Christabel Cane*

A Route Back to Temporary Intrinsics for Relational Accounts of Persistence

https://doi.org/10.1515/krt-2025-0022
Received May 13, 2025; accepted November 7, 2025; published online November 17, 2025

Abstract: 'Relativizer' relationalism posits temporary properties as relations that obtain between the object that instantiates them and the times at which they are instantiated. A tomato, for example, that ripens from green to orange over the course of a working week bears the greenness relation to Monday, and the orangeness relation to Friday. David Lewis (Lewis, David. 1986. *On the Plurality of Worlds*. Oxford: Blackwell and Lewis, David. 1988. "Rearrangement of Particles: Reply to Lowe." *Analysis* 48: 65–72) takes 'relativizer' relationalism to imply that all temporary properties are extrinsic, given that the times through which an object persists are distinct from and external to such objects. If Monday and Friday are independent of our ripening tomato, its colour properties do not come down solely to the way that the tomato is, given that they are at least partially dependent upon these times. A great deal of work has been done in the name of defending relationalism. Many of these responses involve a modification of the 'relativizer' view, developing more sophisticated relationalist accounts. This paper will clarify, motivate and defend naïve 'relativizer' relationalism. I begin this task with an examination of the view and Lewis' critique of it within an explicitly relativistic framework. I argue that vestigial Newtonian background assumptions of 'absolute' space and time lend force to the problem, and, concomitantly, put relationalism at an unfair disadvantage. If temporary properties are cast as relations that obtain between objects and 'absolute' times, then it seems dubious that these properties are intrinsic. However, if we understand these properties to be relations that an object bears to the spacetime region it occupies, a natural solution presents itself. I suggest that 'relativizer' relationalists endorse the identity view of supersubstantivalism, which identifies an object with the spacetime region it occupies. This allows these relationalists to recast temporary intrinsics as reflexive relations. Drawing on Rosen's, (Rosen, Gideon. 2010. "Metaphysical Dependence: Grounding and Reduction." In *Modality: Metaphysics, Logic, and Epistemology*, edited by B. Hale, and A. Hoffmann, 109–36. Oxford: Oxford University Press and Francescotti's (Francescotti, Robert. 1999. "How to Define Intrinsic Properties." *Noûs* 33 (4): 590–609) and Francescotti, Robert. 2014. "Intrinsic/

***Corresponding author: Christabel Cane**, Philosophy Department (PhD Student), UCL, London, UK, E-mail: zctycan@ucl.ac.uk. https://orcid.org/0009-0005-8474-7084

Extrinsic: A Relational Account Defended." In *Companion to Intrinsic Properties*, 175–98. Berlin, Boston: De Gruyter) work on intrinsics, I present the case for thinking that these special relations count as bona fide intrinsic properties.

Keywords: temporary intrinsics; relationalism; endurantism; supersubstantivalism; problem of change

1 Introduction

'Relativizer' relationalism posits temporary properties as relations that obtain between the object that instantiates them and the times at which they are instantiated.[1] A tomato, for example, that ripens from green to orange over the course of a working week bears the greenness relation to Monday, and the orangeness relation to Friday. This view is outlined in *§1*, along with the criticism that was most famously levelled at it. Lewis (1986, 1988) takes 'relativizer' relationalism to imply that all temporary properties are extrinsic, given that the times through which an object persists are distinct from and external to such objects. If Monday and Friday are independent of our ripening tomato, its colour properties do not come down solely to the way that the tomato is, given that they are at least partially dependent upon these times.

A great deal of work has been done in the name of defending relationalism. Many of these responses involve a modification of the 'relativizer' view, developing more sophisticated relationalist accounts.[2] This paper will clarify, motivate and defend naïve 'relativizer' relationalism. *§2* begins this task with an examination of the view and Lewis' critique of it within an explicitly relativistic framework. I argue that vestigial Newtonian background assumptions of 'absolute' space and time lend force to the problem, and, concomitantly, put relationalism at an unfair disadvantage. If temporary properties are cast as relations that obtain between objects and 'absolute' times, then it seems dubious that these properties are intrinsic. However, if we understand these properties to be relations that an object bears to the *spacetime region* it occupies, a natural solution presents itself. In *§3*, I suggest that 'relativizer' relationalists endorse the identity view of supersubstantivalism, which identifies an object with the spacetime region it occupies. This allows these relationalists to recast temporary intrinsics as reflexive relations. Drawing on Rosen's (2010) and Francescotti's (1999, 2014) work on intrinsics, I present the case for thinking that these special relations count as bona fide intrinsic properties.

In *§4* I consider some potential issues with how the view I've outlined cashes out modal predication, along with three potential ameliorative strategies. Identifying

1 As named by Ryan Wasserman (2003).

2 See, for example, Haslanger (1989), van Inwagen (1990) and Fiocco (2010).

objects with spacetime regions needn't impoverish our accounts of either if we find counterparts or modal parts plausible. In particular, I favour a part-theoretic explanation of why an object's modal properties might differ from those we'd attribute to the spacetime region it inhabits, and I sketch out how a super-substantivalist could improve their view by supplementing it with modal parts. I conclude that relationalists needn't give up on the simplest version of their view, *or* on temporary intrinsics, *or* on a full and rich range of modally predicated descriptions of objects.

