

The Color of Time

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Time seems to pass in a way space doesn't. According to A-theorists, this seeming difference between time and space is objective and fundamental; according to B-theorists, it's either illusory or reducible to facts about how we apprehend time and space. I argue that there are instructive parallels between (1) the debate between A- and B-theorists, and, (2) contemporary debate about whether things have colors and if so what their having colors amounts to. The main take-home is that the passage of time raises no important metaphysical challenge that we don't already encounter vis à vis color.

Everyone agrees that time differs from space (at least, everyone who recognizes the reality of time and space, including those who regard time and space as two aspects of relativistic spacetime). Time has one dimension, space has three; time plays one role in scientific theories, space plays another; we measure time with clocks, space with yardsticks. But time also seems to differ from space in other ways. Time, unlike space, flows; events, unlike places, recede into the past; the *now* has a reality that distinguishes it from other times, unlike the *here*, which has no special ontological status. This is often summed up by saying that time is characterized by a type of *passage* that doesn't characterize space: time, unlike space, passes.

Most people agree that time at least *seems* to pass in a way that makes it fundamentally unlike space. However, experts are divided over whether this seemingly fundamental difference really is fundamental, and even over whether it exists. So-called A-theorists think that time's passage is real and fundamentally distinguishes time from space; so-called B-theorists think not.¹

¹So-called after McTaggart's "A-series" and "B-series," described in McTaggart (1908).

The goal of this paper is to show that what really drives debates about the passage of time are questions that also drive philosophical debates about less exalted phenomena, like color and odor. This doesn't directly translate into a solution to the problem of the passage of time, but it does put the problem in a new and highly revealing light.

The bulk of the paper is organized around five questions, as shown in the figure on p. 22. Here is a quick synopsis.²

According to a small but vocal minority, ordinary experience doesn't even *suggest* that time passes: it merely suggests a world of events occurring in relations of earlier and later, and at various spatial and temporal distances from one another. In §1, I argue that this is like saying that ordinary experience doesn't even suggest that things have colors distinct from their geometrical and dynamical properties.

Assuming the argument of §1 is sound, it's safe to say that our experience at least suggests that time passes. But does our experience have features that *a priori* entail that time passes? In §2, I argue that it does not, any more than it has features that *a priori* entail that there are colorful physical objects.

Given that our experience suggests without *a priori* entailing that time passes, a natural thought is that for time to pass is just for the world to be disposed to give us the sort of experiences that suggest to us that time passes. In §3, I argue that this dispositional theory of passage is as plausible as dispositionalism about color.

As an alternative to dispositionalism about passage, you can say that passage is whatever underlying feature of events disposes them to give us the sort of experiences that suggest to us that time passes. In §4, I argue that this kind of scientific realism about passage is as plausible as scientific realism about color.

“Color is just a disposition of some things to cause phenomenally colorful experience” can be taken two ways: as claiming that color has a certain nature, or claiming that things don't really have colors, but merely dispositions to give us phenomenally colorful experience. The statement, “the passage of time is

²I'm not the first to compare time and color in this context—see, e.g., (Grünbaum, 1967, 374, 386, 388), (Pelczar, 2010a, 49), (Pelczar, 2010b, 275, 290), (Skow, 2011, 362), and (Deng, 2013a, 369)—but, to my knowledge, the comparison has never been worked out in detail.

just a disposition of events to cause the sort of experiences that suggest to us that time passes” can likewise be taken two ways; in §5, I argue that an anti-realist reading of this statement is as plausible as anti-realism about color.

If time passes, and its passage is neither a disposition to give us the sort of experiences that suggest to us that time passes, nor an underlying feature of events that grounds this disposition, then it’s hard to see what the passage of time could be, if not a primitive metaphysical feature of time. In §6, I consider the prospects for this kind of primitivism, concluding that they are on a par with the prospects for primitivism about color.

Some complain that debates about the nature or existence of temporal passage fail to address the question why time, but not space, *appears* to us to pass. In §7, I argue that the fact that we have evolved to experience the world’s temporal aspects differently from how we experience its spatial aspects presents no philosophical challenge that we don’t already encounter in relation to color.

I Cognitive error theory

In the philosophy of color, there’s at least one thing that everyone, or almost everyone, agrees about, which is that our experience at least *seems* to give us a basis for thinking that there are colorful objects. The situation is somewhat different in the philosophy of time. While most parties to the debate about the passage of time, including those who deny that time passes, agree that our experience at least *seems* to give us some basis for thinking that time passes, an appreciable number suggest that not even this much is true. According to proponents of what Kristie Miller and her co-authors call the “cognitive error theory,” our experience doesn’t even give rise to an illusion that time flows, that events recede into the past, etc.: rather, we tend to misconstrue or misdescribe our experience as giving rise to such an illusion even though it really does not.³

For example, Craig Callender maintains “that there is no ‘experience of the present’ as contemporary metaphysicians conceive it,” Natalja Deng raises doubts about “the claim that there is an element of temporal experience which B-theorists need to take to be illusory,” David Braddon-Mitchell says that

³(Miller et al., 2020, 753).

