On this picture, he says, each temporal point of view carries its own world with it. Consider, for instance, an utterance of 'It is raining today', made yesterday, and an utterance of 'It was raining yesterday', made today. Today, we might say of yesterday's utterance of 'It is raining today' that it was true if and only if it was raining yesterday. But, according to the view that tense is real, the fact we thereby express is not the fact that made this utterance true (if indeed it was true). In as far as the fact that made this utterance true belonged, so to speak, to the world of yesterday, it can only be expressed from the temporal point of view of yesterday. Conversely, we can express the fact that makes today's utterance of 'It was raining yesterday' true by saying that it was raining yesterday. Yet this fact is a fact that belongs to today's world and, as such, we could not have expressed it from the temporal point of view of yesterday.

The question Moore explores is whether we have any reasons to reject such a picture of reality as fragmented into different worlds, constituted by facts which can only be expressed from the corresponding temporal point of view. In particular, he looks at Kant's philosophy as a possible source for arguments which would show that temporal reality can't be thus fragmented but must be unified. What he says, following Kant (1929), is that, ultimately, there are no such arguments. Or rather, if we think that temporal reality can't be fragmented but must be unified, the source of this conviction cannot stem from any more basic principles that we can adduce to, but must stem from a self-conscious reflection on the way we think about the world and our place within it. Time, that is, is *given* to us as having the requisite unity, which is reflected in the nature of the judgements we in fact make.

A central element of Kant's philosophy which Moore appeals to in clarifying the idea that time, as it is given to us, is unified is the idea that time is given to us in a way that justifies our applying the same categories to what is present and what is not present. Interestingly, one example that Moore mentions in this context is our ability to apply the category of causation across different times. Recall that, in the previous section, we asked whether purely causal notions

suffice to explain the way in which our thinking is connected with the past in episodic memory. What Moore argues, in effect, is that in order to judge, say, a present event to be the effect of a past event, we must already conceive of both events as belonging to the same categorical order, and we must think of the relation between them as obtaining independently of our particular point of view on one of them as past and the other as present (points also echoed in Peacocke's chapter). That is to say, we must represent them as occupying different positions within a single world on which we have different temporal points of view at different times. As such, making the required causal judgement, for instance, requires a certain understanding of what is involved in using the past tense. This understanding cannot be explained without an appeal to our ability to appreciate the links that obtain between judgements made from our current temporal point of view and judgements made from other points of view in time, in virtue of the fact that they are all points of view onto the same world.

Memory, temporal thought, and self-consciousness

Some of the most intriguing questions with which the chapters in this volume leave us concern the connections between memory and temporal thought, on the one hand, and self-consciousness, on the other. Consider again, for instance, how Peacocke describes full-blown use of the past tense as a matter of assigning events positions in one's own history and, correlatively, in the history of the world. His words suggest that use of the past tense, in this sense, is underpinned by a combination of capacities for objective thought and capacities for first-person thought.

A crucial element in Peacocke's theory is the claim that a thinker's understanding of sentences in the past tense consists in part in her having information about a certain link that obtains between thoughts entertained or utterances made at different times. We have already seen a related idea at work in Moore's account when he says that our understanding of the past tense involves the ability to apply the same categories in our thinking about the past as we do in our thinking about the present. Peacocke's account tries to make sense of this idea by talking about a 'property-identity link' implicit knowledge of which informs our understanding of past-tense statements. For instance, he contends that a thinker's understanding of the utterance 'Yesterday it rained' consists in part in her having the information that that utterance is true just in case yesterday had the same property as today has to have for the utterance 'It is now raining' to be true when evaluated with respect to today.

Within Peacocke's theory, the claim that our understanding of the past tense is underpinned by implicit knowledge of such a property-identity link forms a centrepiece in an attempt at spelling out a particular brand of realism about the past. Realism about the past, in general, is the doctrine that there can be past-tense statements which are true, but unknowably so. What Peacocke argues, in effect, is that a subject who is in possession of the information given in the

property–identity link can conceive of the truth-conditions of past-tense thoughts or utterances in a way that doesn't require her to know whether those thoughts or utterances are true or not. Furthermore, the property–identity link makes intelligible how there can be past-tense utterances or thoughts which are true even though there are no states of affairs obtaining now from which their truth could be inferred.

