Modal Perdurantism: An Integrated Modal and Temporal Ontology

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I, Christabel Henrietta Stewart Cane confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

ABSTRACT

I will explore a metaphysic that integrates space-time and possibility, advocating a unified approach to spatio-temporal and modal ontology.

Specifically, I propose that we should explain change over time and difference across possible worlds with analogous strategies. I will endorse perdurantism, or the notion of 'temporal parts', and argue that we should also endorse 'modal parts': that is, just as objects exist across spacetime in virtue of having parts located at different times, so they exist across modal space by having modal parts located at different possible worlds. The aim of my project is, therefore, to show that it is, (contra Ted Sider) plausible to wed temporal perdurantism to its modal analogue, just as he weds his stage theory to its modal analogue of counterpart theory, and just as it is possible to wed endurantism to the modal theories of Kripke, McDaniel, Yagisawa and the actualists.

I will argue that modal perdurantism, in virtue of making sense of our modal claims and providing as good a response to the Humphrey objection as possible, is the best modal theory on offer. This reason, twinned with the reason that perdurantism is the best account of how objects persist because it provides the best answer to the problem of temporary intrinsics, constitutes enough evidence to take seriously a dual integrated modal and temporal perdurantism. I will also extol the virtue of holding an integrated modal and temporal metaphysics, and show that doing so in the case of perdurantism brings with it the gift of a conceptually consistent solution to the problems of temporary and permanent coincidence.

CONTENTS

IMPACT STATEMENT

The philosophy of modality is highly contested but is central to various branches of philosophy, including those of mind, epistemology, metaphysics and language, in addition to being influential in linguistics and computer science. Modal perdurantism, the theory I put forward, promises to shed light upon several long-standing philosophical problems, (especially regarding temporary and permanent coincidence).

Indeed, the final section of my thesis is dedicated to an account of how coincident objects may be distinct (why, for example, a statue is not identical to the lump of clay that composes it). Sider holds that the statue and the lump cannot be thought of as two distinct objects, because their properties are non-additive when they coincide (the statue-lump is not twice the mass of the lump, does not smell twice as potently or create two visual impressions etc). However, the notion that composition implies identity is highly disputed, because coincident objects often have different properties. These include historical properties (the lump is older than the statue-lump), and modal properties, (*if* the statue-lump was squashed, the lump would persist; the statue would not).

Further research into this area that takes advantage of a hybrid modal and temporal perdurantism promises to provide the apparatus for distinguishing objects that temporarily coincide (in virtue of their sharing some but not all of their temporal parts) and also those that permanently coincide (in virtue of their sharing some but not all of their modal parts), thus contributing to this enduring and salient debate.

INTRODUCTION

Ordinary objects undergo changes. I'm very different to myself as a baby, yet intuitively I'm still the same person. In much the same way, ordinary objects could have been different. I might have moved to Canada to join the mounted police, yet my very statement of this possibility takes for granted that the person who moved to Canada would still have been *me*. It is a fairly established modal concept that the counterfactual "I could have been a Mountie" is cashed out in terms of there being 'possible worlds' which may only differ minimally from the actual world, except for the fact that there, I am a Mountie. I propose that we should explain change over time and difference across possible worlds with analogous strategies.

I turn my attention first to how objects may differ over time. In order to answer this, I survey ontological views of the past, present and the future, arguing that special relativity shows us that, contra presentism and growing universe theory, it is not the case that merely present objects exist, nor merely present and past objects exist, but that objects timelessly exist in the past, present and future. Section *1.1.3* therefore concludes that the eternalist picture shall be assumed throughout the remainder of the thesis.

This allows us to precisify the question of how objects may differ over time. Assuming the eternalist picture, the import of an object changing is that there are multiple (existent) instantiations of the same object which do not share all and exactly the same properties. Any assertion of an identity relation between these instantiations contravenes Leibniz's Law, which is unacceptable. In section *1.2* it will be argued that the problem of temporary intrinsics is solved by the adoption of perdurantism, which explains cross-temporal identity through appeal to the idea that persisting objects have 'temporal parts', which exist at different times of an object's duration.

Having established the perdurantist solution to how objects differ over time, I turn my attention to how objects may differ according to counterfactual scenarios. My second chapter introduces counterpart theory, which explains the truth or falsity of statements like 'I could have been a Mountie' with reference to my having a counterpart in another possible world who is a mountie.

I shall note, in my third chapter, that perdurantism and counterpart theory, though both held by David Lewis, provide heterogeneous answers to the questions of how objects may differ from themselves over time and according to counterfactual scenarios. This inconsistency, originally outlined by Ted Sider, prompted him to introduce a counterpart-theoretic approach to persistence, which posits that ordinary objects are instantaneous temporal parts, or 'stages'. Naturally, this metaphysic introduces a drastically altered model of persistence and change, which I critique within sections *3.1.2-3.4.3* and eventually conclude is untenable.

However, Sider's attempt to bring his temporal picture into alignment with his modal one should be applauded. The principle that a single approach to answering how objects may differ from themselves should do the philosophical work of solving how objects both do this over time and according to counterfactual scenarios is a virtuous one. It is with this principle in mind that I briefly explore another temporal and modal pairing. I therefore briefly take up endurantism, and examine the ways in which the endurantist might align her modal metaphysics with her temporal stance.

Chapter four will show that Kripke's thesis of brute identity, along with Yagisawa's 5+-dimensional hyperworm theory and McDaniel's modal relationalism all parallel eternalist endurantism. Additionally, actualism will be introduced as the modal analogue of presentism. Just as the presentist avoids the problem of temporary intrinsics by holding that an object only exists at one time, (and that all other times are unreal), the ersatz-worlder avoids the problem of difference in accidentals by holding that an object only exists in one world, (and that all other worlds are unreal). As shall be made clear at the close of this chapter, I do not advance this temporal and modal endurantism pairing in order to put it forward as a live alternative to the pairing of stage theory and counterpart theory, as endurantist-style modal explanations of how objects differ from themselves imply a contravention of Leibniz's Law just as inevitably as temporal endurantism does, and relationalist-style modifications to the theory made by McDaniel (or indeed any hypothetical adverbialist-style modifications) fail to ameliorate this problem in a satisfactory manner.

Sider saw the conceptual inconsistency between Lewis' modal and temporal answers to the question of how objects may be different from themselves. Sider started from counterpart theory and fashioned a temporal metaphysic to match. My fifth chapter attempts much the same project, but assumes Lewis' temporal picture as its starting point. To this end, I sketch what a 'modal perdurantism' will look like. In brief, it cashes out the truth or falsity of statements like 'I could have been a Mountie' in terms of my having a part in another possible world that is a Mountie. Like the modal endurantism analogues, modal perdurantism implies that ordinary objects are trans-world entities, but unlike these theories modal perdurantism does not inherit the problems inherent to positing an identity relation between modally distant objects. This is because just as worm-theoretic perdurantism states that every temporal part of an object is related to every other temporal part of that object in virtue of the co-parthood relation, modal perdurantism states that every modal part (or 'phase') of an object is related to every other phase in virtue of the co-parthood relation.

