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What is time?

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This question elicits many responses, but a successful analysis of time has never been one of them. I argue that it is premature to rule out the possibility of such an analysis. We might be able to give a successful analysis of time, in terms of conscious experience.

1 Introduction

The headline question is, on the face of it, a request for a definition of time. Today, few philosophers take it that way. Instead, they take it as an invitation to answer any of a variety of other questions, such as: Are the past and future real? How does time differ from space? In what sense, if any, does time pass? Is an object wholly present at each moment of its existence? How is change possible? Does time require change? Is time absolute, or relational? What is the metaphysical significance of tense?

David Chalmers distinguishes the hard problem of consciousness from the easy problems of consciousness. A similar distinction applies here. The easy problems of time are the ones posed by questions like those collected in the foregoing paragraph. The hard problem of time is that of saying what time is.[1]

As with consciousness, the easy problems of time are "easy" only relative to the hard problem. The fact remains that solutions to the former can never add up to a solution to the latter. Answering the

[1]For Chalmers' distinction, see (Chalmers, 1996, xi-xvii).

easy questions might constrain the project of finding out what time is, as answering the question whether rainbows touch the ground might constrain the project of figuring out what rainbows are. But if we want to find out what time, or a rainbow, is, we need to go beyond the easy questions.

2 Eliminativism about time

The analogy between the philosophy of consciousness and the philosophy of time doesn't end there. Confronted with the question "What is consciousness?" or "What is time?" some philosophers offer answers, while others offer resistance.

The most common form of resistance to the consciousness question is anti-reductionism. Anti-reductionists refuse to offer any solution to the hard problem of consciousness, on the grounds that consciousness is a fundamental feature of the world, resistant to analysis in terms of anything more basic. Explicit avowals of anti-reductionism about time are less common, but that probably just reflects the fact that anti-reductionism about time is so widespread that people feel no need to avow it.

A different way to resist the consciousness question is by denying that consciousness exists. This is eliminativism about consciousness. In the philosophy of time, there is a long tradition of eliminativism, the latest manifestation of which is an argument that takes its cue from developments near the forefront of modern science:[2]

(1) Our best scientific theories represent our world as one in which there is no such thing as time.

(2) If our best scientific theories represent our world as one in which there is no such thing as time, then there is no such thing as time.

(3) So, there is no such thing as time.

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[2]See (Barbour, 1999), (Earman, 2002), and (Rovelli, 2009).

The first premise hinges on speculative scientific theories, or on contentious interpretations of well-established theories. That, however, isn't the main problem with the argument. The main problem is this: given a choice between (a) understanding our best science as a machine for generating predictions, rather than a way of representing the world, and, (b) denying that you were alive two minutes ago, which do you choose? If you have a Moorean bone in your body, you choose (a). But then you also reject (1), if the alternative is to accept (3).[3]

Perhaps the most obvious objection to temporal eliminativism is also, prima facie, the most damning. When I look inward, I find conscious experiences changing over time; or, so it seems. For example, I find an experience as of a traffic light changing from red to green. Maybe my experience is illusory. Maybe there is no physical light, and no physical change. But doesn't the conscious experience itself change? In order to have an experience as of a light changing from red to green, mustn't I *first* have an experience as of a red light *and then* an experience as of a green light? Isn't change—and, therefore, time—an essential feature of my *experience*, regardless of how things stand in the external world?

We return to this question below. But first, let's look at some theories that acknowledge the reality of time, but try to reduce it to something more basic.

3 Mainstream analyses of time

Reductive theories of consciousness attempt to reduce facts about consciousness to facts about an ostensibly more basic level of reality (e.g., physical or functional facts). Similarly, reductive theories of time attempt to reduce facts about time to facts about something ostensibly more basic (e.g., causal or entropic facts).

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[3]Tim Maudlin makes a similar point in (Maudlin, 2002, 7-11).

