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ORIGINAL RESEARCH

Qualia share their correlates' locations

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Abstract
This paper presents the location-sharing argument, which concludes that qualia must share the locations of their physical correlates. The first premise is a consequence of relativity: If something shares a time with a physical event in all reference frames, it shares that physical event's location. The second premise is that qualia share times with their correlates in all reference frames. Both physicalism and dualism benefit from having qualia share locations with their correlates, as this makes relations between qualia and physical things easier to explain.

Keywords Consciousness · Qualia · Special relativity · Simultaneity · Time

1 The location-sharing argument

Qualia, the elements of conscious experience, share locations with their physical correlates (henceforth simply 'correlates'). This follows from the theory of relativity and from the times when qualia and their correlates appear. The *location-sharing argument* demonstrates this:

< 1 > *Relativistic premise:* If something shares a time with a physical event in all reference frames, it shares that physical event's location.
< 2 > *Timing premise:* Qualia share times with their correlates in all reference frames.
< Conclusion > *Location-sharing:* Qualia share their correlates' locations.

While physicalists might accept location-sharing as a consequence of a mind-brain identity theory, neither physicalism nor dualism entails it, and both physicalists and dualists have denied it.[1]

This section provides clarification about qualia, correlates, and sharing of times and locations, as well as historical background. Section 2 defends the relativistic premise.

[1] Physicalists Malcolm (1963, 1968) and Altrichter (1973) deny location-sharing. So do non-physicalists Descartes (1637/1999, 1641/1999), Shaffer (1961), McGinn (1995), and Nagel (1998).

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Section 3 defends the timing premise. Section 4 describes how location-sharing benefits theories of mind–body relations. It helps physicalists answer objections concerning the location of qualia, and helps dualists avoid commitment to Cartesian selves. Location-sharing makes qualia relate nicely to everything else.

Qualia constitute what it's like to have conscious experiences such as sensations and feelings.[2] What it's like to see a blue sky and what it's like to smell a flower are respectively constituted by visual and olfactory qualia. One can have identical blue-qualia when looking at the sky during daytime, and at night when dreaming about looking at the sky, as having blue-qualia is a property of one's mind rather than the sky. Some theorists distinguish qualia from representational, functional, and causal properties of experience. Since the timing premise is true of qualia whether construed to include or exclude such properties, location-sharing will be true as well. Since other mental states like beliefs and desires plausibly share times with their correlates, location-sharing may be generally true of mental states, though I'll focus on qualia here.

Correlates are the physical structures most directly implicated in the existence of mental states. Standard forms of physicalism treat correlates as constituting qualia, while standard forms of dualism treat correlates as causing qualia. Physicalists often claim that qualia and their correlates are identical, so they'll exist simultaneously. Dualists typically claim that correlates cause qualia, so that qualia will exist simultaneously with correlates or immediately after, depending on whether or not causation is simultaneous. As I'll use "correlates" here, it doesn't apply to anatomical structures that persist through dreamless sleep, but only to the activated modes of these structures that constitute or cause qualia. As David Chalmers (2000) notes, there might be one unified correlate for all one's qualia at a time, different correlates for qualia in different sensory modalities and emotions, or different correlates for different qualia individuated in some finer-grained way. While correlates are somewhere in the brain, neuroscientific theories disagree about their location and structure.[3] While this empirical uncertainty presently prevents the location-sharing argument from assigning qualia precise neural locations, it can determine that qualia are somewhere in the brain. More precision may be achievable with future progress in neuroscience.

Sharing locations is occupying the same space or being contiguous. Sharing times is occurring simultaneously, or immediately before or after. Sharing locations and times allows relations of identity and causation to hold between qualia and their correlates. If qualia and their correlates are identical, as physicalists typically claim, they occupy exactly the same space at the same time. Metaphysicians disagree about whether causes must precede their effects or can occur simultaneously. Either way, sharing locations and times keeps correlates in position to cause qualia, as dualists typically claim.[4]

Location-sharing has been discovered and forgotten repeatedly since Albert Einstein (1905) discovered relativity. Bertrand Russell (1927) may be the first to argue that

[2] Pierce (1866/1982), Nagel (1974), Peacocke (1980), and Block (1990).