“[i]t’s not that things seem as though there are A properties, it’s just that some people mistakenly believe that they do,” and Christof Hoerl holds that “there is in fact no phenomenology of passage.”⁴

Debates about how things seem can be hard to adjudicate, but in this case I believe that the cognitive error theorists are in the wrong. This comes out when we compare our mental lives to the mental lives of hypothetical beings who perceive the world through experiences that differ from ours in ways that make much of our talk about time incomprehensible to them.

It might not be in our power to imagine experience devoid of *all* the phenomenal features that we’re inclined to describe using temporal vocabulary. But we can imagine beings—call them Tralfamadorians⁵—each of whom has a mental life consisting of a single, complex experience as of a multitude of simultaneous events standing in various spatial patterns and exhibiting various qualitative regularities. We can imagine that human and Tralfamadorian experiences support the same scientific conclusions, and that the Tralfamadorians have the same science we do, expressible in the language of mathematical physics. In short, Tralfamadorians perceive the same events as us, but they perceive the temporal orders and durations of events (the events’ B-features) through experience that if *we* had it, we would call “experience of a multitude of simultaneous events.” (Maybe temporal order and duration show up in Tralfamadorian experience as conscious appearances of numerical codes attaching to events (like coordinates), or maybe they show up as apparent dis-

⁴See (Callender, 2008, 340), (Deng, 2013a, 368), (Braddon-Mitchell, 2014, 212), and (Hoerl, 2014, 188), respectively, as well as (Mellor, 1998, 14-18), (Huggett, 2014, 9), Frischhut (2015), and Miller (2019).

⁵After the aliens from Kurt Vonnegut’s *Slaughterhouse-Five*. The novel’s protagonist describes the Tralfamadorians as follows: “The creatures were friendly, and they could see in four dimensions. They pitied Earthlings for being able to see only three... The most important thing I learned on Tralfamadore was that when a person dies he only appears to die. He is still very much alive in the past, so it is very silly for people to cry at his funeral. All moments, past, present and future, always have existed, always will exist. The Tralfamadorians can look at all the different moments just the way we can look at a stretch of the Rocky Mountains, for instance. They can see how permanent all the moments are, and they can look at any moment that interests them. It is just an illusion we have here on Earth that one moment follows another one, like beads on a string, and that once a moment is gone it is gone forever... When a Tralfamadorian sees a corpse, all he thinks is that the dead person is in a bad condition in that particular moment, but that the same person is just fine in plenty of other moments.”

tances in a fourth spatial dimension—the exact details don’t matter.)

Given all of this, our relationship to the Tralfamadorians is like our relationship to bat-people who perceive what we perceive visually through a form of echo-locational experience whose phenomenal character we can’t even imagine. Human and Tralfamadorian experiences are equally good guides to the world’s B-features, just as human and bat-person experiences are equally good guides to the world’s surface features. In both cases, the two experiential regimes are like equally detailed and accurate maps printed in opposite color schemes, or in different projections.

Humans and Tralfamadorians can communicate using B-language, just as we can communicate with the bat people using our ordinary words for shapes, colors, motions, etc. Humans and Tralfamadorians are in complete agreement on the spatiotemporal distribution of events in our universe: both would recognize as correct the same descriptions of the physical world in terms of inertial coordinates or the Einstein field equations (or whatever mathematical description turns out to be the correct scientific one). But the Tralfamadorians don’t understand us when we talk about “time passing” or “the flow of time,” they see no need for the words “past,” “present,” and “future,” and they regard tense as a superfluous quirk of our language to which we seem to attach a kind of mystical significance.

The features of our experience that suggest that time passes are those that distinguish it from Tralfamadorian experience, and whose absence from Tralfamadorian experience prevents Tralfamadorians from understanding human talk of the flow of time, the receding of events into the past, and the special reality of the present.

If the Tralfamadorians perceived the world through phenomenally colorless experience (like the bat people), they might doubt that physical objects had a feature, “color,” that humans could perceive but they couldn’t, and in this they might be right. But they would be wrong to doubt that human experience makes it *seem* to the beings who have it that physical objects have colors that are more than mere geometrical or dynamical features of the objects that have them. The Tralfamadorians who “see in four dimensions” make a similar mistake, if they doubt that our experience makes it seem to us that time passes.

Anyway, let's grant that our experience of time does at least suggest that time passes, and let's call the feature or features of our experience in virtue of which it suggests this *phenomenal transience*. Our experience, unlike Tralfamadorian experience, is phenomenally transient.⁶

2 *A priori* realism

There is obviously no valid *a priori* inference from, "We have phenomenally colorful experiences" to, "There are physically colorful objects." Is there a valid *a priori* inference from, "We have phenomenally transient experiences" to, "Time passes"?⁷

Though some suggest otherwise,⁸ it is highly doubtful that there is such an inference. This is a point that has been made before, most forcefully by Michael Pelczar, who argues that there is nothing about our conscious mental lives that compels us to acknowledge that time even exists, let alone passes. Here, I'll re-purpose Pelczar's arguments to support the more limited claim that there is no *a priori* inference from facts about our experience to the proposition that time passes. (This more limited claim might be true, even if there *is* an *a priori* inference from facts about our experience to the proposition that time exists.)⁹

In §1, we considered the Tralfamadorians, who perceived the same world as us, but through experience that lacked the qualities that suggest to us humans that time passes. Now let's consider the opposite: beings who inhabit a world devoid of A-features, but who perceive that world through experience that

⁶Is phenomenal transience an irreducible feature of our experience, or a feature our experience has in virtue of lower-level features? And if the latter, which lower-level features? I won't try to answer these questions here, but see Le Poidevin (2007), Kriegel (2015), and the references in footnote 4 for recent discussion of the second question.