Any reductive theory entails a supervenience claim, to the effect that the facts being reduced supervene on the proposed reduction base, and a major threat to reductive theories of consciousness are prima facie modal counterexamples to the supervenience claims they entail (possible worlds that duplicate ours physically or functionally, but not phenomenologically). Reductive theories of time entail analogous supervenience claims, and face an analogous threat.[4]

According to Michael Tooley, our world comprises a (large) number of durationless events standing in various causal relations. In Tooley's view, the temporal order of these events supervenes on their causal order; i.e., on which events cause, or are caused by, which others.[5]

However, we can conceive of a world, W, in which events instantiate the same pattern of causal relations as the events in our world, but in which all events are simultaneous. (Maybe W is a momentary three-dimensional array of objects, wherein the states of various objects depend on the states of various other objects, via forces that propagate with infinite velocity.) Since the temporal order of events in W is different from the temporal order of actual events, W is a prima facie counterexample to Tooley's theory.[6]

According to Julian Barbour, our world comprises a (large) number of intrinsically timeless spatial configurations of objects, where these configurations are uniquely ordered by a timeless version of the least-action principle. In Barbour's view, the temporal order of

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[4] A-facts logically supervene on B-facts iff logically possible worlds identical with respect to B-facts are identical with respect to A-facts.

[5] See (Tooley, 1997).

[6] Tooley suggests that a world in which all causation takes the form of backward causation is logically impossible (Tooley, 1997, 64), but he doesn't consider the possibility of a world, like W, in which all causation is simultaneous.

events supervenes on the least-action ordering of the configurations in which they occur.[7]

However, if our universe is governed by the least-action principle, so is a time-reversed counterpart of our universe, U, that comprises the same configurations as our world (assuming, with Barbour, that the configurations are intrinsically timeless). So, there isn't a unique least-action ordering of the configurations that comprise our universe. To get the uniqueness that Barbour's account requires, we'd have to add a further constraint. But what constraint might that be? Invoking a further natural regularity (e.g., an entropy gradient) won't help, since we can also imagine that regularity being temporally reversed in U without violating the least-action principle. U is therefore a prima facie counterexample to Barbour's theory.

4 A phenomenological analysis

If finding a good analysis of time is as hard as I've suggested, why not just conclude that time is just part of the ontological bedrock?

Let me answer this question with another one.

What if there's a world-view in which time *does* have a good analysis? An analysis that illuminates not only the nature of time, but also the relationship of our own experience to it? If there is such a world-view, the fact that time reduces to something more basic in it is an intriguing point in its favor.

So, even if you don't think that an analysis of time is valuable for its own sake, you might still like to know whether, and on what terms, such an analysis is possible.

I suggest that we can give a reductive analysis of time, as part of a more general reduction of facts about spacetime and its contents to facts about conscious experience.

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[7](Barbour, 2009).

The world-view in which this reduction is possible is a kind of phenomenalism.

Phenomenalism has been unfashionable for a long time, but it's not hard to understand why people were drawn to it in the past. For anyone who makes a sustained effort to unpack the meaning of everyday statements about ordinary physical things, phenomenalism is a very natural place to end up.

When we talk about a physical thing, like a mountain, what do we mean to be talking about?

Well, when I talk about a mountain, I take it that I'm talking about a bunch of atoms arranged in a certain way. So, in some sense of "mean," what I mean by "Mauna Kea" (for example) is just some such arrangement of atoms.

But there's another sense in which that isn't what I mean. I don't think my beliefs about Mauna Kea would be false, if it turned out that mountains weren't made of atoms. If it emerged that mountains were actually made of Aristotelian Prime Matter, I'd be amazed, but I wouldn't conclude that I'd been wrong to think that there were such things as mountains. I'd conclude that I had been mistaken about the nature of Mauna Kea, but not that I'd been mistaken about its existence. This shows that I don't use "Mauna Kea" as a synonym for "such-and-such atoms arranged mountainwise," even though I do take myself to be speaking of atoms arranged mountainwise when I speak of Mauna Kea.[8]

Let's distinguish between (1) what I *take myself to refer to* by "Mauna Kea," and, (2) what I *have in mind by* "Mauna Kea." By "Mauna Kea," I take myself to refer to a bunch of atoms arranged mountainwise, but a bunch of atoms arranged mountainwise isn't what I have in mind.