Finally, I shall explore how the temporal and modal perdurantist should think about coinciding objects. To this end, chapter six will introduce the stage theoretic and then orthodox perdurantist solutions to the problems of temporary and permanent coincidence. These will be shown to be problematic, before a solution that makes use of an integrated dual temporal and modal perdurantism will be sketched and put forward.

CHAPTER ONE: WORM-THEORETIC PERDURANTISM

1.1 An Argument for Eternalism

There exist three main temporal ontologies: eternalism, presentism and growing universe theory. According to eternalism, all moments of time are on the same "ontological footing" (Balashahov & Jannssen, 2003, 328), and there is no existential difference between the past, present or future, as the objects that populate these three kinds of spatio-temporal regions are all taken to be equally real. On the other hand presentism, an arguably more parsimonious ontology, dictates that the only objects and events which exist are those which are located in the present (Markosian, 2016). An ontology somewhere between the two, growing universe theory, states that only present and past objects, events and times exist. The first section of this chapter will argue that relativistic physics indicates that presentism and growing universe theory are untenable, as both have as a feature of their account an 'absolute present'.

Having established that the eternalist picture will be assumed henceforth, the second section will explore how objects inhabit the block universe. Two competing accounts will be considered, beginning with endurantism. Though it is often thought that endurantism is best paired with a presentist ontology, the idea that some objects are wholly present at multiple real times will not be dismissed outright, and the relationist and adverbialist solutions to the problem of temporary intrinsics will be discussed. However, since I argue that as these accounts are unable to capture real change, they will be set aside, and eternalist perdurantism (specifically worm-theoretic perdurantism) will be adopted.

1.1.1 Special Relativity

The very project of distinguishing a present from the past and the future is problematic in a relativistic universe. According to special relativity, no absolute simultaneity relation between events can be sustained. This is a challenge to presentism, as the notion of a present requires a relation that defines which events populate it. This relation is classically taken to be an equivalence relation, meaning that it is reflexive, symmetric, and transitive (Sider, 2001, 52). However, objects in motion undergo relativistic effects, the most salient of which is time dilation, or the slowing of time for an observer within a particular reference frame. This causes observers to judge others in different reference frames to be moving at different rates of time. These effects become more pronounced the closer the relative velocities between reference frames gets to c, or the speed of light. Time dilation means that spatially separated events happen at different times for different reference frames. Given that there is no privileged reference frame, no privileged simultaneity is indicated by relativistic physics.

Consider Norton's (2007) example of a man at the centre of a platform. At each end of the platform photons a and b are emitted. The photons, which travel equal distances relative to the platform, hit either sides of an ideally thin pane of glass in front of the man, causing him to judge them to be emitted simultaneously. According to another frame of reference, a woman observes the platform

moving in the direction of the *b*-emitter (away from the *a*-emitter). There is no dispute over whether events occurring at the same space-time point are simultaneous (only distant simultaneity is contested), so the photons will be judged to hit the glass simultaneously. In order to compensate for the extra distance that *a* must travel so the glass may be hit by both *a* and *b* simultaneously, she observes *a* as being emitted before *b*. Therefore special relativity implies that spatio-temporally distant events, such as the emitting of *a* and *b*, (but not their hitting the pane) are only simultaneous relative to specific reference frames.

The present is taken to be a particular set of events that occur simultaneously, and different sets of events are simultaneous relative to different reference frames. Therefore different reference frames generate different versions of the present for observers travelling at different velocities. If the presentist thesis presupposes that we "all share a global common now" (Callender, 2012, 5), it is the burden of the presentist to specify a reference frame to which we are all supposed to defer, and provide a satisfactory explanation as to why we should follow their choice.

1.1.2 Minkowski space-time

Minkowski space-time diagrams represent how a differentiation in reference frame will correspond to a variation in the set of events which will be observed to occur simultaneously. Minkowski space-time is a four-dimensional "catalogue of events that can causally interact" (Norton, 2007). For any space-time point in the universe, represented as the origin, the spatio-temporal region containing the events that could have causally interacted with any event at the origin is given by the interior of a backwards light cone, and the spatio-temporal region containing the events that could causally interact with any event at the origin in the future is given by the interior of a forwards light cone.

An object at rest (according to a particular reference frame) has a particular worldline,[1] (or a path that traces its progress through space-time), that travels parallel to the time axis, diagrammatically represented as upwards through the light cones. Subjects who are at rest observe a slice of space-time points orthogonal to the time axis as simultaneous. These slices are referred to as hypersurfaces of simultaneity and are the subject's experiential present. Hypersurfaces of simultaneity 'foliate' space-time, meaning that they give an ordering of space-time points. However, objects in motion generate different sets of hypersurfaces (which will not be orthogonal to the time axis) depending upon their velocity. This generates different subjective presents for observers travelling at different velocities. Theoretically any path taken by an object through the past light cone is allowed, (ignoring the physical constraints as regards getting up to speeds approaching the speed of light), and so too are all the corresponding hypersurfaces allowed, so long that they can be drawn without intersecting with the light cones. A plethora of alternative presents emerges.

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[1] or worldtube for non-idealised non-point-like objects, (i.e. objects that take up space).

Whilst it is possible to set up systems whereby different observers generate one and the same simultaneity hypersurface, the vast majority of objects and their trajectories are not systematized this way. For example, different people on different sides of the globe are travelling at different speeds relative to each other: faster towards the equator and slowest at the poles. Bacon points out that a person in Japan has a different reference frame and therefore hypersurface of simultaneity to a person at the North Pole (Bacon, 2016, 4). However, we would intuitively think that each reference frame is metaphysically equal and hence also each hypersurface of simultaneity is too. Bacon describes this position as 'hypersurface egalitarianism' (*ibid*).

If there is no absolute simultaneity, no 'present' event can be rightly said to be occurring at the same time as another independently of reference frame, and if events are simultaneous only within a given reference frame, no privileged present can be established. We define the present as a special class of events to which we assign the same temporal location (Godfrey-Smith, 1979, 236). Therefore, if we cannot assign reference frame-independent temporal values to distant events, we cannot define which events belong to a reference frame-independent present. It seems then that presentism and growing universe theory seemingly must deny hypersurface egalitarianism, if they are to avoid the implication that different trajectories generate their own unique realities.

1.1.3 The simultaneity relation

The simultaneity relation, understood relativistically, is no longer transitive or symmetrical across different reference frames. It does however remain reflexive, as all space-time points are simultaneous with themselves relative to all reference frames. However, the notion of a privileged present depends not only upon the reflexivity but also the symmetry and transitivity of the simultaneity relation. If observer 1 judges event *A* to be simultaneous with *B*, it is not necessarily the case that observer 2, relative to a different reference frame, will judge *B* to be simultaneous with event *A*. Similarly, if observer 1 were to judge *A* to be simultaneous with *B*, and observer 2 were to judge event *B* to be simultaneous with event *C*, then it is not necessarily the case that either observer would judge event *A* to be simultaneous with event *C* (Putnam, 1967).

This problem may be solved by denying hypersurface egalitarianism and appealing to one particular reference frame and particular space-time point, and asserting that all and only space-time points that are simultaneous relative to this reference frame and specified space-time point should count as the present. However, this approach is, as Sider points out, completely unmotivated by our scientific picture of the world (Sider, 2001, 48).