⁷Not even Berkeleyans and naive realists are committed to there being a valid *a priori* inference from the existence of phenomenally colorful experiences to the existence of physically colorful objects. According to Berkeleyans, only colorful experiences that fit into God's plan a certain way are colorful objects; according to naive realists, only veridical colorful experiences, which are introspectively indistinguishable from their non-veridical counterparts, entail the existence of colorful objects.

⁸E.g., (Eddington, 1929, 97), (Capek, 1961, 164-65), (Davies, 1995, 275), and (Craig, 2000, 138-39).

⁹For Pelczar's arguments, see Pelczar (2010a), Pelczar (2010b), and (Pelczar, 2017, 232-35).

has all the phenomenal transience of ordinary human experience. Call these beings the Pavonians, and the world they belong to Pavonis.

One way to imagine that Pavonis lacks A-features is by supposing that it has no duration, and undergoes no change: in Pavonis, nothing happens earlier or later than anything else. It follows that in Pavonis, there is no such thing as the flow of time (there being no change of any sort), no such thing as events receding into the past (there never having been any past for events to recede into), and no special ontological status that distinguishes present events from non-present events (there never having been any non-present events).¹⁰

Now imagine that, in spite of all this, Pavonians *perceive* Pavonis through experience that has the same phenomenal transience as human experience. This simply requires various phenomenal features of Pavonian experience to play a different perceptual role from the role they play in our experience, as auditory phenomenology would play a different role for people who perceived colors through auditory experience from the role it plays for us. For us, auditory experience is the medium through which we perceive sound waves; for those who “hear with their eyes,” auditory experience is the medium through which they perceive light waves. Similarly, phenomenally transient experience the medium through which we perceive our persisting and changing world, while for the Pavonians it’s the medium through which they perceive their changeless and durationless world.

If the phenomenal transience of experience *a priori* entails that time passes, then the scenario just described is incoherent. (If the phenomenal transience of experience *a priori* entails that time passes, then it’s *a priori* impossible for phenomenally transient experience like the Pavonians’ to exist in a changeless and durationless world like Pavonis.) Is the scenario incoherent?

It is not.

For all we know *a priori*, a transparent brain in a transparent vat in a transparent world might have phenomenally colorful experience. So, from the

¹⁰ According to McTaggart, Pavonis doesn’t even have B-features, since, according to McTaggart, B-features can exist only in a world where time exists and time can exist only by passing: see (McTaggart, 1908, 461-62). I don’t take a stand on this here. For present purposes, it’s enough that we can imagine a world that has the structure described by modern physics (what McTaggart calls the “C-series”); whether it’s appropriate to describe that structure in B-theoretic terms is beside the present point.

fact that our experience is phenomenally colorful, it doesn't follow *a priori* that there are colorful things in the world. Well, neither does it follow *a priori* from the fact that there are phenomenally transient experiences that time flows, or that events recede into the past, etc. In fact, there isn't even an *a priori* inference from "There are phenomenally transient experiences" to "there are objectively enduring phenomena." For all we know *a priori*, a durationless brain in a durationless vat in a durationless world might have phenomenally enduring, phenomenally transient experience.

For example, we can imagine that instead of a diachronic sequence of brain states (one for each "time slice" of some ordinary human brain), there is an otherwise indistinguishable synchronic sequence of brain states whose asymmetric dependencies are mediated by relations of simultaneous rather than asynchronous causation. Like Ned Block's famous China Brain, this one would reproduce all the signalling and information processing that takes place in an ordinary human brain, and so arguably would ground or sustain a phenomenologically normal human mental life. At least, it's conceivable that such a brain would sustain such a life.¹¹

We've been considering a version of Pavonis in which there is no passage, because there is no duration. In a different version, Pavonis is an eternal four-dimensional block devoid of any sort of temporal passage. We needn't decide here whether we should think of this version of Pavonis as a world where time exists without passing (as B-theorists would have it), or a world in which there is no time, but only an arrangement of entities having the same abstract structure that events in our world have by occurring in time (as McTaggart would have it). Either way, we can suppose that Pavonis is a four-dimensional block having all and only the sort of features that modern physics describes.