[3] Edelman (1989) thinks correlates are re-entrant loops in thalamocortical systems. Bogen (1995) regards them as intralaminar nuclei in the thalamus. Sheinberg and Logothetis (1997) think they are particular neurons in the inferior temporal cortex.

[4] Huemer and Kovitz (2003) and Mumford and Anjum (2011) defend simultaneous causation. Maslen (2018) argues against it.

"mental events admittedly have temporal relations" while "time and space are so much less distinct than they were" before relativity, so "It has become difficult to hold that mental events, though in time, are not in space" (p. 384). He continues, "It is almost irresistible to go a step further, and say that any two simultaneous perceived contents of a mind are compresent, so that all our conscious mental states are in our heads" (p. 385). But he doesn't find this very important, writing "However, I have no wish to go further into psychology than is necessary, and I will pursue this topic no longer, but return to matters of more concern to physics" (p. 385). Robert Weingard (1977) and Michael Lockwood (1984) rediscover the argument, not recognizing that Russell preceded them. Location-sharing typically goes unnoticed in discussions of dualism, including David Armstrong's (1968) objections which define dualism as committed to nonspatial minds, and William Lycan's (2009) powerful arguments that dualism is better with minds in space. Perhaps if Russell had taken more interest in his argument, it would've been better remembered.

While location-sharing has seemed a mere curiosity to philosophers, it gains significance from the importance of spatial location in causal explanations. Location-sharing makes causal pathways to qualia spatially continuous. If qualia were in weird places or lacked spatial location, these causal pathways might be discontinuous, having gaps or jumping out of space. This would fit poorly with empirical observations that macroscopic causal pathways are spatially continuous. While we can imagine magic spells causing distant events, the causal relations actually observed hold between things that share locations. This spatial continuity inductively justifies physicists' traditional skepticism about action at a distance. (Quantum entanglement seems to involve spatially nonlocal correlations. But it's not clear whether this amounts to causation, and correlates are more plausibly macroscopic neural structures rather than entangled quantum particles.[5]) Throughout this paper I'll assume that if dualism is true, qualia are epiphenomenal, since causal powers are better assigned to their correlates. But if this assumption is false and dualist qualia have causal powers, they'll be in the right place to cause further mental events. And if the identity theory is true, qualia and their correlates are one and the same, having the same spatiotemporal positions and causal powers.

More awareness of location-sharing in the 1920s might have saved a science of consciousness. Psychologist Samuel Fernberger (1922) proposed dividing his field into a science of consciousness and a science of behavior, making room for consciousness research alongside behaviorist psychology. Behaviorist theoretician Karl Lashley attacked his proposal in "The Behavioristic Interpretation of Consciousness", a lengthy two-part series in the influential *Psychological Review* (1923a, b). Arguing that behaviorism deserved "exclusive possession of the field of psychology," Lashley rejected "the development of two cognate sciences, such as Fernberger has recently advocated" (1923a, p. 243). Lashley saw consciousness as scientifically disreputable in large part because of its supposed capacity for "transcendence of time and space", often characterized in contradiction to physical law (p. 246, also pp. 249, 254–262,

[5] Papineau (2013) argues that all causation, including mental causation, is macroscopic. It's not clear what follows if qualia are caused by quantum-level correlates, as this turns on precise details about the correlates and on unsettled questions in the philosophy of quantum mechanics. See Ruetsche (2011) for a sophisticated discussion of causation and quantum entanglement.

271).[6] Rather than permit scientific study of such a disreputable phenomenon, Lashley encouraged behaviorists to dismiss it with crude reductions: "'Consciousness is behavior.' 'Consciousness is the particular laryngeal gesture we have come to use to stand for the rest.'" (pp. 240–241). The location-sharing argument shows that consciousness causes no special trouble in spacetime, and fits into spatially continuous causal pathways even if dualism is true. But Fernberger and his allies didn't find Russell's argument, and Lashley's criticisms determined the course of psychology. We are left to wonder what a century of consciousness research might otherwise have achieved.