2 Change & Temporary Intrinsics

Relationalism is worth defending because it offers a simple and intuitive explanation of change.[3] Intuitively, objects persist through at least some changes. Tomatoes ripen, hot pokers cool off, and plants and animals grow, age and decay. Necessarily, as a result of these changes, objects instantiate different properties at different times. These are the temporary properties, and they are often mutually incompatible. Before a tomato ripens, it'll be green all over, and after the change, it's red all over. This seems to contravene Liebniz's Law, which states that identity only holds between objects that share all and exactly the same properties. Our early tomato does not share all its properties with its earlier and later instances. The task, then, is to explain how such objects retain their identity across time despite undergoing change.

Relationalism is sometimes taken to be an umbrella term that comprises three conceptually aligned but distinct solutions to the problem of change. This paper will defend the 'relativizers', or those relationalists who hold what Fiocco (2010, 68) characterises as relationalism in its most bald and unsubtle form. 'Relativizer' relationalists posit temporary properties as relations that obtain between the object that instantiates the property, and the time(s) at which the property is instantiated.[4] Our tomato therefore bears a greenness relation to some earlier times, and a redness relation to some later ones.

3 There are, of course, many solutions to this problem. Perdurantists think that our ripening tomato persists through time and change in virtue of having distinct temporal parts that are green and red (see Lewis 1986; Noonan 2001 *inter alia*). Exdurantists identify ordinary objects with their momentary instantiations or 'stages', such that no ordinary object truly instantiates the incompatible sets of properties we associate with change, (like the tomato's being green-all-over and later red-all-over) because they don't exist for more than an instant (see Hawley 2001, Sider 1996). Presentists deny the reality of non-present properties (see Hinchliff 1996; Fiocco 2010). However, a full assessment of these views is beyond the scope of this paper, which is devoted to critiquing an objection to the relationalist solution.

4 See D.H. Mellor (1981, 111–114).

Relativizing constitutes an elegant solution to the problem of change: there is no contradiction in saying that an object bears disparate relations to different individuals. I may be heavier than my houseplant, but lighter than my house. This poses no problem, as the properties of being light and heavy are not incompatible when I am instantiating these properties with respect to different individuals. In much the same way, the tomato can be both red all over and green all over if these properties are understood as relations to different times. Thus the 'relativizer' relationalist reconciles the incongruous earlier and later properties of changing objects.

Miller and Braddon-Mitchell (2007) name a further form of relationalism 'indexicalism'. Advocates of this approach temporally index temporary properties, such that if the tomato is green and then red at times t_1 and t_2, then it timelessly possesses the properties, *green-at-*t_1 and *red-at-*t_2.[5] Lastly, adverbialism is also sometimes counted under the banner of relationalism. Adverbialists do not temporally relativise properties, but their *instantiation*. According to adverbialism, it's the ascription of the tomato's greenness that is temporally qualified, such that it could be said to be green t_1-ly.[6] I will remain neutral on these subtler versions of relationalism[7] and focus on 'relativizer' relationalism (henceforth simply *relationalism*), as it is most squarely targeted by Lewis' formulation of the problem of temporary intrinsics, and is the most disadvantaged when considered against the backdrop of the Newtonian paradigm of space and time that I'll argue Lewis' formulation rests upon.

Lewis (1986, 1988) charges relationalism with being inconsistent with the idea that temporary properties are at least sometimes intrinsic.[8] That is to say, he

5 See Peter van Inwagen (1990).

6 See Sally Haslanger (1989), Mark Johnston (1987) and E.J. Lowe (1988).

7 It's worth noting that the subtler forms of relationalism seem vulnerable to a critique that isn't levelled at the 'relativizers', viz. the critique that the view fails to capture change. Lewis (2003) defends 'relativizers' from this charge, stating that this version of relationalism avoids this pitfall. I agree; the objects of the 'relativizers' *do* change over time: the tomato first bears the greenness relation, then later, the redness relation. Lewis *does* single out another, similar view (specifically Josh Parsons' (2000) formulation of endurantism) that supposedly substitutes "changing temporary intrinsic properties for the permanent intrinsic property of having such-and-such history of change" (Lewis 2003, 39). Parsons (2004, 10) replies that perdurantism doesn't do much better on this front as "on Lewis's account, intrinsic change is a matter of an object's having two qualitatively different temporal parts, where the relationship between an object and its temporal parts is an atemporal one", and goes on to imply that this is a problem for many "broadly eternalist" accounts (2004, footnote 5).