Could the inhabitants of this eternalist version of Pavonis experience their world through phenomenally transient experience? It's hard to see why not. We can suppose that the Pavonians have bodies just like ours in all respects describable by physics, embedded in environments just like ours in all respects

¹¹Since the neural events relevant to a normal human mental life are finite in number, a brain of the sort described could comprise a finite number of brain states (pseudo time-slices). A generous upper bound on the required number of states = the number of seconds in a normal human lifespan (≈ 3 billion) multiplied by the number of Planck moments in one second ($\approx 5.391247 \times 10^{44}$).

describable by physics. Whether this logically or nomologically entails that the Pavonians have experience phenomenally just like ours is an open question, but even if it doesn't, it's at least epistemically possible that they do. It's not something we can rule out *a priori*.¹²

I've argued that phenomenal transience doesn't *a priori* entail temporal passage (or even objective duration), any more than phenomenal color *a priori* entails objective color. Some authors, such as Ian Phillips, disagree. They claim that if introspection makes it appear to you that one of your experiences possesses some objective temporal feature (duration, flow, or whatever), then the experience really has that feature. If this is correct, then perhaps we can infer on the basis of introspection alone that our experiences have various objective temporal qualities, such as duration and flow.¹³

But the claim about introspection is dubious. If, upon introspection, one of your experiences appears to you to possess some spatial feature, it doesn't follow that the experience has that feature: as Pelczar points out, the pain of a leg cramp isn't located in your leg, even if introspection makes it appear to you that it occurs there.¹⁴ Well, why should the fact that introspection suggests that my pain endures entail that the pain really endures? If temporal phenomenology licenses an inference from appearance to reality that other types of phenomenology don't, Phillips et. al. have yet to explain how or why.

If the existence of phenomenally transient experience *a priori* entails that time passes, then the Pavonian scenarios described above are incoherent. I've just argued that the Pavonian scenarios are not incoherent. I conclude that the fact that ordinary human experience is phenomenally transient does *not* entail *a priori* that time passes. As we'll see in the following sections, the lack of an *a priori* entailment from phenomenal transience to metaphysical pas-

¹²Simon Prosser makes much the same point in (Prosser, 2013, 70).

¹³See (Phillips, 2010, 183), as well as (Soteriou, 2010, 227) and (Rashbrook, 2013, 588-609).

¹⁴See (Pelczar, 2017, 233). In the same place, Pelczar raises a further problem for Phillips' proposal. If introspection suggests that our experiences have any objective temporal features, it suggests that they have absolute durations. For example, introspection of the experience you have when you hear the doorbell suggests that the experience lasts about a second, and not, say, a year. But if the experience has any objective duration, it *is* correctly describable as lasting a year, since if it has an objective duration, it occurs in relativistic spacetime, in which anything that can be accurately described as having a duration of about a second can also be accurately described as having a duration of a year.

sage removes what would otherwise be a serious obstacle to the suggestion that the passage of time is an illusion, or a disposition of events to give us phenomenally transient experience.

3 Dispositionalism

Given that our experience suggests without *a priori* entailing that time passes, a natural thought is that for time to pass is just for the world, or certain features of it, to be disposed to give us the sort of experiences that suggest to us that time passes. In this section, I relate this thought to dispositional theories of color.

Color dispositionalism identifies the property of being red with the property of being an x such that x is disposed to affect people in ways that result in their perceiving x by having phenomenally red experience.¹⁵

At least, that's the rough idea. It needs some refinement, to accommodate cases where someone perceives non-red things by having phenomenally red experience. Suppose that you've lost your eyes, and have been fitted with a prosthesis that receives light from your environment, transducing it into electrical signals that directly stimulate your optic nerves. Due to a manufacturing error, the prosthesis responds to light from red jalapeños by stimulating your optic nerves the way that green light stimulates the optic nerves of normal human beings (including you, before your accident), and it responds to light from peas by stimulating your optic nerves the way red light normally stimulates human optic nerves. If you now look at a glass bowl full of green peas against a pure white background, you perceive the peas by having phenomenally red experience, even though there's nothing red for you to perceive.

The standard dispositionalist response is that for x to be red is for x to be disposed to affect people in ways that *under normal circumstances* result in their perceiving x by having phenomenally red experience.

What is it for circumstances to be normal? What is it, such that circumstances are *not* normal in the case of the malfunctioning prosthesis? These are

¹⁵Modern defenses of phenomenal dispositionalism about color include (Kneale, 1951, 121), (Ayer, 1973, 83-84), Johnston (1992), Levin (2000), and the discussions cited in footnote 16. The basic idea arguably goes back to Locke: see (Locke, 1694/1979, II.viii.10) and (Bennett, 1971, 102-105).

challenging questions that we can't pursue here. Similar questions arise for any dispositional analysis that invokes normal circumstances, which includes most dispositional analyses, including the dispositional analysis of temporal passage considered below.

Another challenge for dispositionalism emerges if we imagine that half the human population has visual anatomy wired one way, and half the population has visual anatomy wired a different way, such that half of us have visual experience with one phenomenal color scheme, and the rest have visual experience with the opposite (inverted) scheme. When my phenomenally inverted counterparts look at talcum powder, they perceive the powder by having phenomenally black experiences. Since the powder is not both black and white, there is pressure on color dispositionalists to conclude that either my inverts' phenomenal inversion is a handicap that prevents them from seeing things as they really are, or else that *my* phenomenal inversion (relative to the others) is a handicap that prevents *me* from seeing things as they really are.