The location-sharing argument deserves more recognition. The next two sections attempt to provide the most thorough and accessible articulation of its premises. The final section describes its unrecognized advantages in making relations between qualia and physical things easier to explain. While physicalism and dualism are often treated as being in zero-sum competition, location-sharing benefits both. It's good news for our understanding of mind–body relations that qualia share locations with their correlates, connecting them to the causal wiring of physical reality. Einstein's theory of relativity delivers this good news.

2 The relativistic premise

Einstein discovered relativity by considering the consequences of light having the same speed for both moving and stationary observers. Relativity entails that all simultaneity is relative to reference frames.

Einstein (2006) tells a story illustrating the relativity of simultaneity. For a farmer standing by a railway while a very fast train passes, two lightning bolts might strike simultaneously—one ahead of the train, and another an equal distance behind. But for a rider passing the farmer just as both bolts strike (in the farmer's reference frame), the bolt ahead strikes first. The rider doesn't merely see the bolt ahead first. It really strikes first in the rider's reference frame. We must reject a tempting explanation of why the rider sees the bolt ahead strike first: both bolts strike simultaneously, and light from the bolt ahead closes in on the rider faster than the bolt behind, since the rider is moving towards it. This tempting explanation contradicts Einstein's assumption that the speed of light is the same for all observers, regardless of how fast they are moving. Light from each bolt approaches the rider and the farmer at the same speed. So the bolt ahead must strike first in the rider's reference frame, while both bolts strike simultaneously in the farmer's reference frame. This requires abandoning absolute simultaneity, and understanding simultaneity itself as relative to reference frames.

Events can be simultaneous in all reference frames only by sharing locations, as the relativistic premise entails. There are differences regarding the simultaneity of the lightning bolts in the rider and farmer's reference frames because they strike in different locations. The rider moves towards one lightning bolt and away from the other while the farmer remains stationary between them. Moving towards events makes them happen earlier and moving away from events makes them happen later, explaining the differences in simultaneity. Whenever two events happen in different locations

[6] Lashley discusses Bergson (1911) and Sheldon (1922) as suggesting such violations of physical law.

simultaneously in a reference frame where both are at rest, a reference frame moving from one event towards the other will treat the event ahead as earlier and the event behind as later. But if two events happen in the same location, no reference frame can move towards one and away from the other. Events happening simultaneously in one location therefore happen simultaneously in all reference frames. This is the strongest form of simultaneity that relativity allows, resembling absolute simultaneity in holding for all observers. While experimental observations confirm that simultaneity in our universe is fundamentally relative to reference frames, this simultaneity holds relative to all reference frames.[7]

An objection to the relativistic premise is that it could be false about nonphysical entities, allowing dualist qualia to share times with their correlates in all reference frames while not being in the same location. The experimental observations supporting the relativistic premise concern physical entities rather than nonphysical entities, so this objection doesn't directly contradict any experimental results. If this objection is false about nonphysical things, dualist qualia might violate the relativistic premise, sharing times with their correlates while being nowhere.

A first problem with this objection is that it requires a disunified explanation of when things occur across all reference frames. It requires two distinct ways to explain when an event occurs in a reference frame: one for physical entities, in virtue of their own spatial locations; and another for nonphysical entities, perhaps in virtue of their correlates' spatial locations rather than their own. Positing a second way of explaining when things occur produces a disunified and less simple theory of time, and is ad hoc, as no evidence suggests it. Introspection and other sources of evidence about qualia don't reveal anything unusual about how they relate to time. Treating dualist qualia as exempt from the relativistic premise therefore disunifies our theories of when things occur for no gain in explaining the data. When all other theoretical virtues are equal, more unified explanations are superior, and explanations of when things occur that are consistent with the relativistic premise are more unified.[8]

A second and deeper problem with the objection is that the nature of time itself explains the truth of the relativistic premise, rendering the physicality or nonphysicality of qualia irrelevant. A correlate's coming into existence is a physical event occurring within spacetime, where relativity applies. Then if qualia share times with their correlates, they must be in spacetime as well. Once the qualia are within spacetime, they must share locations with their correlates to share times in all reference frames, whether they're physical or nonphysical. The relativistic structure of spacetime guarantees that qualia will share their correlates' locations. If qualia are residents of time, and time and space are related as relativity says, qualia will have the spatial relations that come with being residents of time. Sharing times with some physical thing in all reference frames will require them to share its location. To make an exception of qualia isn't just to say that they're special. It's to say that spacetime doesn't have the unity that Einstein's theory of relativity reveals.