8 Though as Haslanger (1989, 119–120; 2003, 332) notes, perdurantism – Lewis' preferred solution to the problem of change – also struggles to deliver an intuitive account of temporary intrinsics, given that perdurance implies that temporary properties are only properly intrinsic to *temporal parts*, and merely derivatively intrinsic to *whole perduring objects*.

characterises relationalism as being unable to accommodate the intuition that some things change in their properties, and yet those temporary properties still come down to "the way that thing itself, and nothing else, is" (Lewis 1983, 197). If temporary properties are relations between objects and times, he says, they do *not* come down simply to the way that the object itself is, because the relationalist introduces times into the picture.

This may be more easily seen in the context of Lewis' (1983) commitment to defining intrinsics as properties that are necessarily preserved under duplication. Let's return to our tomato that possesses the temporary property of redness[9] on Friday. We can imagine a duplicate of our tomato in another possible world which is exactly similar to ours, except the seeds from which it germinated were sown two days earlier, and so this tomato is red on Wednesday. According to the relationalist, the redness of my actual tomato is a relation that obtains between it and Friday, and the redness of the merely possible tomato is a relation that obtains between it and Wednesday. These properties are not the same. Given that this temporary property is *not* preserved, it cannot be counted as intrinsic. This problem generalises to all temporary properties, given the relationalist's commitment to characterising all such properties as relations that obtain between the object that instantiates them and the times at which they are instantiated. In all such cases, we can posit that there are possible worlds in which the object exists at a different time, and the temporary property will fail to be preserved under duplication.

This is an unsatisfactory result, because it seems that there is no salient difference between objects that temporarily instantiate a certain property, and those that permanently do. There doesn't appear to be any special feature of the redness of my tomato that makes it extrinsic, in comparison to the redness of, say, a smear of paint that holds this property for its entire duration. There seems to be no analytic link either between a property being temporary and extrinsic, or between it being permanent and (at least sometimes) intrinsic. There *do* seem to be good reasons for thinking that some *necessary* properties are permanent: if a ruby is, *by definition*, red, then it makes sense that the ruby only comes into being once it instantiates this property, and must cease to exist, *qua* ruby, once this property is lost. However, necessary properties are not always intrinsic properties, and contingent properties are not necessarily extrinsic ones. It may be necessary for an identical twin to have a sibling, but having a sibling is not an intrinsic property. In much the same way,

9 It might be reasonably be objected that properties I'll employ as examples are extrinsic. Colour, for instance, might be thought to require some observer with a sufficiently sophisticated optical setup to see it. So henceforth when colour (or temperature, or height, or indeed any other property) is mentioned, please take me to be referring to the features in virtue of which, in standard situations, (in the absence of sensory illusions), an object is observed to be such-and-such a colour, temperature, or any other property.

Shaquille O'Neal is contingently 7'1, because he could have been shorter or (even) taller, but intuitively his height is an intrinsically-held property of his.

3 Absolute Space & Time Vs. Spacetime

Lewis' problem has yielded a variety of replies. Many (either implicitly or explicitly) rely on a principle of Haslanger's (1989, 123–124) that I will call the

Temporally relativised intrinsics principle (TRIP): A relational property like being *F* at *t* is intrinsic if and only if whether an object is *F* at *t* depends solely on how that object is in and of itself at *t*, independently of anything else.[10]

The TRIP is certainly intuitive: the fact that times are introduced into the relationalist picture shouldn't disqualify temporally relativised properties from counting as intrinsic, *just* because they're temporally relativised. No, the relationalist's temporary properties don't quite *entirely* come down to the object that instantiates them, but it seems like the properties that come down to the way that the object is – *and* the time(s) at which they are instantiated – should count as intrinsic.

This paper will motivate the TRIP by showing that Lewis' formulation of the problem benefits from an assumption that is far from unimpeachable. This is the assumption that times are distinct from the objects that persist through them. I will offer the relationalist reason to reject this assumption, and thus show that relativising properties needn't imply that these properties come down to anything over and above the objects that instantiate them. I'll argue that the current formulation of the problem of temporary intrinsics seems to implicitly assume an outmoded conception of 'absolute' space and time, which lends the problem more force than it should be understood to have. I'll state the problem for relationalists, offering two options for relativising properties within an explicitly relativistic framework: proper times and spacetimes. I'll reject the first option, showing that the problem remains if properties are relativised to proper times (even if it appears less pressing). This leaves us with the second option, which is to relativise temporary properties to regions of spacetime. This second option presents a unique benefit to the relationalist, because it will constitute the first step towards securing temporary intrinsics.