Neither alternative is attractive. For this reason, color dispositionalists have recently gravitated toward relationalist versions of the theory. According to these, there is no such thing as redness, and no such state of affairs as something's being red, any more than there is such a thing as aboveness, or such state of affairs as something's being above. Rather, there is only redness-to-*x* or redness-to-*y*, just as there is only above-*x*-ness or above-*y*-ness, and there are only such states of affairs as *O* being red to *x*, or *O* being red to *y*, just as there are only such states of affairs as *O* being above *x*, or *O* being above *y*. The bust has the property of being white-to-us (normal human observers), and it has the property of being black-to-them (our color inverts), but it has neither the property of being black-to-us, nor the property of being white-to-them.¹⁶

Color dispositionalism says that for things to have colors is just for them to be disposed to cause phenomenally colorful perceptual states under normal circumstances.¹⁷ Similarly, dispositionalism about the passage of time

¹⁶For relationalist versions of color dispositionalism, see Averill (1992) and Cohen (2009).

¹⁷Or, in relationalist versions: for things to have colors relative to specified observers is just for them to be disposed to cause phenomenally colorful perceptual states in the specified observers under normal circumstances. For brevity's sake, I'll conduct the remainder of this discussion in terms of non-relationalist dispositionalism. The same points apply to relationalist dispositionalism.

says that for time to pass is for events to be disposed to cause phenomenally transient perceptual states under normal circumstances.¹⁸

Passage dispositionalism has all the advantages, and faces all the challenges, of color dispositionalism, including the challenge of saying what it is for circumstances to be “normal.” However, you might think that passage dispositionalism faces one challenge that color dispositionalism does not: you might think that passage dispositionalism, unlike color dispositionalism, is circular.

Whatever problems color dispositionalism might face, it’s at least not circular. Phenomenally magenta experience could exist in a world devoid of anything that is objectively magenta (magenta in the sense that magenta ink is magenta): this is evident from the possibility of having phenomenally magenta experience in a dream or hallucination. Nor is it necessary for us to use the concept of objective magenta in order to think of or refer to phenomenally magenta experience: if I’m having a phenomenally magenta experience, I can refer to its phenomenal magentanness by thinking of it as “the feature of my experience that I’m now attending to.”

The situation might seem different when it comes to passage dispositionalism. Can phenomenally transient experience exist in a world in which time does not pass? Can we conceive of phenomenally transient experience other than as experience that unfolds with the passage of time?¹⁹

Fortunately for passage dispositionalists, we’ve seen that the answer to these questions is: Yes! The Pavonians have transient experience in a world in which time does not pass, and anyone who has phenomenally transient experience can conceive of phenomenal transience as the feature of his or her experience that he or she attends to (on a given occasion). Only if there were

¹⁸Grünbaum (1967) is an early defense of passage dispositionalism; for more recent defenses, see Ismael (2011), Deng (2013b), Dainton (2014), and Ismael (2017).

¹⁹The challenge goes all the way back to (McTaggart, 1908, 474): “If we reduce time and change to appearance, must it not be to an appearance which changes and which is in time, and is not time, then, shown to be real after all?” Sometimes dispositionalists argue that experience with the same representational content as ours could exist in a world free of passage, and conclude on that basis that there’s no circularity in reducing passage to a disposition to cause experience like ours; see, e.g., Ismael (2017). This argument assumes that the phenomenal features of experience suggestive of passage reduce to representational features, or else that there’s nothing in the phenomenal quality (as opposed to the representational content) of our experience that suggests to us that time passes. Both disjuncts are controversial.

an *a priori* entailment from, “I’m having phenomenally transient experience” to, “I’m having experience that occurs in the flow of passing time” would passage dispositionalists face a threat of circularity that does not threaten color dispositionalism. But as we saw in §2, there is no such entailment.

Of course, dispositional theories of passage face the same general challenges as dispositional theories of color: defining “normal circumstances,” accommodating variation in different subjects’ perceptual phenomenology, etc. But since these challenges seem no greater for passage dispositionalism than color dispositionalism, the theories seem about equally promising.

4 Scientific realism

Suppose that when an object gives a normal human observer phenomenally blue experiences under normal circumstances, it’s because the object has a certain surface geometry, β . Now imagine a world where there are objects with surface geometry β , and human beings anatomically just like us, but where objects with β do not cause phenomenally blue experiences in normal human observers under normal circumstances. (Maybe β objects cause phenomenally yellow experiences in the envisioned world, or maybe they’re not disposed to cause any experiences at all.) Suppose that *nothing* in the world we’re imagining is disposed to cause phenomenally blue experiences in anyone. Are there blue things in such a world?

Color dispositionalists say that there aren’t. Some theorists think this is a mistake: they think that there *are* blue objects in the envisioned world, despite there being nothing in that world disposed to cause phenomenally blue experience. According to these theorists, for something to be blue is for it to have whatever feature accounts for the disposition of certain actual objects to cause phenomenally blue experiences in actual observers (under normal circumstances). Given that the feature in question is β surface geometry, any possible world that contains objects with β surface geometry contains blue objects. Whether those objects are disposed to cause phenomenally blue experience (as in the actual world) is irrelevant to the question of their blueness.²⁰

²⁰See (Descartes, 1647/1985, 218), (Reid, 1764/1997, 77-87), (Armstrong, 1968, 274-77), (Hilbert, 1987, 61-80), Jackson (1996), (Byrne and Hilbert, 1997, 264-67), and (McLaughlin, 2003, 478-79).