[7] Michelson and Morley (1887), Kennedy and Thorndike (1932), Hall (1990) and Eisele et al (2009) measure light. Ives and Stilwell (1938) and Chou et al (2010) move clocks.

[8] Kitcher (1981), Schurz (1999), Myrvold (2003).

Relativity makes a simple and essential contribution to the location-sharing argument. Something can share times with a physical event in all reference frames only by sharing the physical event's location. Then if qualia share times with their correlates in all reference frames, they must share their correlates' locations. Regardless of whether qualia are physical or nonphysical, the nature of spacetime makes this true.

3 The timing premise

The timing premise is that qualia share times with their correlates in all reference frames. It draws support from sensory and introspective observation of when experience occurs, and from the Markovian structure of all empirically observed causation. Relativity generalizes it to all reference frames.

Sensation and introspection together provide evidence that qualia and correlates share times. When I open my eyes to a clear sky, there is no discernable delay before my blue-qualia occur. I perceive no gap between my eyes being open and my having qualia. I know when my eyes open through tactile and kinesthetic perception, visual perception (which may include the blue-qualia themselves), and however I know my own intentional actions. I know when I have qualia by introspecting their immediate presence, and I know that this introspection is concurrent with events I sense in the external world. While I can't directly observe what's happening in my brain, the correlate must be near the end of the causal sequence from light striking my just-opened eyes to having the blue-qualia. This causal sequence occupies such a narrow time-slice that I can't detect anything between opening my eyes and having blue-qualia. That correlates and qualia are contained within such a narrow time-slice that no passage of time is discernible between them is evidence favoring the timing premise. This evidence isn't conclusive because the time-slice isn't strictly instantaneous – ordinary observation can't distinguish events taking only an indivisible instant from events happening over a tiny but continuous period of time. Sensation and introspection lack the temporal resolution to discern extremely slight increments of time. Still, in confining qualia and correlates to a time-slice so narrow that no further passage of time is observed within it, they raise the probability of the timing premise and justify its commonsense plausibility.

Introspection provides observational evidence for the timing premise because of its reliability about whether qualia exist now. As I look at the sky, I introspect that my blue-qualia exist now, not merely that they'll exist sometime, perhaps in the past or future. Other perceptual modalities similarly represent events as happening now. While I introspect, I can also see that the sky is clear now, and smell flowers. The temporal content of these perceptions justifies my belief that I'm having blue-qualia while the sky is clear and flowers are near. Remembering them justifies my later belief that all these things happened at once.

Skeptics may offer scenarios in which introspection or perception is unreliable about timing, leading to erroneous acceptance of the timing premise. Such errors are unlikely, as introspection is generally reliable about qualia, and the various perceptual modalities are generally reliable about whether events are happening now. For introspection or perception to significantly misrepresent when qualia arise would be a

unusually systematic perceptual error about the timing of seemingly present events. For introspection to misrepresent past qualia as present now would add the implausibility of backwards causation, as past qualia would precede the correlates causing them. Furthermore, positing either form of temporal misrepresentation would provide a less simple picture of reality that explains no additional evidence. Such misrepresentation is conceivable but deeply improbable, like many other skeptical scenarios, and should likewise be dismissed from serious consideration.

This use of introspection is consistent with Michael Pelczar's (2015) view that introspection alone doesn't show that experiences succeed one another.[9] He writes that "as far as our introspective evidence is concerned, 'before' and 'after' are concepts that have no application to conscious experience" (pp. 59–60). Even if Pelczar is right that introspection alone is insufficient to establish the timing premise, combining introspection with evidence from sources like sensation integrates qualia into the timelines in which physical events occur. Introspection that blue-qualia are present while seeing the sky provides evidence that blue-qualia occur while seeing the sky. And since seeing the sky causes blue-qualia, the Markovian nature of causation in this universe suggests that the correlates activated by looking at the sky share times with blue-qualia.