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[8] As I'm using the phrase "atoms arranged mountainwise," the claim that mountains are atoms arranged mountainwise is consistent with the claim that there are mountains.

What do I have in mind?

Is it: something that is *either* a bunch of atoms arranged mountainwise *or* a mass of Prime Matter enformed mountainwise?

No. If it turns out that both Aristotle and modern physics have gotten it completely wrong, so that Mauna Kea consists of neither atoms nor Prime Matter, that will undermine my faith in modern physics (and Aristotle), but it won't make me doubt the existence of Mauna Kea.

This suggests a test for isolating what I have in mind by "Mauna Kea." By "Mauna Kea," I have in mind x, only if learning that there were no such thing as x would compel me to doubt that Mauna Kea existed. This test rules out atoms-arranged-mountainwise and Prime-Matter-enformed-mountainwise as candidates for what I have in mind when I speak of Mauna Kea. What doesn't the test rule out?

Here's one thing it might seem not to rule out: *something that tends to give me conscious experiences as of a mountain with such-and-such qualities*. Maybe there's no such thing as a bunch of atoms arranged mountainwise; maybe there's no such thing as a hunk of Prime Matter enformed mountainwise. I might accept all that and more, without relinquishing my belief that Mauna Kea exists. But if you convince me that there is nothing that tends to give me experiences like those I have when I perceive Mauna Kea, won't that compel me to doubt that Mauna Kea exists?

But wait: if what I have in mind when I think of a mountain isn't some nature that the mountain has independent of any potential for conscious experience, why suppose that the mountain is anything more than such a potential? Why think that there is anything "behind" the experiences I have when I perceive Mauna Kea—anything that gives me the experiences, or serves as their source? Instead, we can think of the mountain as a *pure potential* for conscious experience, which may be realized, as it is when I perceive the mountain, but can also exist in the absence of any actual experience.

This is the basic idea behind phenomenalism, a theory first championed by J.S. Mill. According to Mill, the physical world is a ten-

dency for conscious experiences to occur in certain patterns. For there to exist some physical object, or occur some physical event, is for it to be the case that conscious experiences with certain phenomenal properties or "qualia" would occur, if certain other conscious experiences (characterized by their own qualia) were to occur.[9]

Define a *sensation-conditional* as a counterfactual conditional whose antecedent and consequent have purely phenomenological import. (A statement has purely phenomenological import just in case it does nothing besides (1) predicate some quale or qualia of some experience or experiences, or (2) predicate some abstract—e.g., logical or mathematical—property or relation of one or more qualia or experiences.) According to Mill, the obtainment of any physical state of affairs is equivalent to the truth of some conjunction of sensation conditionals.[10]

The main source of resistance to phenomenalism is the feeling that in order for physical things to exist, there must be something that *explains why* our world has the phenomenological potential that it does—that, without some such explanation, the "world" is merely a dream.

To overcome this resistance, we can start by drawing a distinction between skeptical hypotheses and metaphysical hypotheses. An hypothesis is skeptical if accepting it would rationally require us to abandon most of our everyday beliefs about the world; an hypothesis that we couldn't rationally accept without abandoning the belief that there are physical objects would be a skeptical hypothesis. An hypothesis is metaphysical if it proposes an account of the ultimate nature of physical reality that is consistent with most of our everyday beliefs, and, in particular, with the belief that there are physical objects.[11]

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[9]See Chapter 11 of (Mill, 1865/1979).

[10]The phrase "sensation-conditional" is from (Skorupski, 1994, 114).

[11]The skeptical/metaphysical distinction comes from (Chalmers, 2010).

Consider a world that contains the same phenomenological potential as the actual world, and nothing else; call it Mill World. (Two worlds have the same phenomenological potential iff the same sensation-conditionals are true in both.) The fundamental disagreement between Mill and his opponents is that his opponents think that the hypothesis that our world is Mill World is a skeptical hypothesis, whereas Mill thinks it is a (true) metaphysical hypothesis.