The incongruity generated by differing relativistic reference frames is most damaging to the presentist and growing universe theorist, as these ontologies imply that different observers with unique reference frames will disagree about the very existence of events. Indeed, the presentist will in some cases have to conclude that two observers have attached to them entirely different realities.

Two attempts have been made to modify our conception of simultaneity such that some form of presentism might remain tenable. Reichenbach argues that events are 'simultaneous' if they cannot be causally connected, (Reichenbach, 1958) whereas Godfrey-Smith proposes that spatially distant events are 'simultaneous' if it is possible that they may causally interact via an electromagnetic signal. Godfrey-smith specifically talks of the possibility of electromagnetic signals being sent and received by hypothetical agents at distant space-time points, describing the set of objects that may be described as 'simultaneous' with any space-time point as those an observer at this point may receive such signals from (Godfrey-Smith, 1979). For example, if there is a flash at space-time point a, and I am taking a photograph at space-time point b, such that the light from a reaches b just in time for the light from a to be captured on film, the two events are said to be simultaneous.[2]

According to Godfrey-Smith, an observer at space-time point a would not observe the taking of the photo at b, so this new 'simultaneity' is not symmetric. This version of presentness is also intransitive. If a person standing on Earth at space-time point d observes a flash from a headlamp emitted at space-time point e and light from the Moon emitted at space-time point f simultaneously, an observer on the Moon at space-time point f would not observe the headlamp light emitted at e and would therefore not consider themselves to be co-present with it.

According to Reichenbach on the other hand, event a is not 'simultaneous' with event b, but it is so with every event that occurred at that space-time point that happened before a. This includes my fumbling with my camera, my arriving at b to take the photograph, right back to whatever was happening at that space-time point at the time of my birth, at the times of my ancestor's births, and at any time before the human race or even life evolved. In short, according to Reichenbach, a is 'simultaneous' with a catalogue of events that stretches back into the beginning of time.

Both Reichenbach's and Godfrey-Smith's reformulations constitute extremely bizarre notions of simultaneity, which imply that the present consists within a very strange partitioning of spacetime, whereby regions of spatio-temporal points are 'co-present' with each other relative to a particular space-time point, which either "flagrantly violate[s] the idea that there are no privileged observers" or implies that each space-time point generates its own unique present (Putnam, 1967, 246).

Whilst it is certainly true that each space-time point generates its own experiential present, meaning that differently located individuals will experience reality differently, this should not convince us that there is are infinitely many different realities. Furthermore, prejudice against the idea of this infinite plurality of competing realities should not force us to arbitrarily pick one as 'absolute'. Rather, we must recognize that any ontology which relies upon the notion of absolute simultaneity is unmotivated on physical grounds, and take up eternalism.

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[2] In terms of Minkowski space-time, events just on and just inside the lightcone are present with the origin (i.e. time-like and light-like separated events).

1.2 The Problem of Temporary Intrinsics

However, the eternalist[3] is faced with a problem. Leibniz's Law states that if x = y, then x and y share all the same properties. As the properties of ordinary objects change over time, and all of the past, present and future instantiations of an object equally exist, a contradiction seems to arise. My tea was once hot, but now it is cold. The younger and older versions of my tea exist equally, and we want to say that my tea retains its identity throughout the transition between the younger and older instantiations. However, the young tea and the old tea do not share all and exactly the same properties, (viz, their temperature), and so any assertion of identity between the two contravenes Leibniz's Law. For the presentist, the hot tea no longer exists, so the statement 'the tea is cold' is unproblematic. The eternalist, holding that past and present objects are equally real, must say that the (older) tea is hot and the (younger) tea is cold. However, this contravenes Leibniz's Law, as the statement ascribes differing properties to one and the same individual (namely the tea). Furthermore, the very fact that the tea is 'young' at one stage and 'old' at another, indicates that the tea is instantiating contradictory historical properties, meaning that a straightforward assertion of identity between the two objects to which the predicates 'young' and 'old' are attached will contravene Leibniz's Law.[4] This is the problem of temporary intrinsics, or the problem of how a single object persists through undergoing various changes in its properties (Forrest, 2012).

Endurantism and perdurantism are the two principal theories of persistence. Whilst endurantists hold that objects are wholly present at any time at which they exist, perdurantists hold that objects have a temporal part at every time at which they exist. It is often assumed that the endurantist will also be a presentist, because the idea that the only objects that exist are those that exist in the present implies that the object is wholly present during the instantaneous present. It is also often assumed that the perdurantist will be an eternalist, because the idea that an object has a temporal part at every time at which it exists seems to imply that an object exists at multiple different times, and that it has parts that exist in the past and the future as well as the present. However, Offra Magidor rightly points out that the persistence debate runs orthogonal to the ontological debate (Magidor, 2016). The perdurantist may hold the presentist line by saying that an object has a temporal part at every time at which it exists, but that the only time at which it exists is the present, meaning that it is composed of exactly one (instantaneous) temporal part.

1.2.1 Endurantism

On the other hand, the endurantist eternalist may hold that though an object exists at multiple different times, it is wholly present at all of these times. This is a bizarre claim, but it is not entirely unpopular. However, the endurantist eternalist must not only account for how something can wholly exist in many different spatio-temporal locations, but also for how the object can be

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[3] And also, though perhaps to a lesser degree, the growing universe theorist, though having outlined the theory's shortcomings as regards the relativistic picture, and assumed the eternalist picture, this point is moot.

[4] For a brief evaluation of the move to eliminate historical properties, see *6.3.5*.

straightforwardly identical to itself at these different locations, given that change will mean that these different instantiations will have different properties. The simplest form of endurantism states that an object endures change, and posits cross-temporal identity that is a brute fact. Given that this brute identity contravenes Leibniz's Law, endurantists have sought to supplement their theory. Relationalists hold that an enduring object changes not in its properties, but in the way that it relates to different times (Hawley, 2015). Therefore my tea bears the is-hot-on relation to fifteen minutes ago, and is-cold-on relation to five minutes from now. Supposedly there is no contradiction in holding that these disparate relations obtain between one and the same cup of tea and multiple different times. Adverbialists make a similar move by treating the instantiation of properties much like a verb, and positing that temporary intrinsics are possessed in certain ways just as actions might be performed in certain ways, and therefore linguistic attributions of these temporary intrinsics may be modified in the same way that adverbs modify verbs. They therefore hold that it is no contradiction to say that one and the same cup of tea is hot in a fifteen minutes ago sort of way and that it is also cold in a five minutes from now sort of way (Haslanger, 2003).

The issue here is that relationalist model strips objects of their intrinsic nature. Instead of having and instantiating properties, an object merely stands in a certain kind of relationship to various times. Furthermore, it is highly dubious that the adverbialist is right to claim that it is possible for an object to instantiate multiple contrasting properties in multiple different time-relativised kinds of ways without generating a contradiction. Indeed, both the relationalist and adverbialist theses posit that objects instantiate differing properties atemporally, rather than specifically at the time at which we would say that the property is instantiated. According to the relationalist or adverbialist, my tea is (in some arcane sense) atemporally cold even when it is burning my tongue, which is a claim that runs counter to how properties are generally taken to present themselves.