The particular task Peacocke sets himself is to show how we can square the idea that our understanding of the past tense can be realist, in the sense that it allows for the possibility of such unknowable truths about the past, with the idea that it also essentially rests upon a capacity for learning knowable truths about the past. Arguably, we can only credit a subject with an understanding of the past tense (including implicit knowledge of the property–identity link) if there are at least some instances in which that subject can recognize that the truth-conditions of past-tense utterances or thoughts obtain. More specifically, the question Peacocke tries to address is how memory can make available modes of thinking about past events in such a way that the events thus thought of could have happened without our knowing about them, then or now. And it is here that the idea of a connection between objective thought and first-person thought might be seen to have a crucial role to play.

The question, in short, is how the subject can make sense of the possibility that past-tense utterances or thoughts she knows to be true might be true without her knowledge. One possible suggestion (adapted from a similar suggestion made by Evans, 1982, about perceptual knowledge) runs as follows. The subject can make sense of the possibility of truths about the past she doesn't know about only if she can appreciate what makes certain truths about the past knowable. Put differently, the subject has to grasp that there are further conditions to be met, apart from things having been a certain way in the past, before she can know that they have been that way. Crucially, this gives us one way of understanding the connection Peacocke draws between the subject's ability to assign a remembered event a position in the history of the world and assigning it a place in one's own history (see also Hoerl, Ch. 12, this volume). Had the subject's own history been different, the very events she now remembers could have happened without her knowing that they did. Thus, the suggestions runs, it is only in as far as the subject can conceive of the contents of her memory as the joint upshot of her own history as well as the history of the world that she can make sense of how the truths she actually knows about could be beyond her ken.

Saying that, however, leaves wide open the question as to the specific kinds of reasoning about herself—the kind of self-conscious reasoning—a thinker needs to be capable of if she is to have the notion of her own history that is at issue here. And the views put forward in other chapters in this volume suggest that there are a number of possible answers to this question.

Perhaps the most central issue is whether possession of such a notion of one's own history requires what is typically called a 'theory of mind', that is, an understanding of the representational nature of mental states and of the causal relations

in which they stand to the world and to each other. For instance, on a metarepresentational view, such as that proposed by Perner (1991) and further developed by Dokic (Ch. 8, this volume), it would seem that a subject's ability to make memory-judgements about particular past events depends on her capacity to think of her present mental state as the effect of an earlier experience of those events. If this is true, it suggests that an essential part of having the notion of one's own history, as it enters into such judgements, must be the ability to think of oneself as the bearer of certain representational states in the past. Therefore, on this account, the crucial issue would be to clarify what it takes to have access to one's own mind in this way.

Other contributors, however, suggest that it is not so much the thought of one's own mental states in the past that our memory-judgements are based upon, but our ability to evoke those mental states in the form of a memory image. In having the memory image we re-encounter, so to speak, the world from a point of view we once had. Admittedly, this leaves the question as to what it takes for the subject to be able to correlate her past point of view with her present one, as two different points of view on the same reality (this point is discussed below with reference to the chapters by Conway and Martin). But an explanation of this ability might not need to invoke a capacity to conceptualize one's own mental states as such. It could be more simply, for instance, that the subject must appreciate that what she knows about the past is determined by where she was at different times, that is, her own spatiotemporal location. In this sense, having a notion of one's history would be a matter of thinking of oneself as a physical object located in different places at different times, and the question would be what it takes for someone to think of herself as such an object in the world (cf. Povinelli, Landau, and Perilloux, 1996).

MEMORY AND EXPERIENCE

In one way or the other, the theories we have discussed all put special emphasis on the ability to remember particular past events that were personally experienced. According to these theories, our ability to represent and think about events in time in general is intimately connected with the ability to bring before the mind or think back to particular things which we have done or which happened to us. Yet what exactly is involved in this special kind of memory ability? In the remainder of this introduction, we wish to discuss the idea that considerations about the phenomenology of memory may hold the key to the question as to what it is to remember particular, personally experienced events. This idea can be found articulated in different ways in several of the contributions to this volume.