I agree with Mill. Discovering that Mill World was our world would have little impact on our beliefs, and no impact at all outside a narrow band of metaphysical theorizing. In particular, it wouldn't require us to revise any of our everyday beliefs about what there is.

For example, I believe that there is coffee. In so believing, I believe, or am disposed to believe, that people who have experiences as of certain plants tend to have experiences as of a certain kind of berry, that people who have experiences as of roasting and grinding such berries tend to have certain olfactory sensations, that people who have experiences as of drinking hot water that has been filtered through the result of such grinding tend to have certain flavor sensations, that people who have experiences as of subjecting such filtrate to various chemical tests tend to have certain visual experiences, etc. But my belief that coffee exists does not come with a belief, or a disposition to believe, that these phenomenological propensities have some deeper, non-phenomenological grounding. My everyday thinking about coffee is completely neutral on the grounding question.

I submit that a world that tends to reward experiences as of the plants with experiences as of the berries, experiences as of the roasting with experiences as of the aroma, experiences as of the hot filtrate with experiences as of the flavor etc. gives us everything any of us ever wanted from coffee. Whether the reward system is metaphysically fundamental or grounded in something more basic doesn't matter to us, which is why phenomenalism poses no threat to the Guatemalan economy.

As Mill puts it, "these various possibilities"—what I'm calling phenomenological potentials—"are the important thing to me in the world." His point is that whatever must be true in order for us to be justified in caring as we do about whether there are physical phenomena, *is* true in Mill World. So, to whatever extent physical objects are the sort of thing whose existence we should care about, physical objects exist in Mill World. (If physical objects aren't the sort of thing we should care about, phenomenalism can hardly be faulted if it fails to deliver them.)

Unlike traditional idealist theories, phenomenalism allows that most physical entities exist unperceived: a sensation-conditional can be true even if there are no minds or experiences.

Phenomenalism also distinguishes between veridical and non-veridical experiences. A veridical experience is one that fits into the total pattern of experiences (or potential experiences) in a certain way; a non-veridical experience is one that doesn't. When Dorothy dreams of an emerald city towering over a field of poppies, she has an experience intrinsically indistinguishable from some possible veridical perception. Dorothy's dream-experience is non-veridical, because the sensation conditional, "there would be an experience as of Dorothy looking toward an emerald city if there were an experience as of Dorothy looking across a poppy field" is false.

This isn't the place to mount a detailed defense of phenomenalism. My goal here is just to show that a natural extension of Mill's position creates conceptual space for a satisfactory analysis of time.

For Mill, the fact that a tree has a certain shape and color reduces to the fact that if experiences with certain qualia were to occur, there would also occur experiences with certain phenomenal shapes and colors. These phenomenal shapes and colors are not physical shapes or colors. A phenomenally green, phenomenally tree-shaped experience isn't (or at least need not be) literally green or tree-shaped—green or tree-shaped in the same sense as a tree. A phenomenally green experience could occur in a world in which nothing *physically* green ever existed. For Mill, the fact that there exist various visible,

audible, tangible, odorful, flavorful things reduces to the truth of various counterfactual conditionals concerning invisible, inaudible, intangible, odorless, and flavorless experiences.[12]

In Mill's system, all features of the physical world get phenomenalized, *except* for temporal features. The objective roundness of a soap bubble reduces to the *phenomenal* roundness of certain potential experiences—experiences that have no location in objective space. But, according to Mill, the bubble's objective duration comes to the *objective* duration of a sequence of potential experiences—experiences that do have location in objective time (or would have such location, if they actually occurred).

Why doesn't Mill try to phenomenalize time? It's because he thinks that consciousness is essentially temporal:

> Sensations exist before and after one another. This is as much a primordial fact as sensation itself; it is a feature always present in sensation, and we have the strongest ground that can ever be had for regarding it as ultimate, because every genesis we assign to any other fact of perception or thought, includes it as a condition.[13]

Mill is far from unique in taking this view. To most people, it seems beyond obvious that experience occurs in time. Their certainty on this point has, I think, three sources, corresponding to three levels of phenomenological reality.