The Markovian structure of all empirically observed causation, a consequence of the dynamical laws governing physical systems, further supports the timing premise. Causation is Markovian when causes have intermediate effects all the way to their final effects. For example, hearing a song yesterday causes me to buy the album tomorrow by affecting my brain throughout the intervening time. In a non-Markovian world, my hearing the song yesterday could cause me to buy the album tomorrow while leaving the whole universe exactly the same today as if I hadn't heard the song. Actual-world macroscopic causation doesn't involve such delays between causes and their effects, with the world exactly the same in between as if the cause hadn't occurred. As David Builes and Michele Odisseas Impagnatiello (forthcoming) write in a recent prizewinning paper,

> is our world Markovian? Subject to certain qualifications, our best physical theories say that the answer is yes: specifying the present state of the universe suffices to determine (or determine the chances of) all future events. This is true in classical theories of particles and fields, quantum theories of particles and fields, and even relativistic versions of both classical and quantum theories. (3)

They explain how Markovian causal structures hold probabilistically in indeterministic causation, between all inertial reference frames in special relativity, and between Cauchy surfaces that constitute times in general relativity. Markovian causation suggests no delay between correlates and qualia. While standard physicalism supports the timing premise by identifying correlates with qualia so that no delay could separate them, dualists typically regard correlates as causing qualia, making delays conceivable. But the absence of such delays in our Markovian world provides inductive evidence that correlates will share times with any qualia they cause.

[9] Pelczar further argues that the blue-qualia don't exist in time. His transcendental phenomenalism treats consciousness as ontologically prior to time. Considering such an awesome view is beyond the scope of this paper.

Dualists might ask how observing Markovian causation of physical things can provide inductive evidence for Markovian causation of nonphysical qualia. It must be conceded that observing Markovian causation of other nonphysical things would provide stronger inductive evidence. Unfortunately, there is no uncontroversial observational evidence about how nonphysical things are caused, partly because we lack uncontroversial examples of such causation. But while observational evidence about causation of nonphysical things is scarce, observational evidence about causation by physical things is abundant. All our best observations of causal relations involve physical causes. Since correlates are physical things, all this empirical evidence supports generalizations about how they cause nonphysical qualia, and suggests that this causation is Markovian.

Induction allows evidence from entirely physical systems to suggest Markovian causation of nonphysical qualia by physical things. The nonphysicality of dualist qualia doesn't exempt their causation from induction. Otherwise, dualists couldn't predict that seeing a clear sky will cause blue-qualia in the future. Induction from cases of physical-to-physical causation generalize to physical-to-nonphysical causation, as the broad projectibility of inductive generalizations makes them useful even about unobserved types of things. Consider previously unobserved fundamental particles like the Higgs Boson and new transuranic elements with atomic numbers over 100. Induction guides their creation in particle accelerators, and supports the correct assumption that they arise through Markovian causation. Experimenters who didn't assume Markovian causation would have to keep their detectors active for an unduly long time to be sure of observing the new things. Evidence from physical systems admittedly provides stronger justification for Markovian causation of new physical things like these than of dualist qualia, but this is merely a matter of degree. Inductive evidence from more similar things is stronger evidence, but inductive evidence from less similar things is still evidence. Markovian causation of physical effects by physical causes therefore provides modest inductive evidence for Markovian causation of nonphysical qualia by physical correlates. Meanwhile, there is no inductive evidence for non-Markovian causation. Modest evidence is better than nothing, so induction suggests that any nonphysical qualia are caused the Markovian way.

These defenses of the timing premise from Markovian causation and from sensory and introspective observation are complementary. The ubiquity of Markovian causation offers general inductive justification for the timing premise. Such inductive justification can be defeated if it conflicts with observational evidence. But sensory and introspective observation in fact support the timing premise, detecting no delays between correlates and qualia, and confining both within the narrowest time-slices observation can distinguish. Induction from all observed causation and the most direct empirical evidence thus agree that correlates and qualia share times. No observational or inductive evidence suggests otherwise.