When Tulving first introduced the term 'episodic memory' to describe our ability to remember particular, personally experienced events, the idea of a difference between episodic memory and other types of memory had the status of a 'pretheoretical position' (Tulving, 1972: 384), based primarily on distinctions

between different types of memory tasks. He writes: 'Nothing very much is lost at this stage of our deliberations if the reality of the separation . . . lies solely in the experimenter's and the theorist's, and not the subject's mind' (ibid.). However, the situation has changed significantly since then, and much current work on episodic memory can be seen as an attempt at finding more substantive grounds for talk about episodic memory as a distinct system.

A significant amount of work in this area has gone into pointing out ways in which episodic memory can fail. Dokic (Ch. 8, this volume), for instance, discusses at length a passage in which Goethe professes that there are certain events in his childhood which he probably only knows about because he was told by others. What Goethe's example brings home is that there is a sense in which we may forget events we have experienced even though we may still know that they happened from other sources, such as the word of others. Conversely, there are cases in which a person's knowledge goes back to the experience of a particular event, but in which information about the occurrence of that event has not been retained. Here we may think, for instance, about Claparède's famous experiment with an amnesic patient (Claparède, 1911, discussed in Kihlstrom, 1995; see also Campbell, Ch. 6, this volume). After a handshake during which he had pricked her with a pin that he had concealed in his own hand, she refused to shake hands with him again. Yet, asked why she was suddenly reluctant, she would only say things like 'Sometimes pins are hidden in people's hands' and seemed to have forgotten all about the actual incident.

The notion of episodic memory tries to capture a combination of two aspects, each of which is lacking in one of the examples just given. They correspond to two ways of understanding the idea that episodic memory is essentially memory for personally experienced events. Ascriptions of episodic memory signify that a person is able to make judgements about a particular sort of thing, that is, a specific event in his own life; at the same time, such ascriptions also indicate what puts the person into a position to make such judgements, namely his own experience of that event.

It can be argued, however, that there is also another respect in which episodic memory differs from the kinds of retention of information involved in the examples given above. A dominant theme in current research on episodic memory is that there is a specific kind of phenomenology to episodic recall as an aspect of the subject's conscious awareness. Thus, it has been argued that there really is a distinction 'in the subject's own mind' in as far as there is a difference between what it is like to recollect a particular, personally experienced event as opposed to retrieving other kinds of information or knowledge.

The conscious experience of recall (or 'recollective experience', as he puts it) has also become a major focus of Tulving's work. He writes that 'recollective experience should be the ultimate object of interest [in theories of episodic memory], the central aspect of remembering that is to be explained and explored' (Tulving, 1983: 184; see also Wheeler, Stuss, and Tulving, 1997). However, such claims are by no means uncontroversial (cf. Cockburn, Ch. 15, this volume). The

idea that appeals to the phenomenology of recall can help to explain what is important and distinctive about our ability to remember particular, personally experienced events has come under attack from at least two, quite different, quarters—one within psychology and the other within philosophy.

One challenge to this idea has come from methodological considerations about the study of memory capacities in animals and infants. It has been argued that recent theories of episodic memory, which place special emphasis on the conscious experience of recall, make the question as to whether non- or pre-verbal populations possess episodic memories seemingly unanswerable. Some researchers have therefore preferred to say that all they are after is establishing whether animals or infants possess ‘episodic-like’ memories (cf. Griffiths, Dickinson, and Clayton, 1999; Meltzoff, 1990), implying that the behavioural measures they use cannot test whether there is an equivalent in animals or infants to the conscious experience of recall in adult humans. Often, however, such remarks also indicate a certain scepticism as to whether the concept of episodic memory can actually serve to single out a psychologically useful category, if claims about the representational abilities involved in episodic memory and its cognitive function cannot be considered separately from claims about the phenomenology of recall.

The idea that considerations about the phenomenology of episodic recall are central to giving an account of this kind of memory has also been challenged on epistemological grounds. Specifically, what theorists have been arguing against is a picture which assimilates our knowledge of events we have experienced ourselves to knowledge that is derived from the observation of certain features in our environment which we interpret as causal traces or effects of past events. Instead, it has been argued that memory delivers a peculiarly direct, non-inferential form of knowledge about the past. Indeed, without this form of knowledge, knowledge of the past by inference would never get off the ground, since we would have no conception of the kind of circumstance to infer to. It is in this context that theorists have also questioned the relevance of conscious experiences in giving an account of memory (Wittgenstein, 1958, 1980; Anscombe, 1976; Ayer, 1956). Specifically, they have argued that an appeal to such experiences cannot explain how there can be such direct, non-inferential knowledge of the past, since these experiences themselves stand in need of interpretation before they can tell us anything about the past. Rather, the argument goes, it is because we already know about the past that we can see such experiences as having anything to do with the fact that we remember.