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[12]By "phenomenal shapes," "phenomenal colors," etc., I mean the qualia that characterize experiences that we typically describe using the vocabulary of shape, color, etc., as when we describe a visual experience of a tomato as red and round (or reddish and roundish). I don't take a stand here on whether an experience must represent the world as containing a red or round object, in order to instantiate phenomenal redness or phenomenal roundness.

[13](Mill, 1865/1979, 198-9).

First, there is *phenomenal temporality,* which we find at the level of the individual experience. It consists of the instantiation, by individual conscious experiences, of qualia that we tend to describe in temporal terms: phenomenal duration, phenomenal succession, phenomenal change, etc. When I hear a rising tone, for example, I have an auditory experience that instantiates phenomenal duration and phenomenal change.

Second, there is *phenomenological continuity,* which we find at the level of the stream of consciousness. This is a relationship between the individual conscious experiences that constitute a typical extended conscious episode. When I listen to a song, there is a continuity to my auditory experiences that is missing between the last experience I have when I fall asleep, and the first experience I have when I wake up.

Third, there is *experiential memory*. We find this at the level of the stream of consciousness, but it's a relationship that can also span different streams, provided that they belong to the same conscious mental life. Experiential memory includes memories (conscious or not) of one's own conscious experiences, as well as *conscious* memories of anything at all.

I believe that none of these phenomena gives us a compelling reason to locate consciousness in time.

Consider phenomenal temporality. This is a pervasive feature of human experience. For example, when you see the full Moon, you have a visual experience that it's natural to describe as having duration, in addition to color, shape, and size. When we describe the experience as "bright" or "round," however, we don't mean that it is literally bright or round, like the Moon itself. Your experience is *phenomenally* bright and *phenomenally* round, but not (as I've put it) *objectively* bright or round.

But, if we can't infer that an experience of the Moon is objectively round from the fact that it's phenomenally round, how can we infer that the experience has objective duration, from the fact that it has phenomenal duration?

We can't. *Phenomenal duration does not entail objective duration,* any more than phenomenal roundness entails objective roundness. The same goes for other aspects of phenomenal temporality (phenomenal succession, phenomenal change, etc).

If someone says that phenomenal temporality *is* evidence of objective temporality, the burden is on him to substantiate that claim, since he's claiming, in effect, that phenomenal temporality differs from all other phenomenal properties.

I know of only one argument for regarding phenomenal temporality as exceptional in this respect. It goes like this: "If, upon introspective reflection, one of your experiences seems to you to possess some objective temporal feature, then the experience has that feature; many of your experiences *do* seem to you to possess objective temporal features, upon introspective reflection; therefore, many of your experiences have objective temporal features."[14]

The argument fails at step one. Compare: "If, upon introspective reflection, one of your experiences seems to you to possess some spatial feature, then the experience has that feature." But the pain of a stomach cramp isn't located in your stomach, even if it seems to you (upon introspection) that it occurs there. So, the first premise of the argument works only if phenomenal temporality is fundamentally unlike phenomenal spatiality. But that is exactly what the argument was supposed to show.

Furthermore, if introspection seems to reveal anything about the temporal features of experience, it seems to reveal that our experiences have absolute durations. Introspection of the experience you have when you see the second-hand of a clock sweep through a 3° angle suggests that your experience is correctly describable as having a duration of about half a second, and not, say, a year. But if the experience has any objective duration, it *is* correctly describable

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[14]See (Phillips, 2010, 183), (Soteriou, 2010, 227), and (Rashbrook, 2013, 588-609).

as having a duration of a year, since if it has an objective duration, it occurs in relativistic spacetime, in which anything that can be correctly described as having a duration of half a second can also be correctly described as having a duration of a year (or any other non-zero magnitude).

Those looking for a reason to locate consciousness in time must look beyond the individual experience. So let's move up one level in the phenomenological hierarchy, to the stream of consciousness.

Suppose you're watching a car drive down the road, from position P_1 to position P_3 via position P_2. If the car is moving at the right speed (neither too fast nor too slow), you have an experience of the car moving from P_1 to P_2, and an experience of the car moving from P_2 to P_3, but no experience of the car moving from P_1 to P_3 via P_2. Yet, you have only one experience of the car being at P_2. (So it's not like the situation that would have transpired if you had watched the car drive from P_1 to P_2, then lost consciousness, then revived to see the car proceed from P_2 to P_3.)