In addition, both types of endurantism have been criticised for not capturing actual change. Let us assume that it is indeed possible for an object to endure. It will, according to the relationalist, bear the same relations to different times at every instant of its existence. In much the same way, according to the adverbialist, an enduring object will instantiate the entire set of properties it will ever instantiate at every instant of its existence. Given both my doubt of the cogency of the eternalist endurantist's claim that objects persist through being wholly present at multiple different times, and their failure to adequately explain change, endurantism will be discarded as a temporal theory[5] and the eternalist perdurantist framework will be assumed.

1.2.2 Perdurantism

Perdurantism, or four-dimensionalism, implies that ordinary objects persist through time through 'perduring' as four-dimensional entities, inhabiting not only three-dimensional space, but four-dimensional spacetime. Perdurantists explain persistence through time by making reference to objects having a continuous succession of temporal parts throughout their existence, such that any

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[5] Despite this, its modal analogue will be briefly taken up again in *4*.

physical object has a unique temporal part at every moment and for every possible interval of time that it exists, and the fusion of these temporal parts is identical to the object to which they belong.

Two analogies assist explanation. Events are the paradigm analogy, as they "obviously and unproblematically have temporal parts" (Lowe, 2002, 51). For example, a journey might involve walking, taking the bus, and the underground. This journey can be reduced to discrete parts, split for example into one part per mode of transport. It can also be divided into infinitely many discrete instantaneous temporal parts. Instantaneous parts of events are described as 'x-at-t' where 't' is a time, and parts existing through intervals of time could be described as 'x-between-$t1$ and $t2$' where $t1$ and $t2$ are distinct times (*ibid*). Thompson talks of physical objects having corresponding instantaneous 'temporal slices' (which will be the part of the object that exists at any time t during its existence) and continuant 'temporal chunks' (which will be the part of the object that exists between any times $t1$ and $t2$ during its existence) (Thompson, 1983, 207).

The second analogy is between temporal and spatial parts. As Sider explains "the part-whole relation behaves with respect to time analogously to how it behaves with respect to space" (Sider, 1997, 204). An object is, according to this eternalist perdurantist picture, its world tube, which is why eternalist perdurantism is often referred to as worm-theoretic perdurantism. Distinct spatial parts of an object may unproblematically instantiate different, even opposite properties. The front half of a worm may be warm whilst the back half may be cold, but this does not pose a conceptual difficulty. Similarly, a once-green apple is now red, because the apple timelessly possesses sequential temporal parts. If $t1$ is the end of the first week of the apple's existence and $t2$ is the end of the second, the apple before $t1$ and the apple after $t2$ are distinct objects, and therefore can possess contrasting properties, namely the colours red and green. Worm-theoretic perdurantists overcome the problem of temporary intrinsics by relativising temporary predications with respect to the subject, meaning that perdurantists only ascribe a given property to the temporal part of the object which exists at a specific time interval. Therefore an object 'a' has a property 'P' at a time 't' becomes P(a-at-t) (Butterfield, 1985, 38). Change over time is therefore variation between successive temporal parts.

This solution both allows objects to instantiate different properties as they undergo change without contravening Leibniz's Law and seems to capture genuine change. Though it is true that an object instantiates properties by dint of having a part that instantiates a certain property, that part (if it is a proper part) will not exist at every moment of the object's existence, but will be part of a sequence that will be rotated through as the object persists. Given this highly plausible explanation of persistence and thoroughly satisfactory solution to the problem of temporary intrinsics, worm-theoretic perdurantism is to be preferred over all of the various brands of eternalist endurantism.

CHAPTER 2: COUNTERPART THEORY

It seems very reasonable to answer the question of how objects persist through time and space with the answer that they do so in virtue of having a temporal part at every spatio-temporal location at which they exist. There seems to be an analogous question as to how objects exist across modal 'space', or how an object exists in multiple different possible worlds. Every possible combination of states of affairs, (or more colloquially, 'ways things might have been') is exemplified by the way one particular world is set up. In the actual world, my fruit bowl is full of lemons. There are worlds in which everything is the same as the actual world, but my fruit bowl is filled with bananas. There is another world in which no fruit but only vegetables exist, and my bowl is filled with potatoes, and there are even worlds in which there are no bowls at all, no civilization at all, and arguably there exists a world which is merely a dark, empty vacuum.[6] Obviously my fruit bowl does not exist in this last world, but there is certainly at least a sense in which it seems to (with varying levels of modification) in the others.

After briefly establishing radical modal realism in *2.1*, the idea that objects have counterparts in the possible worlds that represent their existence shall be introduced, first in its original form in *2.2*, and then as the revised version in *2.3*, where the problems associated with the one-to-one correspondence between counterparts will be expounded upon, which will indicate the motivation behind allowing one and the same object to bear the counterpart relation to a variety of other-worldly objects. Finally, section *2.4* will introduce the Humphrey objection, and provide an argument that this move destroys the distinction between essential and accidental properties.

2.1 Possible Worlds

While according to Baldwin there exists at least one empty world, the vast majority will not be empty (or nearly empty) vacuums. In fact, there are a great many that will be much like the actual world, and some of these worlds will contain humans. Imagine that I have just knocked over my tea. This should not be difficult, as it seems to have become an almost daily occurrence. It is possible that it will either spill on my laptop, my desk or the floor. That means that there are two possible non-actual worlds that are qualitatively identical to this world save for the fact that in one, my tea is now on the floor and in the other, I am taking my laptop to the repair shop (bad luck). Or rather, in these merely possible worlds, what I will henceforth refer to as an 'object-version' or a 'me-version'[7] has to do those things. I introduce this theory-neutral term in order not to imply that numerically identical objects exist in multiple possible worlds. If I say that in another possible world, 'I' am having to take my laptop to the repair shop, I am at risk of asserting a cross-world identity between my actual self and this possible version of me. For now, all I

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[6] See Thomas Baldwin's 'subtraction argument' for proof that a truly empty world is possible, which I believe to be convincing. It loosely runs as follows: 1) There might be a world with a finite domain of concrete objects. 2) For each object, it is a genuine possibility that it might not exist. 3) The nonexistence of any one set of objects does not entail the existence of any other set 4) There might be a world that does not contain any concrete objects at all (Baldwin, 1996, 232).

[7] The same goes for merely possible versions of you: 'you-versions'; or people, for example, my aunt Tabitha: aunt Tabitha-versions; or buildings, for example Carfax tower: Carfax Tower-versions; or universities: for example, UCL-versions and so on.

would like to say is that a 'me-version' has to perform this inconvenient task. If I am currently mopping up my desk, it is surely not *I* that am praying that my laptop clings to life. We may be exactly the same in all respects save our tea spillages (and consequently our laptops), but Leibniz's Law allows no exceptions, and therefore the other worldly versions of myself and my actual self cannot be straightforwardly identical.[8]

Lewis himself endorses modal realism, or the idea that all possible worlds are equally real (Lewis, 1968, 1971, 1979 & 1986). Just as the eternalist holds that all times are on ontological par, so the modal realist holds that all possible worlds are so. The actual world is only special because it is the one that is inhabited by *us*. When we make modal statements, we quantify over 'ways that things might have been' in such a way that the implication is that these 'ways that things might have been' are real worlds or 'possible worlds' (Lewis, 1986). Lewis certainly takes our ordinary talk seriously, and I think that we should follow him in the project to build a metaphysics that adheres to normal ways of speaking by making as much of our ordinary talk, and its implications, true. Therefore, let us assume for the remainder of this thesis that to say that something is possible is to say that it exists within some possible world.