Neither of the two lines of thought we have just described denies that we typically have certain conscious experiences when we remember particular past events. Instead, what they call into question is the significance we should assign to these experiences in ascribing episodic memory to others (including, perhaps, animals and children) and to ourselves. In short, they suggest that any conscious experiences we have when we remember past events are only contingently associated with our ability to make judgements about these events.

Several of the chapters in this volume can be seen as exploring an alternative conception of the relation between episodic memory and conscious experience, which is linked to the claim that episodic memory is essentially memory for personally experienced events. We have already said that this claim combines two aspects: that a person is able to make judgements about a specific event in his own life; and that he is in a position to make such judgements because he has experienced that event himself. However, this claim can also be understood to indicate that there is a specific connection between these two aspects, in the sense that there is a particular kind of judgement a subject can make about past events which he can only make if he has experienced these events himself. If this is true, it might give us a particular way of understanding the role of conscious experience in episodic memory. Basically, the idea would be that there is a certain experience which the subject would not have had he not experienced the event in question. And it is his having that experience which explains the sense in which he is able to make particular kinds of judgements about that event. Thus, an appeal to the phenomenology of episodic memory can serve to make clear how these two aspects of episodic memory are connected. In other words, talk about an 'experience of recall' can be seen as an attempt to capture the idea that someone who episodically remembers a certain event has available to him a particular way of thinking about that event, together with the idea that this way of thinking about that event would not be available to him had he not experienced it himself.

In what follows, we wish to discuss three concrete ways in which this general line of thought may be articulated. They correspond to three broad suggestions about the phenomenology of episodic remembering which can be extracted from contributions to this volume. Very simplified, the suggestions go as follows: (a) Episodic remembering involves an awareness that one's present mental state has been caused by one's own personal experience of the remembered event; (b) Episodic remembering involves having before the mind a memory image of the remembered event; (c) Episodic remembering involves having a temporal impression of the length of the interval that has elapsed since the remembered event occurred. We shall consider these three suggestions in turn.

Recollection and awareness of a causal link with the past

Both Jérôme Dokic and Andrew Mayes, in their contributions to this volume (Chs. 8 and 7), present theories in which the causal connection between the subject's past experience of an event and her present recollection of that event is assigned a particular role in explaining the phenomenology of recollection. Dokic's argument develops from considerations about the metarepresentational theory of episodic memory, first proposed by Perner (1991). According to Perner's original proposal, episodic memory makes available two kinds of information, namely information about the world and information about our own mental states. When we episodically remember an event, we not only possess information about the event, we also possess the information that this information

was acquired perceptually. What Dokic aims to clarify is the role of this latter 'metarepresentational comment'. He notes that, as it stands, Perner's theory may make it look as though the metarepresentational comment is simply a further piece of factual information that was acquired in the original encounter with the event and is now being retrieved. Instead, what Dokic proposes is that the metarepresentational comment must be construed as a piece of information about the subject's current mental state. Thus, it cannot be said to be retrieved from memory in a similar way as a previously acquired piece of factual information. Retrieving factual information, for Dokic, means getting into much the same sort of mental state we were in when we first acquired that information. In episodic memory, by contrast, the way in which our present mental state has been caused by past experience makes a difference to what it is like to be in that mental state, in as far as we become aware of a new fact, namely that the conscious information available to us now derives from that past experience. In this sense, episodic remembering is thought to involve a special sort of conscious awareness which allows us to think of our past experience of a certain event as the cause of our present mental state, and thus to think about the event in a way in which this would not be possible had we not experienced it.