An examination of the problem should begin from a shared understanding of the relevant concepts. If critique is brought against relativising to times, it'd help to have

10 Wasserman (2003) draws on Haslanger's principle to provide his solution, Fiocco (2010) seems to imply that Haslanger's principle holds when only the present time is considered real (such that objects only ever instantiate one set of relativised properties), and Miller and Braddon-Mitchell (2007) insist that there are no unrelativised properties *simpliciter*, and that therefore deeming only unrelativised properties to count as intrinsics sets too high a bar.

a clear idea of what times *are*. We construct times by ordering *instants*. An instant can be understood as a collection of events that are simultaneous with a particular spatio-temporal point. By layering these simultaneity slices on top of one another, we generate a chronology, such that we can order events depending upon which slice they occupy. The Newtonian paradigm of space and time entails that there is just one set of simultaneity slices, such that there is exactly one chronological ordering of events. This ordering is called *absolute time*. Importantly, absolute times are completely independent of the objects that persist through them and what those objects *do*. For instance, according to the Newtonian paradigm of absolute time, if two ideal clocks are synchronised, they will remain so, even when they are in relative motion.

Lewis' formulation of the problem of temporary intrinsics is advantaged when considered against the backdrop of Newtonian absolute times. The assumption that objects are wholly independent of the times through which they persist goes a long way to motivate the criticism that the relationalist's temporary properties are necessarily extrinsic. To be clear, it is not the *relational* nature of these properties that disqualifies them from being intrinsic. Indeed, some relational properties are intrinsic. Examples of such intrinsic properties are relations that obtain between an object's parts. These 'relational intrinsics' are allowed by Rosen's stipulation that "a property *F* is intrinsic iff whether or not *X* is *F* depends entirely on how things stand with *X* and its parts, and not on *X*'s relations to things distinct from *X*" (Rosen 2010, 112). This definition works on the *assumption* that *Y* is distinct from *X* iff *Y* is not identical with *X* or any of *X*'s parts, so it follows that properties that *X* has purely in virtue of the relations that obtain between *X*'s own parts are intrinsic to *X*. Drawing on Rosen's definition, Francescotti advocates a view of intrinsic properties as wholly dependent on the 'internal properties' of the object that instantiates them. Properties count as internal to an object if their instantiation does not consist in the object's relation to any objects other than that object itself, or (explicitly) its proper parts (Francescotti 1999, 2014). For instance, I intrinsically instantiate the property of having one foot that is larger than the other, which is a relation between two of my parts. My parts are not independent from me, which allows some relations between them to count as intrinsic properties of mine.

Given that a property may be both relational and intrinsic, it is not enough to call the relationalist's temporary properties necessarily extrinsic just because they are relations. If it turned out that temporary properties were relations that obtained between the (proper or improper) parts of the objects that instantiate them, then they'd count as *intrinsic*. Lewis' formulation of the problem of temporary intrinsics relies on the implicit assumption that times can be properly distinguished from the objects that persist through them. The assumption of absolute times therefore weakens relationalism, as the characterisation of objects and times as fully

independent of each other implies that any relations that obtain between them must count as extrinsic properties.

However, it is widely accepted that times are *not* wholly independent of the objects that persist through them. Indeed, the times through which an object persists are revealed to be in an important sense dependent on the behaviour of the object. For instance, two ideal clocks will desynchronise under relative motion. This follows from the theory of special relativity, which implies that there are many different and equally authoritative sets of simultaneity slices. When two synchronised ideal clocks undergo relative motion, they become associated with different sets of simultaneity slices, causing them to measure differing amounts of time to have elapsed.

The 'twin scenario' illustrates this principle. If we have a set of twins, and one stays at home whilst the other travels away from the Earth and back again at high speed, their rates of change will diverge. Let's say that both twins are such that they will develop their first wrinkle at age 35. According to the travelling twin's watch, the Earthbound twin will have aged prematurely, whereas according to the Earthbound twin, the travelling twin's ageing process has slowed. However, we know that this apparent discrepancy is illusory. Each twin experiences a 35-year interval of *proper time* before their first wrinkle, which is to say, an ideal clock would measure a physical quantity of 35 years once it had passed along its worldline, or the set of spatio-temporal points that constitute its trajectory through spacetime. It's just that less of one of these intervals has already passed when they meet up again. The Earthbound twin will claim that over 35 years have elapsed since the time and place of their births, but the travelling twin will disagree. We therefore see that there is no singular, authoritative 'absolute' set of times.

Lewis' formulation of the problem treats relativising to times in the same way that we might treat relativising to external ordinary objects. The idea is that relativising the tomato's greenness to Monday is analogous to relativising its greenness to some independent object *O*, in that both kinds of relativising entail that the relativised property is extrinsic. Lewis' framing of the problem of temporary intrinsics presents statements like 'the tomato is *green* at *t*' as on a par with those like 'the tomato is *greener* than *O*'. Of course, this is exactly what the TRIP contests. This principle implies that the former statement describes an intrinsic property, given that the greenness of the tomato is a relational property that depends solely on how the tomato is in and of itself at *t*, whereas the latter describes an extrinsic property, in that being *greener* obtains between the tomato and *O*, which we've stipulated is independent of our tomato. I think that it could fairly be claimed that the TRIP begs the question against Lewis, given that the former commits to the claim that relativising properties to times *doesn't* preclude their being intrinsic, which is just the negation of Lewis' own statement of the problem. In cases like these, it pays to attend to which view is more plausible within our current context. Contexts that

characterise times as independent, absolute entities lend Lewis' case against temporally relativised intrinsics much more plausible.