Replacing the lightning bolts in Einstein's example with qualia illustrates how sharing of times between qualia and correlates ramifies across reference frames. In Chicago, Michelle looks at the midwestern sky and has blue-qualia. In DC, Barack looks at the East Coast sky and has blue-qualia. In the farmer's reference frame, Michelle and Barack look up simultaneously. The rider is going from Chicago to DC, and in his reference frame, Barack looks at the sky before Michelle. This parallels

the order of the two lightning bolts in the original example – the one ahead strikes first. Of course, the important question concerning the timing premise isn't whether Michelle or Barack's qualia happen first, but whether their qualia share times with their respective correlates. Do Michelle and Barack's blue-qualia share times with their respective correlates, in both the rider and the farmer's reference frames?

Relativity requires that if the blue-qualia share times with their correlates in the farmer's reference frame because either identity or causation binds them together, they share times in all reference frames. In the farmer's reference frame, their blue-qualia occur simultaneously. In the rider's reference frame, Barack has both correlates and qualia first, while Michelle has correlates and qualia later. In no reference frame will either Michelle or Barack's blue-qualia precede their correlates. While relativity entails surprising divergences between reference frames, it doesn't allow the causal order in one reference frame to be reversed in another. If correlates precede and cause blue-qualia as dualists might suggest, relativity forbids reference frames where blue-qualia precede their correlates, or where the blue-qualia happen at no time at all. And to address physicalism, relativity obviously won't permit the incoherence of a single event preceding itself. So relativity treats qualia as sharing times with their correlates within every reference frame, making the timing premise true.

To see what would go wrong if qualia had different locations from their correlates, imagine Michelle's qualia being in DC ahead of the rider, while her correlates are behind the rider with the rest of her body in Chicago. Since both her qualia and their correlates share times in the farmer's reference frame, the train's motion towards her qualia will make them exist before their correlates in the rider's reference frame. Physicalism forbids temporal orderings where qualia precede correlates, as it treats qualia as constituted by their correlates, so that both must exist simultaneously. Dualism similarly forbids reversed temporal orderings, as it treats correlates as causing qualia to exist, and having the qualia exist first would be backwards causation. As we see, standard physicalism and dualism reject the possibility of reference frames where qualia precede their correlates. These rival theories of mind therefore must agree with each other and with relativity that qualia and their correlates share locations.

Whether the timing premise and the location-sharing argument will continue to join in Einstein's empirical success remains to be seen. But for now, all available evidence suggests that qualia and their correlates share times in all reference frames. Combined with Einstein's view that things must share locations to share times in all reference frames, this entails that qualia and their correlates share locations.

4 Helping everyone with the mind–body problem

Location-sharing helps physicalists defend the mind-brain identity theory, and helps dualists do without Cartesian selves. While dualists have traditionally regarded qualia as nonspatial, having them share locations with their correlates is an improvement.

Standard forms of physicalism are committed to location-sharing. In identifying qualia with their correlates, the mind-brain identity theory gives qualia their correlates' spatial locations. Jerome Shaffer (1961) objects to the identity theory on grounds that brain processes (B-processes) have locations while mental states (C-states) do not:

> B-processes are, in a perfectly clear sense, located where the brain is, in a particular region of physical space. But it is not true that C-states occur in the brain, or inside the body at all, for that matter… The fact that it makes no sense to speak of C-states occurring in a volume occupied by a brain means that the Identity theory cannot be correct (p. 815).

Shaffer echoes Rene Descartes' (1641/1996) claim that "I am simply a thinking, non-extended thing" (p. 54). But as the location-sharing argument shows, mental states occur in a volume occupied by a brain. Shaffer's premise that C-states lack bodily location is false.