Mayes's theory shares much with that proposed by Dokic, in so far as one of Mayes's central claims is that recollection involves an awareness that the contents of one's present consciousness were encountered in specific ways in the past. Both authors also agree that this awareness cannot be explained by appeal to the retrieval of a particular kind of information that was encoded earlier. There is a difference between them, however, when it comes to the question as to what does explain this awareness. Dokic says little about this question apart from claiming that it needs to be addressed at the level of sub-personal mechanisms. Mayes, by contrast, thinks that it can be explained by appealing to a specific aspect of the subject's conscious awareness, namely in terms of the way the information comes into consciousness. The way in which information comes into consciousness is an aspect of our conscious awareness which cannot be reduced to features of the content of that information. Mayes identifies it instead as the fluency with which that information is activated. Thus, one way of understanding Mayes's proposal is that, for instance, the fact that we have acquired certain pieces of information through personal experience of an event might make a difference to the conscious experience of activating that information, since the information will be activated more fluently. If this is true, however, it implies that this conscious experience can serve as a basis for making a particular kind of judgement about the past, namely that a certain past experience is responsible for one's current mental state, and thus that one is remembering.

The theories put forward by Dokic and Mayes may give us a lead on a possible connection between our ability to recollect past events and our grasp of the kinds of temporal concepts that McTaggart talks about. One important observation made by McTaggart is that there is an intimate connection between thinking about an event as real and applying certain kinds of temporal concepts to that

event. In particular, he suggests that in order to think of an event as real, we must be capable of thinking of it as having a determinate location with respect to our own temporal perspective (see McTaggart, 1927: 16). He asks us to consider, for instance, the sequence of adventures that are narrated by Cervantes in *Don Quixote*. The adventure of the galley slaves, say, is later than the adventure of the windmills, and, in this sense, they may be said to stand in a temporal relation to each other. Yet part of the force of saying that these are not real events, but only fictional ones, lies in the fact that they cannot be judged as either past, present, or future.

Now, it is at least possible to interpret what Dokic and Mayes say as implying that recollection, in as far as it involves seeing a remembered event as the cause of our present mental state, makes manifest to us our temporal perspective on that event in McTaggart's sense. That is to say, we can judge that this event has taken place in the past because it has left certain effects on us. We can locate it not just with respect to other events we know about, but also with respect to our own temporal point of view. Moreover, because it has left this effect on us, we can also judge that this event has really happened (see Peacocke, Ch. 13, this volume). Thus, the grounds we have for judging that the event has taken place in the past are at the same time grounds for thinking of it as a feature of reality.

However, it might also be thought that the accounts put forward by Dokic and Mayes still leave open some important questions regarding the way past events are represented in episodic memory. Arguably, thinking of one's current mental state as having been caused by one's experience of an event in the past can fall short of knowing which particular event one has actually experienced. It seems to imply only that there has been an event which fulfils a certain descriptive condition, namely that one's experience of it has caused one's current mental state. Indeed, Mayes's account makes this quite explicit in as far as he also allows that retrieval from factual memory can be accompanied by increased fluency. Thus, on his account, even when we retrieve facts from memory, such as the fact that the chemical formula of table salt is NaCl, we can be aware that we acquired that fact in the past.

Clearly, on the accounts of both Mayes and Dokic, part of an explanation of the distinctive nature of episodic memory (as contrasted with factual memory) also lies in the particular kind of information that was acquired when the remembered event was first encountered. But there are different ways in which this idea might be spelled out. One idea that has been very influential is that episodic memory depends on the retention of certain kinds of contextual information. Something like this may also be what Mayes and Dokic have in mind. An alternative idea, however, is that episodic memory inherits certain experiential characteristics from the original perception of the event (see McCormack, Ch. 11, this volume). In the next section, we will look at this latter idea in the context of the theories put forward by Conway and Martin. As we will see, however, they also differ from Dokic and Mayes on the role of the causal connection between past and present in episodic memory.

The idea of a memory image

The idea that episodic remembering involves a distinctive phenomenology is also a central theme of the theories presented by Martin Conway and M. G. F. Martin in this volume (Chs. 9 and 10). However, the key to understanding this distinctive phenomenology, for both of these authors, lies in the way imagery features in episodic recollection.