But if we recognise the commitment towards making our metaphysics generally consistent with contemporary scientific paradigms, then the relationalist is independently motivated to avoid temporally relativising to absolute times. This leaves us with the question: exactly to *what* should the relationalist relativise? There are two options. The first is to relativise to proper times. This may on the face of it seem to help the relationalist's case. Proper times are not *quite* independent of the objects that persist through them. As demonstrated by the twin scenario, the proper times that determine an object's rate of change are intimately bound up with the behaviour of the object as regards its trajectory, velocity and location. The times through which our tomato ripens are dependent on the tomato's worldline, which is to say, they are dependent upon what the tomato *does*. So, abstracting the problem of temporary intrinsics away from the Newtonian paradigm of absolute space and time and opting to consider it instead within the context of relativistic spacetime makes the TRIP seem much more plausible, and Lewis' position less so.

However, relativising to proper times doesn't quite secure temporary intrinsics. Even though proper times are closely connected to the objects that persist through them, they are not themselves proper or improper parts of those objects. Consequently, Rosen's and Francescotti's accounts of intrinsic properties entail that relations that obtain between objects and proper times are *extrinsic*. The relationalist must look elsewhere.

I submit that the relationalist is independently motivated to avoid relativising to times altogether. This is because it is impossible to properly disentangle space and time, as Minkowski au pined when he said that "space by itself, and time by itself, are doomed to fade away into mere shadows, and only a kind of union of the two will preserve an independent reality."[11] In light of this, the idea that properties are relations that obtain between objects and *times* loses credibility. However, this shouldn't be of great concern to the relationalist: as post-Newtonian physics substitutes times for spacetime regions, so, naturally, should relationalism. I suggest the relationalist relativise their temporary properties to the spatio-temporal regions that are occupied precisely when *and where* those properties are instantiated. This proposal stays true to the relationalist solution to the problem of change, which at base is a commitment to showing that temporary properties are perfectly compatible when located at different times, (and now, spatio-temporal regions). This update retains the original spirit of this simple solution. However, in recasting temporary properties as relations between objects and spacetime regions, this updated version of relationalism aligns more comfortably with relativistic physics, and comes with a benefit.

11 80th Assembly of the German Natural Scientists and Physicians, Köln, September 21, 1908.

4 Updated Relationalism & The Identity View of Supersubstantivalism

This benefit arises from the idea that the relationalist may identify an object with the set of spatio-temporal points it inhabits. This move would not be unprecedented. Marc Lachièze-Rey writes that a physical system (i.e. an object, broadly construed) *is* its own worldline (Lachièze-Rey 2014, 41). This view is echoed by Jonathan Schaffer, who advocates the 'identity view' of supersubstantivalism, whereby material objects are identified with the spatio-temporal regions that they occupy (Schaffer 2009).

If both the identity view of supersubstantivalism and the convention of relativising temporary properties to spacetime regions are adopted, the problem of temporary intrinsics loses all force. If temporary properties are relativised to the regions of spacetime that the object occupies when and where it instantiates those properties, the supersubstantivalist can identify those regions with the object itself. Once it is established that this region of spacetime just *is* that object, we can see that temporary properties are just reflexive relations. In light of this development, temporary properties appear more akin to intrinsic relational properties, such as that of having one foot bigger than the other, rather than extrinsic relational properties, like that of being lighter than one's house. If Rosen and Fransescotti are to be believed, then the relations that obtain between the parts of an object are intrinsic to that object. We should also, *certainly* think that properties that an object instantiates solely in virtue of its reflexively-held relations are intrinsic to that object too. I'm intrinsically the same height as myself, because my being the same height as I am comes down entirely to the way that I am, and nothing else. A perfect duplicate of me must necessarily also instantiate this very same reflexive property. In much the same way, the properties that are relativised to the region of spacetime with which an object is identified will be intrinsic to that region of spacetime, and hence the object itself. If I have two tomatoes that are qualitative duplicates, they *will* share all and exactly the same temporary intrinsic properties in virtue of instantiating the same pattern of reflexive relations. Both will have, for example, the spatio-temporally relativised (and thus reflexive) property of being green, then the spatio-temporally relativised property of being red. This remains true even if each is distant from the other, inhabiting spatio-temporal regions that are separated by time, space, or even within different possible worlds.