Furthermore, Lewis endorses 'modal egalitarianism' or the view that non-actual possible worlds are composed of the same kinds of things that the actual world is made up of. According to this view, possible but non-actual objects that exist in modally distant worlds are just as concrete as the actual objects which populate this world. Lewis therefore holds that the very word 'actual' functions as an indexical. Just as the word 'here' refers to the location of the speaker and 'now' refers to the time of utterance, 'actual' picks out the world in which the utterance is made, making the assertion that 'I live in the actual world' impossible to utter without it being true. Though an evaluation of the radical modal realism that Lewis endorses is beyond the scope of this paper, the reality of non-actual possible worlds, and the concreteness of the objects that populate them, will be assumed throughout.

2.2 Counterpart Theory

When I am told to be careful with my tea around my laptop, the danger is always couched in terms of *me* spilling the tea. The warning '*You* will be between a rock and a hard place if you short out that laptop before you have handed in that thesis of yours' implicitly implies that this counterfactual scenario includes *me*. Proponents of the theory of trans-world identity take modal expressions like this warning to indicate that it really is one and the same object that lives out these differing scenarios in modally distant worlds. The glaring problem with the thesis of trans-world identity, or the idea that two modally distant objects may be one and the same thing, is analogous to the problem of temporary intrinsics, (and perhaps should be dubbed 'the problem of worldly intrinsics'). The eternalist holds that an object exists in its present, past and future forms, but, (in virtue of change), that there are property differences between those forms. Similarly, the modal realist holds that the objects within each different world are equally real, but that there will be a variety of differences between the members of sets of objects which the trans-world identity

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[8] The possibility of numerical identity obtaining across worlds as put forward by Saul Kripke (1980), Kris McDaniel (2004) and Takashi Yagisawa (2009), and will be discussed in chapter *4*.

theorist will identify as one and the same thing. To reiterate, Leibniz's Law states that if x = y, then x and y share all the same properties. Consequently, the notion of an identity relation that obtains between modally distant bodies that differ in their properties is problematic.[9]

David Lewis suggests that instead of there being an identity relation (straightforward or otherwise) that obtains between modally distant objects, there is a counterpart relation (Lewis, 1986). The counterpart relation is not a metaphysical primitive, and may be reduced to something akin to resemblance. According to this view, the me-version at the laptop repair shop is not me, but merely my counterpart. More generally, any non-actual possible world which is a truthmaker for the modal statement that I could have been alive contains a counterpart of me. Therefore any true modally predicated statements such as "I could have been six foot" are made true by my having a counterpart in a possible world who is six foot.

Lewis therefore endorses the theory of world-bound individuals, which is essentially a denial of trans-world identity, holding that one object may occupy only one world. The exceptions he considers to this restriction are abstracts: meaning that things like colours, numbers and logical statements might exist as trans-world entities. Additionally, Lewis is an advocate of the principle of unrestricted mereological composition, which states that any set of things has a mereological sum. Let us assume this principle. We are left with a vast number of combinations which generates a similarly vast number of trans-world compositions, which will overlap every world that contributes a part of it, and thus is partially situated within each of many worlds. Though it may be strange to imagine that non-adjacent, disparate objects that do not causally interact may be co-parts of an object, I will here follow Lewis in remarking that any ban on trans-world composition is "unmotivated and gratuitous."[10] (Lewis 1986, 212)

2.3 The Revised Account

Lewis originally suggested that just as one object belongs to one world, so may it only have one counterpart per non-actual world. This counterpart is the object-version that resembles the original object the most in any given world. However, such an approach runs into three problems. Firstly, there may be a long chain or web of counterparts that reaches across modal space, where each counterpart might be very similar to its neighbors, such that the web contains clusters of counterparts that all resemble all others in the locality. However, as the web reaches out to more and more worlds, the differences become more and more pronounced until we are left with counterparts that are so disparate that it no longer seems a genuine possibility that one object-version could possibly be the counterpart of the other. Lewis therefore modifies his theory such that the counterpart relation becomes intransitive (Lewis, 1986, 218).

The second problem with the original form of counterpart theory is the difficulty in locating the unique object-version that resembles the target actual object more than anything else. This is not merely an epistemic problem, as there may be equally good arguments for the candidacy of one potential counterpart as another. Lewis illustrates this with a case. A large amount of plastic is divided at the factory such that

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[9] We will return to this point in *4.*

[10] For a fuller discussion of objects being comprised of parts that do not causally interact with each other, and why we should be congenial to such a view of co-parthood, see *5.3.2*

each small amount is enough to be poured either into a dishpan or waste paper basket mould (Lewis 1986, 252). The plastic *could* have been made into a waste paper basket if the dishpan order had come in later, but it was *actually* made into a dishpan. If the dishpan order had come in late, a dishpan would have been made from different plastic a day late. The identification of the correct counterpart of the actual dishpan in the possible worlds in which the dishpan order had come in late is difficult.

Thirdly, there is inconstancy in *de re* interpretations of names. Imagine that the actual world has an almost exact twin in another possible world, *w1*, excepting the fact that in *w1*, their Great Western Railway builds another line, such that it is slightly bigger (let us call this 'GWR+') than our Great Western Railway (let us call this 'GWR'). If the task is to locate the appropriate *w1* counterpart for the GWR, it seems that there are two equally good candidates, which are either GWR+, or the GWR+ minus the extra line (let us call this 'GWR-'). Even though GWR and GWR- occupy exactly the same geographical location, GWR and GWR- differ in that GWR-, unlike GWR+ and GWR, are both completed railway lines (Lewis, 1986).

More generally, different sortal terms that codesignate some object affect the group of object-versions that should be its counterparts. A guitar, regarded as a musical instrument, might have as its *w1* counterpart the *w1* guitar-version that makes the most similar sound. Regarded as property, it may have as its *w1* counterpart the instrument which is owned by the most similar musician. Let us talk about Slash's favourite guitar. If *w1* represents the possibility that he had taken up classical music instead of heavy metal, the *w1* Slash-version might have taken up the tuba, making the most appropriate counterpart to Slash's favourite guitar *w1* Slash-version's favourite tuba. Regarded as a piece of wood that grew from a particular tree, the guitar's *w1* counterpart might be a plank-version that the *w1* tree-version was made into, say, as part a barrel, instead.

As a materialist, Lewis goes to great pains to deny the dualistic notion that oneself and one's body are separate objects, (Lewis, 1971). However, he does hold that persons have disparate *personal* and *bodily* counterparts, as there might exist a person whose body is very similar to mine, and another whose personality is very similar to mine in the same world. Considered as a sportsperson, perhaps it is better to use my bodily counterpart for reference, but considered as a dinner party guest, perhaps my personal counterpart is the more appropriate choice. Perhaps considered *functionally* there exists a person in this world who is writing a similar thesis to this one, and so should rightly be considered my counterpart. More generally, Lewis abandons the stipulation that all objects have a unique counterpart at each world at which they exist and embraces a plurality of counterpart relations, such that in any given context, it might be appropriate to refer to any one of a large number of counterpart candidates.[11] As can be seen from the guitar example, the upshot of this revision is a greatly expanded amount of potential counterparts per individual.