Conway's starting point is a finding which has by now been well established in empirical studies. Participants in memory tests can readily distinguish between two kinds of judgements they may be asked to make (see Tulving, 1985; Gardiner, 1988). A person who has witnessed a certain event may sometimes say that they know of this event but at the same time not be prepared to say that they remember it. It has also been shown that the likelihood of participants making one judgement rather than another can be selectively influenced by task variables at encoding or retrieval (see Gardiner and Java, 1993, for review). These studies also play a large part in Mayes's theory, but Conway's interest in them is somewhat different. Roughly speaking, for Mayes, the crucial question we must ask in the light of these studies concerns the awareness we have of our present mental state that allows us to judge that it is a state of remembering. Conway's interest, by contrast, is in the kind of awareness that goes into that mental state of remembering itself, and indeed he argues that being in that mental state involves a certain disengagement from the present.

The contrast between merely retrieving facts about the past and episodically recollecting a particular past event, for Conway, can be described by saying that the former involves no apparent change in one's consciousness of the external world, whereas the latter involves, as he puts it, an encounter with fragments of a past self. In a certain sense, episodic recollection takes us back to what it was like when we first experienced the event we now remember. Conway explains this feature of the phenomenology of episodic memory in terms of the retrieval of what he calls 'phenomenological records', sensory-perceptual details that were encoded when the subject experienced the event. The point of appealing to these phenomenological records, however, is not just to say that episodic remembering makes available more information than we would otherwise have. Rather, information becomes available in a specific, imagistic, form, and it is in this sense that episodic remembering of an event can be said to be phenomenologically similar to one's perceptual experience of that event.

We can turn to Martin's discussion for a further elucidation of the idea that there is a phenomenological similarity between episodic remembering and perceptual experience, and for an extended discussion of the notion of a memory image. Martin takes issue with an assumption that is shared by many traditional accounts of what it is to have a memory image (cf. e.g. James, 1890; Russell, 1912). The assumption, as he puts it, is that the imagistic forms a neutral, common core to perception, memory, and imagination. On this assumption, the difference between perceptual images, memory images, and images that are part

of an imaginative exercise has nothing to do with the nature of those images themselves. Rather, it results from something like attaching different labels to these images. Martin, by contrast, argues that we should see the difference as one that obtains between the images as such. Specifically, both perceptual and memory images differ from images created in imagination in that the former are intrinsically particular or specific in their content, whereas the latter are not. That is to say, both perceptual images and memory images present or represent a particular object in virtue of the kinds of images they are, independently of the use to which they are put. In this, Martin argues, they differ from images created in imagination, where particularity can only arise if the subject intends to imagine a particular object he knows about.

An important question that might be raised is whether something like Conway's story about the role of phenomenological records in episodic memory can help us explain this difference. It would seem that the distinctive phenomenology of episodic memory, as Martin envisages it, has something to do with the difference between the way memory images are generated as opposed to, say, the way images might be generated on the basis of purely factual information (see also Hoerl, Ch. 12, this volume). In this context, it is interesting to note that Conway does not just say that imagery enters recall when phenomenological records are retrieved, but also that retrieval of these records can be an automatic process, given a suitable cue. This might be a way of explaining a sense in which the images generated in episodic remembering are not of our own making and, in this sense, have the particular content they have independently of our intentions or the use to which we put them.

Once we have distinguished memory images from images created in imagination on the basis of their intrinsic particularity, the question remains as to what distinguishes memory images from perceptual images, which share this feature of intrinsic particularity.

It is tempting to think that at least part of the difference between perception and memory, on the accounts put forward by Martin and Conway, must lie with the way time is represented in memory. Yet, at first blush, this is not how Martin and Conway see things. For instance, Martin's construal of the difference between episodic remembering and perceptual experience seems to have little to do with any temporal information which episodic memory might be said to make available to us. He describes the difference, instead, as that between having an experience, in perception, and representing an experience, in episodic remembering. He elucidates this difference by saying that, in this respect, episodic memory can be seen as sharing a feature with imagination, in as far as imagining is also a matter of representing an experience (only the experience represented in imagination lacks the intrinsic particularity of that represented in episodic memory). A similar idea can be seen at work in the way Conway spells out the difference between perceptual experience and episodic remembering. He argues that the contents of consciousness represented in the memory image are the result of the subject's past attention, guided by his goals at the time. As such, however, the

memory image implicitly carries with it goals which the subject does not currently have. Thus, again, we have something which might be described as a contrast between having an experience, in perception, and representing an experience, in episodic memory.