This is the scientific realist view of color. In our world, various things are normally disposed to give us phenomenally blue experiences. This allows us to refer to the feature of such things in virtue of which they are so disposed, as “the feature of various things in virtue of which they’re normally disposed to give us phenomenally blue experiences.” According to scientific realists, blueness just is this feature. (In Krikpe’s terms, we use the phenomenal disposition to fix the reference of “blue,” but not to give the meaning of “blue.”)

Scientific realists don’t deny that blue things are normally disposed to cause phenomenally blue experiences in beings like us, but they hold that this is only a contingent fact about blue things. This is in contrast to color dispositionalists, who consider a disposition to cause phenomenally blue experience (under normal circumstances) to be essential to blueness.

Just as a scientific realist about color identifies blueness with whatever property of objects happens to underlie their disposition to give us phenomenally blue experience, and denies that objects must necessarily have that disposition in order to be blue, a scientific realist about passage identifies the passage of time with whatever property of events happens to underlie their disposition to give us phenomenally transient experience, and denies that events must have that disposition in order for time to pass.²¹

For example, a scientific realist about passage might hold that what disposes events to give normal humans phenomenally transient experience (under normal circumstances) is that events have a certain causal structure describable in B-theoretic terms; call this structure τ . The events that constitute our world have τ , and it’s because they have τ that they’re disposed to give us phenomenally transient experience. But there are possible worlds where events have structure τ , but are not disposed to cause phenomenally transient experience. An example is a world in which events have the same causal structure as in our world, but where the thus-structured events are disposed to cause only the sort of experiences that Tralfamadorians have. According to scientific realists about passage, time does pass in such a world, just as it passes in ours: it’s just that in such a world, passage doesn’t reveal itself to observers through phenomenally transient experience. That the passage of time reveals itself to us (actual human observers) through phenomenally transient

²¹See Paul (2010) for a recent defense of scientific realism about passage.

experience is a merely contingent fact about the passage of time.

Is scientific realism about the passage of time correct? I don't know, but its prospects seem about as good as those for scientific realism about color. The only difference between the two views is in the phenomenology that we use to fix the reference of the relevant terms ("color," "passage") and the underlying features of the world that account for things' dispositions to give rise to such phenomenology (e.g., surface reflectance properties versus causal event-structure). Here, there isn't even a *prima facie* threat of circularity, since the scientific realist about passage doesn't require there to be phenomenally transient experience in order for time to pass. But even if there were a *prima facie* threat, it would be neutralized by the considerations of §2.

5 Classic anti-realism

Some people agree with color dispositionalists that there's nothing more to things having colors than that they're normally disposed to give us phenomenally colorful experiences, or agree with scientific realists that there's nothing more to color than whatever physical property grounds this disposition, but deny that it follows that things have colors. According to color anti-realists, "Color is really just a disposition to cause phenomenally colorful experience" is like, "Magic is just sleight of hand," or "Santa Claus is just your parents," not, "Water is just H₂O."

When you learn that magic is just sleight of hand, you don't learn about the true nature of magic: you learn that there is no such thing as magic—that magic isn't real. When a kid discovers that Santa Claus is just his parents, he doesn't discover the true nature of Santa Claus: he discovers that there is no Santa. Likewise, according to color anti-realists, when we discover that colors are just dispositions to cause phenomenally colorful experiences, or that they are whatever underlies such dispositions, we don't discover the true nature of color: we discover that there are no colorful things.²²

How do we adjudicate the disagreement between color anti-realists and color dispositionalists (or scientific realists)? I don't know. It might be that different people approach the debate with different pre-theoretical notions of

²²Prominent proponents of color anti-realism include (Galileo, 1623/2008, 185), (Hume, 1739/1978, III.i.1: 301), and (Palmer, 1999, 95).

what color involves, or what it takes for something to have color. It could be that in everyday life, color-antirealists mean something somewhat different by “color” from what color dispositionalists and scientific realists mean by it. If so, the disagreement between the two camps might be merely verbal.

Just as color anti-realists hold that there are no colorful objects, but merely (e.g.) dispositions of objects to cause phenomenally colorful experience, passage anti-realists hold that there is no passage of time, but merely (e.g.) dispositions of events to cause phenomenally transient experience.²³

You might worry that passage anti-realism faces a problem that color anti-realism does not. You might think that passage anti-realism, unlike color-anti-realism, is self-refuting, since you might think that a disposition to cause phenomenally transient experience can exist only in a world in which phenomenally transient experience is at least nomologically possible, and you might think that such experience isn’t nomologically possible except in worlds where time passes.²⁴

The reply to this is the same as our earlier reply to the worry that dispositionalism about the passage of time is circular. If phenomenal transience *a priori* entailed passage, then it would be contradictory to say that time doesn’t pass, but only seems to us to pass due to the phenomenal transience of our experience. But, as argued in §2, phenomenal transience doesn’t *a priori* entail passage. So, the worry is unfounded. That being so, anti-realism about passage and anti-realism about color seem to be equally plausible views.