The revision does go some way to solving the problems associated with long chains of counterparts, the

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[11] He does not attempt to give definitive number of the types of counterpart relation, but muses that there might be a relation for every sortal, or natural kind, or "or any common noun phrase whatever that can be grammatically inserted into 'regarded as a ___?', even the phrase 'yellow pig prime number'" (Lewis, 1971, 210).

problem of ascertaining which out of multiple, equally good candidates is *the* counterpart of any given object, and the problem of inconstant name interpretation. However, arguably the revision does not present a full solution, as there may be multiple equally good candidates relative to a given sortal. For example, there may be twins whose bodies resemble mine very closely in a modally distant world, so it seems that there is a tie as to which twin is my bodily counterpart.[12]

2.4 Criticism

Furthermore, the revision brings with it a problem of its own. Let us return to the guitar example. Slash's actual favourite guitar, under the original counterpart relation *only* had as many counterparts as there are worlds in which there exists a uniquely similar object that appropriately closely resembles that guitar. Presumably the guitar had a set of guitar-like potential counterparts (which would perhaps differ so far as to being lutes or ukuleles in worlds in which guitars have not been invented). However, the revised counterpart relation inflates the set of potential counterparts such that it contains not only completely different instruments, but almost unrecognisably guitar-like objects such as planks of a barrel. The members of these inflated sets are much less likely to instantiate shared properties.

A property that is shared between an object and all modally distant versions of itself is an essential property, and the sum of an object's essential properties is its essence. All properties which are not instantiated by every possible version are accidental properties. To say that an object has accidental properties is to say that some of the object's properties could have worked out another way, whereas the idea that an object has some of its properties essentially captures the notion that the object could not have existed in a way that is so different to how it actually exists without changing into something else entirely. I could not, for example, have been an angle grinder, or a mountain, or an amoeba. Presumably then it is essential that I am human, alive and made of matter, whereas it is accidental that I live in London, am a philosophy student, and prefer tea over coffee.

It is with similar intuitive ease that we may presume that it is essential that Slash's favourite guitar is a string instrument, made of wood or at least something that plays music. However, given the wide variety of counterparts the revised relation assigns to it, none of those properties are essential. Sortal essentialism holds that the properties that make the object the kind of object it is are its essential properties, and so a sortal essentialist would argue Slash's favourite guitar, considered *qua* guitar, has counterparts that are all and only guitars. To the sortal essentialist the idea that Slash's favourite guitar could have been a tuba or a part of a barrel simply does not hold water. On the other hand, origin essentialism holds that essential properties are those that are shared by the set of distant modal objects who share an origin story. This rubric could indicate that the plank of wood that forms part of the other-worldly barrel is a counterpart of Slash's favourite guitar, whilst the most similar guitar in that world to Slash's favourite, (so long as it is made from an entirely different piece of wood) is not. On the other hand, it could imply that the other-worldly craftsman who used the most similar method in manufacturing Slash's favourite guitar created

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[12] Though this problem is ameliorable. Neither twin is my 'closest continuer', and so neither are my counterpart. This kind of solution will be considered at greater length in *3.3.*

the correct counterpart.

According to the revised counterpart theory, Slash's favourite guitar has the plank, the very similar guitar and the very similarly made guitar as its potential counterparts, and we can choose which of these to refer to depending on the kind of modal expression we want to make. However, this wide diaspora of extremely different counterparts degrades the notion that an object has essential and accidental properties, as very few properties will be shared by an object and the set of its counterparts.

Of course, the counterpart theorist is free to do away with the distinction between essential and accidental properties, but it is worth noting that such a distinction is endorsed by a great deal of modal theorists and is thought to be of significant philosophical use. This use will be expounded upon in section *4.1*.

In addition, counterpart theory must provide a suitable response to the Humphrey objection (Kripke, 1980, 45). We can broadly ask how a counterpart of some *y* having property *x* is relevant to the idea that *y* could be *x*-like. Specifically in the case of individuals, we can ask why we should care about our counterparts having different properties to our own. If I say that I could have been taller, it is hardly likely to comfort me that I have counterparts who in fact are. Nor is it relevant. As Lewis writes, "somebody else gets into the act" (Lewis, 1986, 196). This somebody is not you, but a you-version. Kripke's example describes Humphrey, an actual individual who recently lost an election to Nixon. When we make the statement that he could have won, we are talking of another possible world which, without containing Humphrey himself, represents Humphrey as winning through having his counterpart win. The victorious counterpart is also the truthmaker for a second statement: we can truly say that a distant Humphrey-version won. Though these two statements are not in competition, and we need not suppress one in order to guarantee the truth of the other, it remains to be seen as to how the two are relevant to each other, and why the actual Humphrey should care about his counterpart's victory.

Lewis is therefore committed to the idea that objects have a temporal part at every spatio-temporal location at which they exist and at least one counterpart at every possible world that might be a truthmaker for some counterfactual about them. Perdurantism, Lewis' theory that relies on parts, seems to stand on solid ground, but his theory of counterparts, even in its revised form, does not. Additionally, the two theories are conceptually inconsistent in that they take two different approaches in describing the same thing (namely how objects differ from themselves). The next three chapters will show three different accounts of how such a conceptual discrepancy might be avoided by adopting temporal and modal models that answer the question of how objects differ from themselves.

CHAPTER 3: STAGE THEORY

In order to draw out the differences between the worm-theoretic perdurantist's solution to the problem of change and the counterpart theorist's explanation of modally predicated statements, it will be of use to outline Sider's stage theory and his motivation for putting it forward. The first part of the chapter will follow Sider's definition, with specific reference to the temporal counterpart relation, which is to be understood by way of analogy with the modal counterpart relation discussed in the previous chapter. After it has been argued that this counterpart-based model renders the notion of persistence contradictory, the second section will argue that the deceptively intuitive appeal that stage theory shares with endurantism - the idea that the object that exists in the present is the whole object - will be argued to be misleading, especially given relativistic effects. In the light of these problems, Sider's secondary motivation to adopt stage theory, taken from temporal fission and fusion cases, will be briefly introduced in *3.3*, to be picked up again in my last chapter, before a comparison between the ontological status of the stage and the worm is made.

The fourth section will focus on change and processes, returning to chapter one's discussion of the problem of temporary intrinsics, and levelling this problem at stage theory. Finally, it will be argued that the stage-theoretic model fails to capture temporally sensitive predicates, and that worm-theoretic perdurantism is the superior account of persistent objects.