According to Barry Dainton,

> each of the brief phases of your visual experience during this interval is experienced as flowing into its successor.[15]

For Dainton, it is this experienced flow of one experience into another that is the distinguishing feature of the stream of consciousness: "[t]hese experienced transitions . . . are a crucial component of the continuity of consciousness; if our streams were not continuous this way, they would not have the character they in fact do."[16]

I have two problems with this.

First, we don't usually experience our experiences. Usually, we experience our environment. We *experience* our environment by *having* experiences. If we can be said to experience our experiences,

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[15](Dainton, 2012, 177).

[16]Ibid.

it is only when we introspect them. But your experiences stream along even when you're not introspecting.

Second, if you experience—i.e., introspect—one experience A flowing into another experience B, then A and B are parts of the same (complex) experience; otherwise, you couldn't bring them into the scope of a single act of introspection. This complex AB experience may occur in a stream of consciousness before a further experience, C. In Dainton's view, you introspect the transition from AB to C. By the same reasoning as before, it follows that AB and C belong to a complex experience, ABC. And so we are driven to the conclusion that a stream of consciousness is just one big experience—a conclusion that Dainton himself would be the first to reject.[17]

Dainton's talk of experienced flow may miss the mark, but elsewhere he does pinpoint the really distinctive thing about a stream of consciousness. What is really distinctive about a stream of consciousness is the fact that in it, experiences like the P_1-to-P_2 experience and the P_2-to-P_3 experience can co-exist without multiple occurrences of a P_2 experience—without any "repeated phenomenal contents," as Dainton puts it.[18]

What makes this possible, according to Dainton, is that the P_2 phase of the P_1-to-P_2 experience is numerically identical with the P_2 phase of the P_2-to-P_3 experience. The P_1-to-P_2 and P_2-to-P_3 experiences are temporally extended experiences that have a temporal part in common. That's how they can belong to the same stream of consciousness, without that stream's involving any repetition of the P_2 experience.[19]

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[17] And rightly so, as argued in (Dainton, 2006, 113); see also (Pelczar, 2015, 85).

[18] (Dainton, 2006, 141-42).

[19] (Dainton, 2006, 162-82). As Dainton notes, the overlap theory originates with John Foster; see (Foster, 1982, 259-60).

Dainton calls this the "overlap theory" of the stream of consciousness. It's an attractive theory, but if we accept it, we have to give up on the idea of a phenomenological analysis of time, since only experiences that exist in time can overlap temporally.

The crux of the overlap theory is the idea that two experiences can have an experiential part in common. Dainton takes this to be a *temporal* part because he assumes that experiences occur in time. But if experiences can have parts without existing in time, and if some of those parts can be shared by different experiences, then the overlap theory is compatible with a timeless view of experience.

Two experiences can instantiate the same quale without having a part in common; when we look at the sky, our experiences might instantiate the same color-quale, without having any common part. But if one experience's instantiation of a quale Q is the same as another experience's instantiation of Q—if the experiences share not just a quale, but a quale-instantiation—then they do have a part in common.

This is just a corollary of the principle that if two things have a property-instantiation in common, they share a part. For example, if each of two rooms instantiates the property of having a brick wall, and if the first room's instantiation of the property is the same as the second room's instantiation of it—i.e., if the pair of rooms instantiates the property just once—then the rooms share a wall. There is no requirement that the things instantiating the property exist in time. If the rooms exist in one of Barbour's timeless configurations, they still share a part.[20]

In the stream of consciousness discussed above, you have an experience, E, as of the car moving from P_1 to P_2, and an experience, E', as of the car moving from P_2 to P_3. E instantiates a quale by virtue of instantiating which E is (among other things) an experience as

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[20]Maybe we should limit the principle to non-abstract entities; it doesn't matter for our purposes, since conscious experiences aren't abstract.

of a car at position P_2. E' instantiates the same quale. The overlap theory accounts for the stream, provided that E's instantiation of the quale is one and the same instantiation of the quale as E''s instantiation of the quale.