6 Primitivism

Suppose you say that experience suggests (but doesn’t *a priori* entail) that time passes, deny that the passage of time is just a disposition to cause phenomenally transient experience or whatever grounds that disposition, but hold that the passage of time is nevertheless real. As far as I can tell, the only way to hold this combination of views is by taking passage to be a primitive metaphysical feature of time.

²³The classic sources for classic passage anti-realism are Williams (1951) and Smart (1955). For a more recent defense, see Torrenco (2017).

²⁴(Hoerl, 2014, 190) calls this the “intelligibility problem” for error theories of passage; see also (Capek, 1961, 164), Ferré (1972), and Baron et al. (2015).

Like the other views on passage we've considered, this one has its counterpart in the philosophy of color. According to color primitivism, color reduces neither to an experience-causing disposition, nor to a surface reflectance property, nor to anything else.²⁵

Color primitivism faces numerous challenges, which I won't go into here.²⁶ The main argument *for* color primitivism is that it follows from a thesis called "Revelation." The exact content of this thesis is not always clear, but the central claim seems to be that if it is essential to a color—say, International Klein Blue—that p , then reflection on the phenomenal character of the sort of experience one normally has when viewing an International Klein Blue object (like the one pictured on the following page) is enough to reveal that p .²⁷

If Revelation is true, then it's not essential to color that colorful things are disposed to cause phenomenally colorful experience, let alone that they have whatever physical qualities scientific realists deem essential to color, since it's false that reflecting on the phenomenal character of the experience you have when viewing *Blue Venus* is enough to reveal that colorful things are so disposed, or that they have those physical qualities (surface reflectance properties, or whatever). Since it's hard to see what color could reduce to, if not such a disposition or its underlying basis, Revelation militates in favor of color primitivism.

Whether Revelation is true is, of course, debatable. The point I want to make is that there is a parallel thesis related to time, that militates in favor of a parallel primitivism about passage. The parallel thesis is that if it is essential to the passage of time that p , then reflection on the phenomenal character of a phenomenally transient experience is enough to reveal that p . If this is correct, it militates in favor of primitivism about passage, since it's false that reflecting on phenomenally transient (or phenomenally enduring, or phenomenally changing) experience is enough to reveal what sorts of experiences, if any, events are disposed to cause, or what features of events account for their

²⁵For color primitivism, see (Hacker, 1987, 184-87), Watkins (2005), and Gert (2008).

²⁶Many of these are discussed in Byrne and Hilbert (2007) and (Cohen, 2009, 65-74). The biggest problem with color primitivism is motivational: the reasons color primitivists offer for their view don't seem strong enough to justify positing color phenomena additional to what we can describe in terms of physics, phenomenology, or some combination thereof.

²⁷See (Johnston, 1992, 223) and (Byrne and Hilbert, 2007, 77).



Figure 1: *Blue Venus*. Yves Klein, 1962.

being so disposed.

It's far from clear that we should accept Revelation about either color or passage, but the two theses seem to be on a par, credibility-wise. Since revelation claims are the main, or even the only, source of support for the corresponding primitivity claims, primitivism about passage is about as plausible (or implausible) as primitivism about color.

7 Are we just trading one problem for another?

I've argued that when it comes to thinking about the passage of time, our choice points are the same as those we encounter when thinking about color. (I could have made the same argument in terms of sound, odor, etc.—it's just that color has generated more philosophical discussion.) Suppose I'm right about this. Still, you might think that the passage of time raises a question that phenomena like color don't, namely: "Why does time, but not space,

reveal itself to us through phenomenally transient experience?”²⁸

But we can raise the same sort of question about color, namely: “Why does color, but not sound (or odor, or texture) reveal itself to us through phenomenally colorful experience?”

These are all good questions. But they aren’t so much questions about the nature of time or color as they are corollaries of the question why our perceptual experiences have the particular phenomenal qualities they do, rather than any of the (many, perhaps infinitely many) other phenomenal qualities they might have had while performing the same perceptual functions.

Presumably, there are good evolutionary explanations for why humans and other animals have different physical systems for responding to light waves, sound waves, and airborne molecules. But why should these different physical systems give rise to experiences with different qualia? Why doesn’t the part of your brain that processes input from your ears generate visual instead of auditory phenomenology, perhaps in the form of color qualia that actual human beings never have?

If a materialist theory of consciousness is true, there’s a simple answer to these questions: the different physical systems “give rise” to experiences with different qualia because the qualia just are different physical features of the systems. Assuming there’s a good evolutionary explanation for why we have different physical systems for detecting spatial and temporal features of the world, a materialist can say that our experience of time, but not space, is phenomenally transient because for an experience to be phenomenally transient is for it to have a physical property that our time-sensing systems have, and our space-sensing systems lack. (Similarly for phenomenal color, phenomenal sound, etc.)

On the other hand, if materialism is false, the question remains why sound waves give us a different phenomenal quality of experience from light waves, or why temporal phenomena give us a different phenomenal quality of experience from spatial phenomena. But these questions are just ways of raising the hard problem of consciousness. We might equally ask why light or sound waves give us any conscious experience at all, or why light gives us the experiences it does, instead of phenomenally color-inverted experience.