If location-sharing is news to dualists, it's good news. Lycan describes how giving qualia their correlates' spatial locations helps dualists make progress on nine objections including Elisabeth of Bohemia's (2007) interaction problem and Jaegwon Kim's (1999) pairing problem. To solve the pairing problem is to explain which nonphysical qualia belong to which physical body. Location-sharing lets dualists say that qualia belong to the bodies sharing their locations. Lycan's overarching point is that relations between qualia and their correlates are more straightforward if both are in the same place. This isn't to say that giving qualia these locations explains causal interaction or that it makes dualism more plausible than physicalism—Lycan explicitly declares otherwise. But it's better than having the qualia in a weird place, or nowhere at all.

Dualists who accept spatially located qualia can't understand physicality as spatiality, or their dualism will collapse into physicalism. Ned Markosian (2000) warns that they shouldn't use his definition of the physical as the spatially located. If physicality is merely spatiality, and qualia have spatial locations, qualia are physical. Similarly, Jonathan Schaffer's (2009) substantivalism identifies spacetime regions with material objects, so that "there is no distinction between the container and the contained" (p. 134). Since the same regions contain both qualia and their correlates, they'll be identified with these regions and each other as physicalism claims.

Lycan offers dualists a conception of nonphysicality that makes nonphysical qualia in space a coherent possibility: being nonphysical is having different fundamental constituents than non-mental matter. Geoffrey Lee (2007) similarly characterizes dualism as claiming that "some mental events or substances are ontologically fundamental, in the sense that their existence is not constituted by the existence of non-mental events or substances" (p. 341). So when dualists say that nonphysical qualia share their correlates' locations, they mean that fundamental properties not found in non-mental matter are instantiated there, in addition to the correlates' properties.[10]

Location-sharing lets dualists avoid positing Cartesian selves in addition to qualia, answering David Armstrong's two objections to a property dualist bundle theory. Seemingly unaware of Russell's location-sharing argument, Armstrong writes, "the essential point about Dualism is its denial that the mind is a spatial thing" (p. 25). On the assumption that minds aren't in space, he first objects that bundle theory can't explain why particular bunches of qualia across time belong to the same mind – why some qualia are mine and others are yours. Armstrong thinks that attaching the qualia to distinct Cartesian selves is dualists' only option, because "once we are rid of this picture of the mind as literally inside the body, there are only the relations of temporal

[10] See also Dowell (2006), Wilson (2006), Stoljar (2010), and Blumson and Tang (2015) on physicality.

simultaneity and causal connection to bind the mind and the body together" (p. 25). But once we regain the picture of the mind as literally inside the body, spatial relations can bind mind and body together. Qualia can simply belong to the physical body that shares locations with them.

Armstrong's second objection to dualist bundle theory is that "*Experiences are not capable of independent existence*" (p. 21). He asks, "is there not a repugnancy in the idea of a universe which contains nothing but a thought, with nothing to have the thought?" (p. 24). Cartesian selves would provide someone to have the thought. Location-sharing does too.[11] My having qualia is some combination of spatial relations and spatially mediated causal relations between the qualia and the rest of me. My having a nose similarly is some combination of spatial relations and spatially mediated causal relations between a nose and the rest of me. My nose is contiguous with the rest of me, and putting it near a flower causes pleasure-qualia. My pleasure-qualia overlap with the rest of me, and can be caused by putting my nose near a flower. Location-sharing makes having qualia into a simple spatial and causal relation like having a nose.

All standard theories can more easily explain privileged introspective access to qualia if they share locations with their correlates. Jason Megill (2015) thinks otherwise, and argues that spatial locations for qualia make privileged access to them harder to explain. He asks, "Why would one person have access to something that another person has little or no access to if the entity is in space like anything else?" (pp. 924–925). His idea is that anyone can observe things in space, so spatial locations for qualia will undermine privileged access. In fact, spatial locations are often important for explaining privileged access when only one person is spatially positioned to observe the locations. I have privileged access to how things taste in my mouth because my tongue is there and other people's tongues are not. Since my qualia are in my brain and not in other people's brains, only I can introspect my qualia.