3.1 Stage Theory

3.1.1 The Stage-theoretic Model

The most salient difference between worm-theoretic perdurantism and stage theory is in their definitions of ordinary objects. Whilst the worm-theoretic perdurantist holds that *the* person is her space-time worm, the stage theorist will identify her with the instantaneous temporal cross-section of the worm that exists at the present moment. At this point, it is important to make two things very clear. Firstly, Sider, (as he explicitly mentions) does believe that space-time worms are objects. There is, according to him, a space-time worm which exists at all of the spatio-temporal points that my mug occupied between 2016 and 2018, and another space-time worm which exists at all of the spatio-temporal points 'my mug' occupied during the second of 12:21:06 today. However, he denies that these worms are what we rightly mean when we talk of ordinary objects such as mugs, persons, statues or sandwiches. In fact, he holds that these space-time worms are aggregates of ordinary objects. In much the same way, worm-theoretic perdurantists hold that stages are objects, but that they are mere parts of ordinary objects.

Secondly, Sider is not advocating a presentist ontology. Though stage theory states that an ordinary object is wholly present at any time during its existence (during any of its 'stages'), all of the other past and future stages of the object eternally exist in the same way that past and future temporal parts exist according to the worm-theoretic perdurantist. However, unlike worm-theoretic perdurantism, stage theory does not relate the object that exists in the present to its past and future

instantiations in virtue of their all being parts that belong to the same ordinary object, because each stage *is* the ordinary object. Instead, these object-stages relate to each other analogously to Lewis' counterpart theory of modality.

> "According to counterpart theory, an object *x*, has the property **possibly being F** iff there is some object in some possible world that has F, and bears the counterpart relation to *x*… The temporal operator 'was', and also the temporal operators 'will be', 'will be at t' etc., are analogous to the temporal operator 'possibly'" (Sider, 1996, 439).

In other words, Sider suggests that there is a loose counterpart relation (rather than the stricter identity relation) that obtains between the stages that compose the space-time worm.[13] This introduces a new kind of persistence, which is borne out by temporal counterpart relations, which obtain between the stages of perduring objects. Even though an ordinary object is wholly present as a stage, it is linked to the stages that it has been and the stages that it will be, making statements such as 'the banana was yellow' true for some banana *b0* at time *t* iff some stage *b-1* prior to *t* is appropriately temporally counterpart related to *b0* and is yellow.

3.1.2 Persistence

It is unclear that this novel sense of continuity is enough to guarantee the identity of an object over time, or even if this is something that the stage theorist is interested in doing. In fact, Sider refers to this uncertainty as "a problem that initially seems devastating" (Sider, 1996, 438). If stages do not persist, and ordinary objects are stages, the stage theorist must either reject diachronic identity, or demonstrate a novel sense of it. The latter is Sider's choice and runs as follows. For an ordinary object to persist, it must be succeeded by one or more appropriate temporal counterparts. Therefore for a banana to persist, a banana-stage must be succeeded by some banana-temporal counterparts. This seems workable, until we reflect upon the stage theorist's insistence that ordinary objects are their instantaneously present stages. If this is true, my banana is a stage. The stage does not persist, because it does not have a stage-temporal counterpart which exists at a subsequent time. Therefore my banana does not persist. This is a seemingly intractable contradiction.

It might be said that if counterparts cannot explain persistence, neither can parts. There are at least as many temporal parts of an object as there are stages, because stages *are* temporal parts. Perhaps the idea of a continuous stream of discrete parts goes no further to secure the kind of continuation we think of when we talk about persistence than a continuous stream of counterpart-related stages. However, we can resist this claim by making reference to the spatial analogy. A river is extended across space in virtue of having a spatial part at every region that it spans. This is uncontroversial. It would, however, be extremely controversial to assert that the river has expansion in virtue of having spatial counterparts that are similarly located. Indeed, such a scenario seems very much

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[13] This is not to imply that the worm-theoretic perdurantist thinks that an identity relation obtains between temporal parts, but merely a co-parthood relation which guarantees the diachronic identity of the ordinary object in virtue of its having a part located at every time at which it exists.

more to be describing multiple rivers that are grouped over a certain region. The perdurantist can therefore appeal to the spatial analogy in order to explain their model of persistence, whereas the stage theorist cannot.

It might be seen as a point in favour of stage theory that the ordinary object is taken to be an instantaneous three-dimensional temporal cross-section, as to treat ordinary objects as such lends itself to some modes of our everyday talk. For example, when I tell someone that they are beautiful, I am usually taken to mean that they look beautiful at that time, presenting themselves as they currently are. It would be very strange to infer from my comment that I am calling every single temporal cross-section of their temporally extended worm beautiful, as this would be committing to their being beautiful as a baby, during adolescence, and even when they are on their deathbed (a time at which few look their best). Nor would a natural interpretation of my compliment be that the subject's entire space-time worm is beautiful. Indeed, it is unclear to me whether space-time worms are the sort of objects to which can be beautiful or not. Whilst it is perfectly natural to talk of a temporally extended event, such as a fireworks display, as beautiful, it seems that the predicate only applies to temporal parts of an object that span a fairly short interval.[14] The worm-theoretic perdurantist might appeal to the notion of the life of the object as the extension of the predicate beautiful, but it remains to be seen whether lives are of the kind of object that 'beautiful' might appropriately be applied to.[15]

A more appropriate response available to the worm-theoretic perdurantist is that this friction between our metaphysics and our everyday talk can be chalked up to an imprecision in our everyday language. It is true that when we call an object beautiful, we are commenting upon the temporal part of it which is accessible to us at the present time. However, this does not force us to either commit to the claim that all of the object's temporal parts, (or its space-time worm in its *entirety*, if considered as the life of that object), is beautiful, or to accept that ordinary objects are stages. This is because the reference to the object described in a statement like 'this object looks beautiful' functions as an indexical expression that can be analysed as 'the temporal part of the object that I am experiencing'.

3.2 Time Distortion

What, however, is 'the temporal part of the object that I am experiencing'? Stage theory shares the intuitive appeal of endurantism, which is that an object wholly exists at any given moment that I

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[14] I will not attempt to non-arbitrarily define how long or short such an interval can be, but will comment that statements such as "you looked really beautiful today", or "you've been looking really beautiful since you got that haircut" seem unproblematic.

[15] On the other hand, the language structures surrounding concepts such as praise and blame seem to point away from a stage theoretic model. For example, the statement "I blame you for the death of my father" presupposes that I can identify the accusee before me with the person who killed my father. The 'you' I am referring to must persist for (at least) the intervening period of time between my father's death and my accusation, and therefore cannot be a stage.

can experience it. However, the idea that objects exist wholly as instantaneous stages is problematic when temporal distortions are considered.

3.2.1 Phenomenological time distortion

Human perception of time fluctuates greatly. Eagleman describes three edifying examples. If a stimulus is shown repeatedly, the first appearance is judged to have a longer duration than successive stimuli. Therefore if a light were to blink green at a subject for regular intervals, the time taken for the light to blink first would appear longer than that taken by the subsequent blinks. In much the same way, a different stimulus in a repeated series will also be judged to have lasted longer than others of equal duration. For example, if the light blinks green fifty times, and becomes red upon the fifty-first blink, then the red blink appears to last longer than the green blinks. A similar illusion occurs during counting sequences, such that less time is judged to have occurred between successive numbers when a subject is shown them in a sequence (despite there being equal intervals between them). Eagleman speculates that this occurs because the numbers are predictable (Eagleman, 2008, 133).