²⁸See (Callender, 2008, 345-59).

I conclude that the question of why we have evolved to experience temporal phenomena differently from how we experience spatial phenomena presents no philosophical challenges that we don't already encounter in relation to color and other perceptible features of the world.

8 Conclusion

In comparing various theories of the passage of time with parallel theories of color, I've refrained from endorsing any of the former. If I had to list the theories of passage we've considered in descending order of my credence in them, my ranking would be: dispositionalism – scientific realism – classic anti-realism – cognitive error theory – daylight . . . and then a photo finish between primitivism and *a priori* realism.

However, the goal of this paper has not been to decide among rival theories of time's passage (or apparent passage, or ostensible apparent passage), but to show that there are deep parallels between the debate about the passage of time the debate about the nature of color. The value of this is that it puts philosophers of time and philosophers of color in a position to learn from each other in ways that one might not have thought possible.

It's not that the credences one assigns to various stances on passage must duplicate the credences one assigns to the corresponding stances on color: time and color are, after all, different things. But the existence of the argued-for parallel means that we probably shouldn't let these credences diverge without being able to justify the divergence by pointing to some relevant difference between time and color. For example, if you're skeptical about primitivist theories of color, but attracted to a primitivist theory of passage, you need to explain why primitivism is appropriate for the latter but not the former. By the same token, if you are favorably inclined toward scientific realism about color, you should probably take scientific realism as your starting point when it comes to passage. The parallel between the color and time debates might also suggest positions that would otherwise have remained hidden from view. (Cognitive error theory of color, anyone?)

Not all philosophical debates have the same basic choice-points as the color and passage debates. Presumably the choice-points are the same in debates about other sensible qualities (sound, odor, etc.), but debates in moral phi-

losophy and epistemology might not fit the same mold, due to their normative character, and debates in metaethics might not, due to their connection with normative questions. But even if the color debate were the only one that paralleled the passage debate in the way I've argued, it would still be an instructive parallel: it would still enable philosophers working in the two areas to leverage on each other's successes, and learn from each other's mistakes.

The problem of time's passage has struck many as importantly unique: deeper, more central, and more challenging than the philosophical problems that arise in connection with seemingly humbler features of the natural world, like color. In this paper, I've argued that this is wrong: that the passage of time raises no fundamental philosophical challenges not already raised by color (or sound, odor, etc). If I've succeeded, the result isn't a solution to the problem of the passage of time, but something almost as good: a better understanding of the problem, and a better idea of what a solution to it would look like.

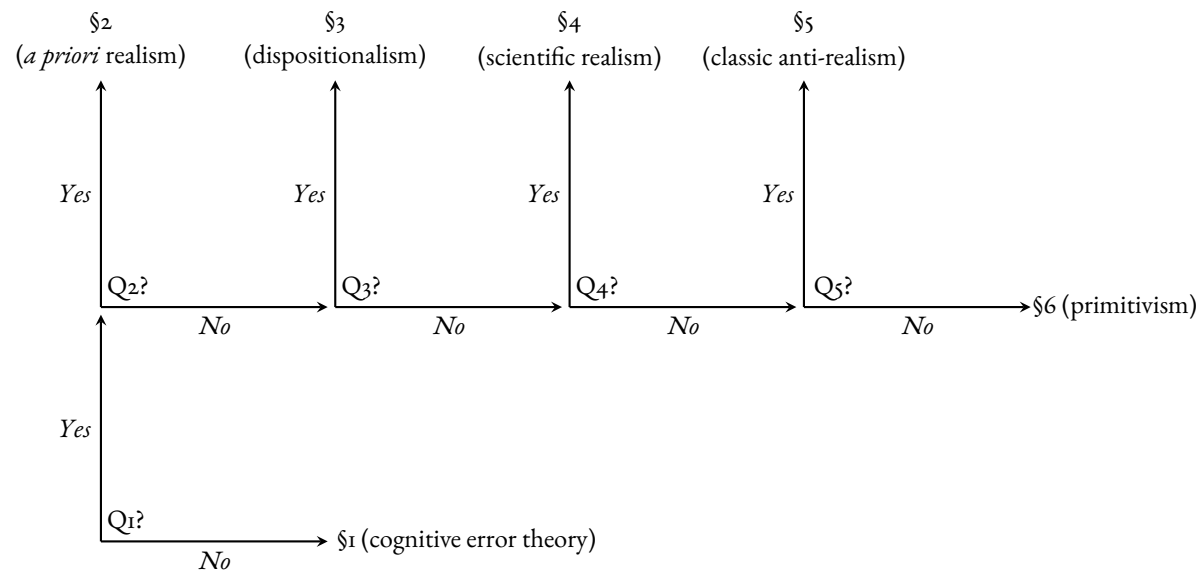


Figure 2: Theories of Passage

Q₁: Does experience suggest that time passes?

Q₂: Does the phenomenal transience of experience *a priori* entail the passage of time?

Q₃: Is passage just a disposition of events to cause phenomenally transient experience?

Q₄: Is passage whatever underlies events' disposition to cause phenomenally transient experience?

Q₅: Is the passage of time an illusion?

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