The relationalist has good reason, then, to endorse the identity view of supersubstantivalism, in that it motivates the TRIP and thus allows relationalists to safely

relativise temporary intrinsic properties.[12] But even if this were not the case, the identity view would still complement a relationalism that relativises to regions of spacetime. At this point, it will be helpful to consider a distinction from Skow, who differentiates between modest and radical supersubstantivalism (Skow 2005, 66–8). The radical view is less popular, because it entails that spacetime only instantiates topological and geometrical properties on the fundamental level. The burden is therefore on the radical supersubstantivalist to explain how properties like colour, density and electric charge can be reduced to these more fundamental properties. It isn't unsurprising therefore that Schaffer, the main proponent of the identity view of supersubstantivalism, advocates the moderate view, which allows spacetime a more varied range of properties, asking "[o]nce one has pinned the geometrical and mereological properties directly onto the receptacle, why stop there? Why not also pin the masses and charges onto the receptacle as well?" (Schaffer 2009, 139). This metaphor of 'pinning' properties to spacetime regions aligns well with the updated relationalist's project of relativising properties to these regions. Though my relationalist is, I think, free to embrace either end of the spectrum between radical and moderate supersubstantivalism, the latter seems to be a better fit. If the plan is to relativise temporary properties to spacetime regions, it is best to think of these regions as the kind of things that can straightforwardly instantiate those properties.

5 The Modal Problem

The adoption of the identity view of supersubstantivalism is not without its problems, however. As Hawthorne points out, regions of spacetime are unlike objects in that regions of spacetime seem to have their spatio-temporal extents necessarily (Hawthorne 2008, 265). Imagine a tomato that reaches a maximum diameter over a span of 14 days, after which it is destroyed. It seems that we can truly state that the tomato could have been bigger if it had existed for a longer duration, or wouldn't have been quite as girthy if it had existed for a shorter interval. On the other hand, it doesn't seem that a certain region of spacetime could have extended further in its temporal or spatial dimensions, given that we identify regions precisely by their boundaries. A large region of spacetime couldn't have been a smaller one – some small region just seems to be a *different region* compared to some larger one. Similarly, we might reasonably believe that an object could have been such that it had exactly the same dimensions, but yet existed in a different time and place than it actually did. But again, it seems entirely wrong to think that a spacetime region could

12 In addition to the benefits that Schaffer (2009) claims *anyone* might reap from adopting the identity view of supersubstantivalism.

have existed in an entirely different spatio-temporal location without just becoming an entirely different region. In identifying objects with spacetime regions, therefore, the identity view of supersubstantivalism seems to imply that objects have their spatio-temporal extents and locations essentially.[13]

This problem disappears when the composition view of supersubstantivalism is adopted. It is less onerous than the identity view, given that it merely requires that objects be *constituted by* the regions of spacetime that they occupy. This leaves it open for this supersubstantivalist to retain the distinction between material bodies and spacetime regions, such that objects merely *composed* of spacetime might instantiate properties that differ from those instantiated by the regions that constitute them. Emily Thomas (2013, chapter 3) provides credible evidence that Newton held the composition view, at least in his early life.[14] However, adopting the constitution view would loosen my relationalist's grasp on temporary intrinsics, which would be best secured if posited as reflexive relations. This is not an option for the relationalist who endorses the constitution view. They *can* plausibly claim that their temporary properties will sometimes be intrinsic to the spacetime regions their bearers occupy, given that those properties come down entirely to the way things are in those regions. However, distinguishing between the objects that instantiate the temporary properties and the regions those objects occupy will entail that the relativised temporary properties will be relations that obtain between two distinct entities. Unless the relationalist takes the further step of identifying objects with the regions they occupy they lose the leverage on temporary intrinsics that is gained from positing them as relations an object bears to itself.

However, those who endorse the identity view of supersubstantivalism needn't accept that objects possess their spatio-temporal extents essentially. Moulton (2016) counters Hawthorne's critique by pointing to two possible solutions. I will reject his first offering, remain neutral on the second, and advance an alternative. The simplest solution Moulton offers is to deny that spacetime points have their metric relations essentially. He points out that this view is motivated by general relativity, which implies that the metric structure of a region of spacetime changes depending on whether or not it is occupied by matter (Moulton 2016, 116). Given that a region's spatio-temporal extent varies with its metric structure, this strategy responds to

13 This is reminiscent of van Inwagen's (1990) critique of perdurantism. He argues that the perdurantist must either endorse counterpart theory or accept that objects, construed as spatio-temporally extended worms, have their temporal extents essentially. As we shall see, we can also supplement the identity view of supersubstantivalism with counterpart theory so as to escape the implication that objects have their temporal extents essentially.

14 Though it's worth noting that the identity view also boasts historically weighty figures as adherents, including Descartes, Spinoza and Alexander (Duerr and Calosi 2021, 13,790).

Hawthorne's problem by denying the premise that spatio-temporal regions have their spatio-temporal extents essentially.

However, I do not think that those who endorse the identity view of supersubstantivalism should make this response. It is not obvious that the sense in which a region of spacetime could have had a different spatio-temporal extent (in virtue of having a different metric structure) quite translates to the claim that a material object could have had a different spatio-temporal extent. Surely when we say that our tomato could have been bigger, we mean that it could, at least in principle, have filled more spacetime than it actually does. This is to say that it could have inhabited an entirely different spatio-temporal region than the one it actually inhabits. This simple solution thus fails to deliver a sense in which this can be true.