So, instead of thinking of a stream of consciousness as a temporal sequence of partially coinciding phenomenal processes, we can think of it as an atemporal sequence of partially coinciding coinstantiations of qualia. Our experiences can exhibit phenomenological continuity, without existing in time.

Thus far, neither individual experiences nor streams of consciousness have compelled us to locate conscious experience in time. This brings us to the third level of phenomenological reality—the conscious mental life—and experiential memory.

On the usual view, the relationship between a memory and that of which it is a memory is temporal, with the memory occurring after the event remembered. This view is incompatible with a timeless conception of experience, since memory is often conscious, and sometimes represents conscious episodes from one's own life.

But the usual view isn't compulsory.

To see why not, let's start by looking at an epiphenomenalist account of memory. By this account, a memory of an event x is a brain state that is a suitably reliable indicator of the past occurrence of x. In some cases, the indicated event is a past state of the same brain as that to which the indicating state belongs. That past brain state may have caused a conscious experience. If it did, then the present brain state (the memory) is as reliable an indicator of the past occurrence of that conscious experience as it is of the brain state that caused the experience, and therefore counts as a memory of the experience. A conscious memory of an event is just a memory that has some appropriate memorial phenomenology.

To get an account of memory that is compatible with a timeless view of experience, we need only replace the epiphenomenalist's appeals to causation with appeals to timeless neural correlation. By this account, a memory of a consciousn experience, E, is a brain

state that indicates the occurrence of a past brain state that E has as its neural correlate. (Note that it is only the brain state, and not the experience, that is past; unlike its neural correlate, E doesn't occur in time.) A conscious memory of an event—any event—is a brain state that (1) indicates the occurrence of that event, and (2) is the neural correlate of some memorial experience.

By this account, brains and brain-states are assumed to be phenomenalistic constructions (just like all other physical phenomena), and neural correlation is to assumed to be a relation that isn't essentially temporal. The former assumption goes with the phenomenalist territory. The latter shouldn't be very controversial. There are various ways to understand neural correlation, but the following characterization captures the basic idea. The neural correlate of an instantiation $I(Q)$, of a quale, Q, is the instantiation $I(P)$, of a physical feature P, such that $I(P)$ naturally necessitates $I(Q)$. (The neural correlate of a quale Q is a physical property P, such that for each instantiation of P, $I(P)$, there is an instantiation of Q that $I(P)$ naturally necessitates.)[21]

One way to interpret natural necessitation is in terms of synchronic or diachronic causality. But that's not the only way. Natural necessitation is simply a form of necessitation weaker than logical or metaphysical necessitation, and there's no obvious reason why such a relation couldn't hold between a temporally located brain state and a non-temporally located phenomenal state. For example, if we understand natural necessitation in terms of entailment by natural law, we can say that it is a natural law, or a consequence of natural laws, that if a certain physical brain state occurs (in time), then a certain phenomenal state exists (not in time).

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[21]We could replace "$I(P)$ naturally necessitates $I(Q)$" with "$I(P)$ naturally necessitates $I(Q)$ under conditions C," where C might require the brain to be functioning normally or embedded in a normal environment; for the details, see (Chalmers, 2000).

We use temporal language to describe various aspects of phenomenological reality. I've argued that this usage is strictly optional. "Phenomenal duration," "phenomenal change," "earlier experiences," "later experiences," etc. are terms by which we pick out various features of consciousness, but consciousness doesn't have to exist in time to have those features. We can use the concept of duration to fix the reference of "phenomenal duration," even though the existence of phenomenal duration doesn't entail the existence of objective duration, just as we can fix the reference of "fool's gold" by saying that fool's gold is a worthless mineral that resembles gold, even though the existence of fool's gold doesn't entail the existence of gold. Likewise for all other aspects of consciousness that we use temporal vocabulary to describe.