The explanatory benefits of spatially locating qualia inside our brains generalize beyond privileged access. To cause our perceptual and emotional experiences, things must have specific spatial relations to us. Who will get experiences of green from a particular leaf, or who will get experiences of pleasure from a particular flower, depends partly on whose qualia will have the right spatial relations to the leaves and flowers. This is true whether the qualia are physical as physicalism claims, nonphysical as dualism claims, or ubiquitous as panpsychists like Philip Goff (2017) claim. All these views connect qualia to events at particular locations. Location-sharing provides what they need.

As we've seen, qualia have more tractable relations to physical things if they share their correlates' locations. The reply to Shaffer defending identity theory shows how spatial relations become more tractable for physicalism. The reply to Armstrong defending bundle theory shows how relations between qualia and selves become more tractable for dualism. The reply to Megill addressing privileged access shows how mind–body relations become more tractable for all theories.

[11] Armstrong allows universals to be instantiated in spacetime, though only derivatively as Magalhaes (2006) discusses. Opponents of bundle theory might understand properties as spatiotemporal if the particulars instantiating them are spatiotemporal. Bundle theorists can opt for Barker and Jago's (2017) elegant view "built on a foundation of properties-in-spacetime" (p. 2971).

Dualism may require the most rethinking in light of location-sharing, but it also has the most to gain. Dualists may previously have agreed with physicalists about what is within space, while believing in additional nonspatial things. Location-sharing frees dualists to reject nonspatial things, but requires believing that space includes something physicalists deny—nonphysical qualia. Lycan and Lee suggest treating the nonphysicality of dualist qualia as their having a fundamentally different nature from nonmental matter. Ontological commitment to additional fundamental entities comes at a price, but dualists must pay this price whether qualia are spatial or not. Either way, causing dualist qualia means their correlates have a causal power irreducible to existing physical law. The question is whether to locate the qualia with the correlates or not. I'll conclude by explaining why locating qualia with their correlates has more empirical support, even apart from the relativistic considerations that give force to the location-sharing argument.

Macroscopic causation is empirically observed to trace a continuous path through space, so any dualist qualia should be expected to share locations with the correlates causing their existence. Causal processes throughout the natural and social sciences hold between things that share locations. Chemical reactions require reagents to share locations, photosynthesis requires light and chlorophyll to share locations, and developing agriculture requires plants and humans to share locations. This is not to say that action at a distance is inconceivable or impossible. We can imagine magic spells instantaneously affecting faraway things. But this kind of magical causation isn't empirically observed among macroscopic things in the actual world. Correlations at a distance occur in quantum entanglement, but the no-communication theorem suggests that this is correlation without causation. Moreover, there isn't good evidence that correlates are entangled quantum entities, with standard views treating them as macroscopic entities like neural structures. For neural structures to cause anything nonspatial or in a faraway place would be more like magic than science.

While empirical evidence tells against spatially discontinuous causal relations, it supports the existence of many fundamentally different entities in space. Contemporary physics recognizes 17 types of fundamental particles, making space a diverse neighborhood where qualia may be tolerated if they don't introduce troublesome new causal relations, or disrupt the other particles' causal explanations. Epiphenomenal qualia have local causes of the standard sort, and don't disrupt explanations. While they differ deeply from their causes, deep differences between causes and effects are common. Hydrogen undergoing fusion in distant stars causes photons to travel space until they activate the visual systems of earthly stargazers, causing the qualia of visual experience. Dualist qualia and visual systems are deeply different, but so are visual systems and photons, and so are photons and hydrogen. The causal chain connecting them nevertheless achieves spatial continuity. A naturalistic dualism of the sort suggested by Chalmers (1996) might treat epiphenomenal qualia as the last among many different links in spatially continuous causal chains.

Location-sharing treats physicalism and dualism as disagreeing about whether additional fundamental entities are needed to explain particular spatially located events, a perfectly ordinary topic for scientific disagreement. Physicalism has the advantage of simplicity. Explaining the existence of consciousness without recourse to dualism's

additional entities would be a great explanatory triumph. But if physicalist explanations fail, dualist qualia are needed, and they fit better in our heads than elsewhere or nowhere at all. As Einstein shows us, qualia really are in our heads, where all the best theories of consciousness need them to be.[12]

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