How, then, does time get into the picture, if at all? There is still a close connection, on both Martin's and Conway's account, between episodic memory and temporal representation. But this connection is little to do with any temporal information that might be carried by episodic memory; rather, it is to do with the fact that the remembering subject needs to have a grasp of time as a structure in which events can be located. Martin draws this out by pointing to the relevance his theory may be thought to have for developmental psychology. What infants must come to understand, he says, is how there can be particular events of which they have conscious knowledge, which are nevertheless not part of the present scene. The key to such an understanding, according to Martin, lies in the idea of time as a causal structure which relates earlier causes to later effects, but also a causal structure in which the infants themselves are located. In other words, we can hold separate and relate remembered events and events that form part of the present scene only if we grasp that our own temporal perspective is changing over time. And what makes this change in perspective intelligible to us is the idea that our own mental states are part of the causal nexus, such that recalled experiences are causally prior to episodes of recall.

A developmental question of the kind posed by Martin could also be raised with respect to Conway's theory. Roughly, the form it would take is this: What does it take for an infant to grasp that a memory image presents it with a view of reality, even though this view of reality is not governed by the goals that direct its perceptual attention in the present? A possible answer to this question may be sought in Conway's notion of an autobiographical knowledge base. Being able to relate the reality presented in the memory image to present reality, according to Conway, depends on the possession of general knowledge about one's own activities or about different periods in one's own life to which that memory image can be linked. This knowledge provides us with a unitary framework in which the different goals we possess at different times can be integrated, such that experiences represented in memory, which correspond to one's goals at times in the past, can be separated from and related with perceptual experiences driven by one's current goals. What bestows unity on this framework is the autobiographical nature of the knowledge involved, that is, the fact that it is all knowledge about us as a thing that persists over time. In other words, for us to possess such a unified framework requires the ability to think of ourselves as possessing an internal causal connectedness (Campbell, 1997), as something whose condition at one time affects the condition it is in later. The crux of the developmental question, then, would lie in the issue as to when children can be said to be able to think about themselves in this way.

Just as with the theories put forward by Dokic and Mayes, Conway's and Martin's theories raise important questions about the connection between our

grasp of causal notions and our grasp of temporal notions, specifically the notion of the past, involved in making memory-judgements. One issue here could be formulated as follows. There are two different reasons why one might think that an understanding of causality is linked to the ability to make memory-judgements. On the one hand, one might think that there is such a link because recollection itself is a matter of being conscious that one's present mental state was caused by a certain past experience. This, roughly, is the route taken by Dokic and Mayes. On the other hand, one might think, as Conway and Martin seem to do, that recollection is simply a matter of having before the mind an image of a particular past event. Thus, according to them, it would seem that the phenomenology of recollection can be spelled out without using causal notions. However, it is still the case, on their view, that the image can only be an image of a particular past event in as far as the subject has a general grasp of the causal conditions that make it possible for us to know about past events although they are not currently perceived.

Distance-based processes and temporal impressions

Traditionally, an important empirical impulse for theories of episodic memory has come from studies of different forms of memory-loss in patients with brain damage. In particular, studies have examined whether brain damage can lead to a selective impairment of episodic memory while leaving other types of memory intact (cf. Cermack, 1982; Hirst, 1982; Mayes, 1988; Parkin and Leng, 1993). Such studies have typically explored memory impairments in patients with damage to medial temporal lobe structures and diencephalic regions, but also frontal lobe damage (see Wheeler, Stuss, and Tulving, 1997).

Yet, as Jill Boucher points out in her contribution to this volume (Ch. 4), there is a case to be made that episodic memory impairments are also a feature that can be found in autism (see also Perner, 2000). More to the point, what her discussion makes vivid is that the study of autism might provide promising, and as yet largely unexplored, resources for studying and factoring out the different elements that are involved in thinking back to particular events we have experienced in the past.

One obvious reason why people with autism should be a very interesting population to look at in the context of the theories we have discussed is that they are often said to suffer from particular difficulties with what is typically called 'mentalizing', that is, intuitive recognition of and reasoning about their own and other people's mental states. Thus, we might expect them to have episodic memory impairments if, as several authors in this volume seem to suggest, episodic recollection of events depends on an appreciation of the causal link between one's present mental state and one's own past experiences.