Mill's reluctance to extend his phenomenalism to the temporal dimension arose from a mistake. He didn't realize that he could phenomenalize the temporal features of the world just as well as he could phenomenalize its spatial features; that, when it comes to amenability to phenomenalist reduction, time is in the same boat as shape or color. Instead of equating the objective duration of a soap bubble with facts about the objective durations of various possible experiences (or sequences of experiences), he could have reduced it to facts about the *phenomenal* durations of various possible experiences. More generally, he could have equated time with the tendency for phenomenological reality to include veridical instances of phenomenal temporality.[22]

We can put this more precisely, in terms of scenarios that maximize the quantity of conscious experience, within the constraints imposed by the true sensation conditionals.

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[22]Mill isn't the only phenomenalist to lose his nerve in the face of time. The primitive relation of Carnap's *Aufbau,* Recollection of Similarity, is explicitly temporal, precluding any analysis of time in Carnap's system; see (Carnap, 1967, 127-28).

Call the phenomenological state of affairs expressed by the antecedent of a true sensation-conditional an *antecedent state*. For each antecedent state, there is a *phenomenological set,* S, that contains just that state and anything that is entailed by a member of S via a true sensation-conditional. Two phenomenological sets are *compatible* iff every member of each can co-exist with each member of the other.

Take all the phenomenological sets that are compatible with a given phenomenological set; call the union of these sets a *complete phenomenological set*. A *complete realization of phenomenological potential* is a global state of affairs including all and only the phenomenological states of affairs in a complete phenomenological set.

This terminology in hand, we can say that *time is that which exists iff there must be veridical instances of phenomenal temporality, in order for there to be a complete realization of phenomenological potential*.

Here, we understand veridicality as above, in terms of coherence with the overall pattern of potential experience. Just as the difference between a veridical experience as of an emerald city and Dorothy's non-veridical experience is a matter of how the experiences fit into the overall pattern of potential experiences, so the difference between a veridical and a non-veridical experience as of duration, succession, simultaneity, or change is a matter of how the experiences fit into the overall pattern of potential experience.

A main weakness of the mainstream analyses of time considered earlier was the existence of possible worlds in which the analyses broke down. It's an advantage of the phenomenalist analysis that it resists this kind of modal counterexample.

We can't conceive of a timeless world that harbors potential for veridical instances of phenomenal temporality, any more than we can conceive of a coffeeless world that harbors potential for veridical instances of phenomenal caffeity. Just as a world that features a suitable phenomenological reward-system for caffeic experience gives us everything we ever wanted from coffee, a world that features a suitable phenomenological reward-system for temporal experience gives us everything we ever wanted from (or feared about) time.

But what about imperceptible things? Isn't there a possible world that has the same phenomenological potential as ours, but in which there fail to occur some (or all) of the imperceptible events and processes that occur in our world?

No. A world that differs from ours at the imperceptible level also differs from ours at the level of phenomenological potential.

Maybe it's logically impossible to perceive an individual helium atom. In that case, there's no true sensation-conditional of the form "If there were such-and-such conscious experiences, then there would be an experience as of an individual helium atom."

Still, a world that contains an enduring helium atom is a world in which there would be detections of that atom, if there were a suitably-utilized quantum-gas microscope. In such a world, there is a true sensation-conditional of the form: "If there were experiences as of a certain kind of apparatus being used a certain way, then there would be experiences as of the apparatus doing certain things"—where the latter experiences are the sort that actual scientists have when they detect actual atoms using actual scientific instruments. Any reason to doubt that a world contains the sort of phenomenological potential represented by such a sensation-conditional is equally a reason to doubt that it contains a helium atom. So, if a possible world differs from ours by containing one less helium atom than our world, it also differs from our world by containing one less bit of corresponding phenomenological potential.

5 Conclusion

I've argued that an analysis of time is possible, given a world-view in which physical facts reduce to facts about experience. Actually carrying out such a reduction would require developing the phenomenalist position much farther than I've developed it here. The goal of the present discussion has only been to show that in our current state of knowledge, a phenomenological analysis of time is an epistemic possibility worth exploring. When it comes to the meta-

physics of time, consciousness might not be our biggest problem after all. It might be our best solution.

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