Moulton then suggests that the supersubstantivalist who subscribes to the identity view could become a counterpart theorist. According to this view, it is possible for an object to be *F* iff it has a counterpart that instantiates that same property, and an object is necessarily *F* iff all of its counterparts are *F* (Lewis 1986). A counterpart of an object is an individual that resembles that object in some salient way. We invoke different counterpart relations depending on the features of the object that are important within a given context. Lewis explains that we can, depending upon the context, pick out some collection of features of an object that "somehow selects the counterpart relation that is to be used to find the counterparts of the thing denoted by that term" (Lewis 1971, 209). For example, if you wish to evaluate whether it would be possible for me to have jumped over a high fence, you will select my counterparts that have bodies that resemble mine. This will involve using the *bodily counterpart relation*. If you're more concerned as to whether I could have solved a fiendish crossword puzzle, the relevant counterparts are those that resemble me in their intellectual capacities. These counterparts will be picked out by an *intellectual counterpart relation*. When supplemented with counterpart theory, the identity view of supersubstantivalism has no problem making claims like 'the tomato could have been bigger' true. We can accept that the tomato is identical to the region of spacetime that it inhabits, but we only attend to its counterparts that are picked out by the *tomato counterpart relation*, rather than the *spatio-temporal region counterpart relation*.

A distinct but related solution to Hawthorne's problem would see the supersubstantivalist adopting the view that objects have modal parts, rather than counterparts.[15] The modal parts view implies that an object is possibly *F* iff it has a modal part that is *F*: in modal parts talk, our tomato could have been bigger if it has some modal part in another possible world that is bigger. Marrying modal parts with the

15 See Meg Wallace (2014a, 2014b & 2019), Martin Vacek (2017), Andrew Graham (2015) and Takashi Yagisawa (2010) for recent elaborations on this view.

identity view of supersubstantivalism would involve committing to the idea that ordinary objects have many parts in many possible worlds, and that while each worldly part is identical to the spacetime region it inhabits, no part is identical to another. This accommodates the intuition that objects *could have* inhabited regions of spacetime that they do not actually inhabit, because they have modal parts that do. However, it doesn't compromise the supersubstantivalist's commitment to identifying an object with the region it occupies.

Meg Wallace (2014a, 2014b, 2019) and Andrew Graham (2015) discuss coincidence cases, where, say, an actual statue is identical to the actual lump of clay with which it coincides. However, the lump of clay *could* have been formed into something else, and so it has a modal part in some other possible world that coincides with, say, an amphora. The statue could not have been an amphora, and so the statue doesn't share this particular modal part with the lump. By the same token, the statue, but not the lump, could have been cast in brass rather than clay, and so the statue has some modal part that the lump lacks because it is made of brass. Wallace and Graham make sense of these differing modal properties by positing statues and lumps as modally extended fusions[16] that overlap in some – but not all – worlds. The supersubstantivalist can use the same strategy to accommodate our intuition that objects have some modal properties that spacetime regions lack. When a worldbound object overlaps a spacetime region, it is identical to that region, *within that world*. However, in much the same way that two apartments may share a communal hallway, but fail to share their other rooms, so the object and the spacetime region will fail to share all their other modal parts at all other possible worlds. The fact that the object and the region differ in their modal parts explains the differing modal properties: the object presumably could have differed in a number of ways that the region couldn't have, and so the object, presumably, has many modal parts that the region lacks.

Jiri Benovsky (2006, Part II, Chapter 5) makes a particularised version of this argument when he observes that a commitment to *modal* parts can help us make sense of the idea that we might have lost some of our *spatial* parts. Consider the spatial part of me that occupies the entire spatio-temporal region that my body occupies, except for my right hand. We can call that part *P*. I'm quite clumsy, so there's a fairly close possible world, *W*, in which I accidentally lose my right hand.[17] Let's call this one-handed, merely possible version of me *M*. This raises a question: am I identical to *M*, or is *P*? If identity requires indiscernibility, then it would seem that *P* is identical to *M*. I have two hands, but *P* only has their left one, and so *M* is *P* in another possible world. But if this is true, it isn't really me that's represented in *W*,

16 Or, to use Yagisawa's (2010) term, 'hyperworms'.

17 This example builds on that advanced by Mark Heller (1984). Yagisawa (2010, chapter 5) also discusses Heller's 'Body-minus' argument when he motivates his version of the modal parts view.

and so the sense in which I could have lost a hand (or indeed, have lost or gained *any* parts, or have differed in my spatio-temporal extent *at all*) is lost. However, if we identify *M* with both myself and *P*, then by the transitivity of identity, I am identical to the part of me that lacks my right hand: an absurd conclusion.