Yet Boucher suggests that there is another possible reason why memory impairments might occur in autism. She observes that people with autism sometimes report feeling 'lost in time', and she presents other evidence that they

appear to have what she calls 'an impaired sense of time on the intuitive level'. These findings seem to indicate impaired processing of temporal information, and Boucher explores the possibility that such an impairment might explain some of the difficulties people with autism have in recalling past events. She hypothesizes that they feel lost in time because the internal clock or oscillator mechanisms which normally underlie intuitive temporal judgements are disrupted.

A central issue that emerges from Boucher's chapter is whether our ability to think back to particular events we have experienced depends, at least in part, on a capacity to make certain kinds of intuitive judgements about the time of events. A similar concern is also raised by Peacocke. A central claim of Peacocke's chapter is that we must recognize certain externalist elements in our understanding of the past tense. Thus, for instance, the understanding that goes into making a memory-judgement of the kind 'Yesterday, it was the case that A' cannot be accounted for purely in terms of a response, on the part of the subject, to certain states of affairs that obtain in the present (see also Cockburn, Ch. 15, this volume). Rather, in as far as it is a judgement about the past, it must involve a sensitivity to temporal relations. That is to say, a complete account of the representational content of the subject's mental state must mention states of affairs at a time other than the present. And it is in this sense that the mental state must be individuated externally.

In this context, Peacocke makes a further claim that brings his account close to some of the ideas explored by Boucher. What he claims is that there is a connection between this sensitivity to temporal relations and the workings of certain subpersonal mechanisms which keep track of time. According to him, the particular temporal relations in which we stand to past events can, at least sometimes, explain certain temporal impressions we have when we remember those events. Thus, for instance, he says that a person's having left the room about ten minutes ago can causally explain a subject's impression that the person left the room a certain interval of time ago, where the length of that interval is in fact about ten minutes. What Peacocke contends, in short, is that our understanding of the past tense relies on our ability to be causally sensitive to temporal facts in this sense. But he also argues that an explanation of this ability must ultimately be sought on the level of computational mechanisms which are responsive to the passage of time.

Thus Peacocke's theory of our understanding of the past tense leads us right back to some of the issues we raised at the beginning of this introduction. A fundamental concern raised by Peacocke's chapter might be formulated as follows. If, as he claims, the idea of a temporal impression is to capture something essential about episodic memory and its role in our grasp of the concept of the past, there is something important left out by some of the other theories of episodic memory we have discussed. A complete account of episodic memory must look not just at the conditions that obtained when remembered events were first encountered, plus whatever factors have to be in place at the time of recall. It must also look at what happens in the interval between encoding and recall. In

particular, Peacocke argues that we need to appeal to the idea of an internal clock to shed light on temporal impressions as a central aspect of the phenomenology of episodic remembering. If he is right, any account of our understanding of the past tense must remain incomplete unless we can give a plausible story of specific mechanisms for keeping track of the time of events we remember.

THE STRUCTURE OF THIS VOLUME

We have thought it helpful to group the contributions to this volume into four main sections. The chapters in the first section look in detail at different accounts of how temporal information might be processed and represented. They provide current views on the psychological foundations of timing and memory for time, discussing the notion of an internal clock and the idea that memory is temporally organized. A common theme of the chapters in the second section is the idea that certain forms of remembering involve a particular kind of awareness of time, or of causal relations between past and present. They also raise questions about particular kinds of temporal or causal reasoning abilities involved in making judgements about the past. The chapters in the third section focus specifically on the phenomenology of episodic memory and the way particular past events can be said to come before the mind in episodic remembering. They explore connections between episodic memory and perceptual experience, and discuss the idea of a memory image. The chapters in the fourth section discuss different accounts of memory in the context of traditional concerns in epistemology and metaphysics. They highlight in particular connections between questions concerning the nature of memory and philosophical questions regarding the reality of time and our understanding of the past tense.

In these introductory comments, we have tried to sketch some of the issues raised in these chapters, which represent a variety of philosophical and psychological approaches to memory and temporal representation. However, we also hope to have given a sense of the interest in bringing together these various approaches, both within each discipline and across them, to address questions as to the relation between our understanding of time and our ability to represent particular past events.

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