But the modal parts theorist furnishes us with a robust sense in which I might have differed in my spatio-temporal extent. I have many modal parts of many different shapes and sizes located in many different possible worlds: I am a *modal perdurant*. The same is true of *P* – it can also be found within many worlds. In some worlds, like *W*, *P* and I are identical because we completely overlap in virtue of sharing all our worldly parts, but in the actual world, I am bigger than *P* in virtue of having a hand-part that *P* lacks. So, *P* and I are distinct when we are considered *qua* modally extended wholes, but we are not when the domain is restricted to the world(s) we coincide within. Those that endorse the identity view of super-substantivalism may adopt the same ameliorative position. The tomato is identical to the spatio-temporal region it occupies in the actual world, because the two overlap completely. However, there are worlds where the region and the tomato fail to overlap, and are as a result distinct. In these worlds, the tomato has modal parts that are identical to smaller or larger spacetime regions than the one it actually occupies. The tomato could have therefore been smaller or larger than it actually was.

The modal parts view can also make sense of the intuition that objects could have had different spatial locations, or began (or ended) at earlier (or later) times than they actually do.[18] Consider the tomato that grows from seeds that were actually sown on Friday, but *could* have been sown on Wednesday. My relationalist can accommodate this possibility by stipulating that the tomato has (at least) two modal parts. The actual part is identical to a region of spacetime that is located two days later than the region of spacetime that is identical to the merely possible part. The parts themselves are distinct, and so are the spacetime regions that my relationalist identifies them with. But the fact that they stand in the modal co-parthood relation to one another makes it true that each of them could have come into existence at a different time than they actually do.

Admittedly, the modal parts solution might not be the best fit for the relationalist defended here. It's unlikely that relationalists will endorse temporal parts,[19] which are arguably much more plausible from a common-sense view than their modal

18 Thanks to the anonymous reviewer who raised this idea.

19 Though as Forbes (2025, 60–1, 54) attests, endurantists needn't necessarily reject temporal parts. They may instead understand their view to be compatible with ordinary objects having temporal parts, so long as those objects satisfy Haslanger's (2003) proper subject of change condition, such that when they undergo change, they instantiate both sets of properties held before and after the change.

analogues.[20] However, a relationalist who endorses the identity view of supersubstantivalism would not violate logical consistency in adopting modal parts, and so this bundle of views deserves mention. What matters is that the relationalist who adopts the identity view of supersubstantivalism needn't sacrifice modal predication about the spatio-temporal extents of objects in order to secure temporary intrinsics, if they are happy to adopt either counterpart theory or the modal parts view.

6 Conclusions

The relationalist can, therefore, preserve both the intuition that some intrinsic properties are held only temporarily, and at the same time keep fast their commitment to relativising temporary properties. They can pull this off in two steps. First, they relativise to regions of spacetime. The relationalist is independently motivated to do this, because the Einsteinian paradigm recognises spacetime as more fundamental than times. I've argued that this update brings relationalism into alignment with contemporary scientific theory without compromising on the core commitments that constitute this view.

Second, my updated relationalist should adopt the identity view of supersubstantivalism. This allows them to recast temporary intrinsic properties as reflexive relations, given that they obtain between the objects that instantiate the properties and the regions those objects inhabit – which, on the identity view, are understood to be identical to the objects themselves. It is my view that adopting the identity view of supersubstantivalism proceeds naturally from my updated relationalist's commitment to relativising to spacetime regions and the intuition (formally expressed in the TRIP) that some relativised temporary properties are intrinsic. The identity view bridges these two concepts by implying that relations that obtain between an object and the region it inhabits are *internal*, and thus qualify as intrinsic, at least according to Rosen and Francescotti's definitions.

20 However, it's also worth noting that modal parts fit no worse into the endurance picture than counterparts do. As endurantists, relationalists will have already rejected the notion of *temporal* counterparts. As Patrone (2020) notes, the temporal analogue of counterpart theory is not endurantism but *stage theory*, and the spatial analogue of these theories is a radical form of mereological nihilism. Patrone calls the combination of these three views 'pixelism'. It can be contrasted with 'five-dimensionalism', which entails that ordinary objects have spatial, temporal and modal parts. My updated relationalist cannot hope to align their temporal and modal approaches quite so elegantly and yet accommodate many of our modal intuitions. They are already committed, by virtue of their relationalism, to temporal endurance, and should pick either a part-theoretic or counterpart-theoretic modal view, or else forsake a great number of the modally predicated claims we are wont to making in everyday discourse.

Finally, my updated relationalist isn't forced to accept that the modal profiles of objects are much less interesting than we customarily think. Identifying objects with spacetime regions doesn't entail that such objects take on all and only the modal properties of those regions, if either counterparts or modal parts are plausible. I think that both, and especially the latter, are. However, I leave it to the 'relativizer' relationalist to weigh the relative merits of this set of suggestions against biting Lewis' bullet or adopting a more subtle version of their view. But it is worth noting that the view I offer may be taken up by the relationalist who is sufficiently anxious to preserve both this radical and elegant version of relationalism, *and* temporary intrinsics, with little to no cost to their modal account of objects.

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