Human brains are fine-tuned to identify causal patterns, so that we can recognise processes and therefore reliably expect appropriate outcomes. A subject who is repeatedly exposed to a flash of light a few seconds after pressing a button will come to expect the flash, and will subjectively experience the time between the button push and subsequent flash as much shorter. This is an example of prediction suppression, much like the counting illusion, whereby expected outcomes seem to follow faster. This experiential time contraction can be so significant that a subject's perception of temporal ordering may be affected. For example, if the delay between the button push and the flash is altered such that it comes only a fraction of a second after the button is pressed, the subject will experience the flash as prior to the press.

These experiments provide compelling evidence for the idea that human perception is rooted in causal processes rather than instantaneous moments. If it were the case that perception occurred in discrete instant units, our brains would construct causal relations between these snapshots after the fact of our experiencing them. However, Eagleman's example shows that our very experience of stimuli (i.e. objects and events) only makes sense within the context of wider causal processes. Objects are therefore not experienced as instantaneous stages, but as participants in dynamic causal structures with extended temporal duration. In the light of these considerations the intuitive appeal of stage theory, i.e. that we experience the whole object in the moment of our perception of it, seems considerably less compelling.

3.2.2 Relativistic time distortion

A further problem comes from relativistic physics. Stages are spatially but not temporally extended, and therefore can rest upon a hypersurface of simultaneity. As demonstrated in my first chapter, relativistic physics does not support the notion of a privileged hypersurface of simultaneity to which distant observers may appeal. My velocity relative to another object

generates the temporal cross-section of the object that I experience. Another observer on a different velocity will experience a different slice. As explained in *1.1*, the experiential presents of observers within different reference frames differ, because their velocities determine which space-time points are intersected by their own hypersurfaces of simultaneity. This means that different observers experience different temporal cross-sections of spatially extended objects.

Say that I am travelling by train past a station with a panel on the platform, and my friend Barry is travelling by motorcycle in the opposite direction on a road on the other side of the platform. There are buttons on the panel that are flickering on and off. At time *t*, I observe button B12 and C16 flicker on simultaneously, with A7 flickering on a moment later after *t*. Barry, however, sees B12 flicker a moment before *t*, and observes A7 and C16 flickering simultaneously exactly at *t*. Who is to say which spatially extended temporal cross section of the panel is *the* stage which occurs at time *t*? It is impossible to decide non-arbitrarily. Perhaps the stage theorist could stipulate that the appropriate cross section at any time *t* for any object is that which rests upon the hypersurface of simultaneity that the reference frame of the object itself generates is *the* stage but I think this response is unsatisfactory because it is entirely unmotivated by physics. Stage theory does therefore not cohere with the ontological implications of relativistic physics.

There are therefore some genuine problems inherent to stage theory as pertain to our subjective experience of time and to the laws of physics.

3.3 Temporal Fission and Fusion Cases

Given these problems, it will perhaps be useful to examine Sider's motivation for adopting stage theory that stands aside from the wish to bring his modal metaphysics into line with his temporal metaphysics. Part of Sider's reasoning for the rejection of worm-theoretic perdurantism is based upon the (supposedly) strange implications drawn out from cases of fission and fusion. He imagines a case where at *t1* Ted is a single person who splits at time *t2* and becomes Ed and Fred at *t3*. If persons are, as worm-theoretic perdurantism suggests, aggregates of their temporal parts, and Ed and Fred are persons, then Ed and Fred are co-located before *t2*. If we are to imagine the case the other way around, and have two separate people Ed and Fred at *t1* who fuse at *t2* becoming a single person Ted, Ed and Fred are presumably co-located after *t2*.

Proponents of closest continuer theory such as Sidney Shoemaker (1979) and Robert Nozick (1981) will deny that Ted survives fission, because there is no stage (of either Ed or Fred) which is the closest continuer of the stages that Ted consists of. There is an infinitely dense chain of Ted-stages up to *t2*. *Ex hypothesi*, there are two streams of infinitely dense Ed-stages and Fred-stages that branch out from the Ted-stages, which are both connected to the end of the Ted-stages by an infinitely small temporal gap. Neither Ed nor Fred is therefore the closest link in the chain and therefore neither is Ted's closest continuer. Ted therefore ceases to exist at *t2*. Of course, we need no recourse to the rule that there must be a 'closest continuer' for an object to survive fission if we

accept that Fred and Ed share their temporal parts that exist before *t2*, but this is clearly something that Sider is unwilling to do.

Sider thinks that co-located objects are "preposterous" because the properties of the two objects are not additive (Sider, 1996, 441). Sider's thought is that if there are two objects, and both of these objects can be said to have certain properties, the composite object must instantiate the sum of these properties. For example, in the fission case, Ted must be the combined mass of Ed and Fred.

Sider's criticism has precedent, and has been widely discussed in the more general study of composition as 'the problem of coincidence' (Johnston, 1992; Noonan, 1993; Lowe, 1995; Wasserman, 2002 & 2018; Moyer 2006; Walters 2019 *inter alia*). Perhaps the most famous and accessible illustration of the problem is that of a statue and the lump of clay from which it is made. This example will be discussed at length in the final chapter, but it is worth briefly noting at this point that some philosophers reject the idea that the statue and the lump are distinct objects (what is referred to as the standard account), because the composite statue-lump-object does not exemplify the cumulative magnitude of the array of properties of both the statue and the lump. It would seem, according to these thinkers, that if we really were faced with a genuine case of distinct but co-located objects, we should expect the composite of the statue and lump, (the statue-lump), to weigh twice as much as the lump of clay, doubling in weight immediately upon completion.

For this reason, Sider rejects the idea that objects are aggregates of their temporal parts. If we follow him and hold that what we would ordinarily call persons are indeed stages, a succession of Ted persons exist before *t2*, after which there are a succession of Ed persons and Fred persons in the case of fission. Similarly, in the case of fusion there are a succession of Ed persons and Fred persons before *t2*, after which there are a succession of Ted persons. Though this greatly inflates the number of persons that exist between *t1* and *t2*, (from one or two to an infinite number), it is no longer true that the Ed persons and Fred persons share temporal parts in the person of Ted, (either before or after *t2* depending upon whether we take the fission or fusion cases respectively), because no one slice overlaps another.

3.4 Persistence and Temporary Intrinsics

The stage theorist is committed to the claim that in order for something to persist there must be an appropriate temporal counterpart relation that obtains between various stages, in much the same way that Lewis' counterpart relation obtains between modally distant counterparts. However, it is not clear that this novel model of continuation coheres with our everyday notions of persistence and change, and non-instantaneous properties.

3.4.1 The problem of Temporary Intrinsics (again)

Imagine that I drop my mug, and that it smashes. I think that it is perfectly reasonable to say that the porcelain that once constituted my mug is now in pieces, where before it was whole and unified.

Indeed, this is exactly how the worm-theoretic perdurantist would report the situation, adding if pressed that the porcelain has a part before the impact that has the property of unity, and a part shortly after the impact that has the property of brokenness. I will not say this of the mug itself, as I do not think that a broken mug is a mug at all, and therefore do not think that it survives the impact.

However, the stage theorist has no business explaining change in this way, if at all. If ordinary objects are stages, then *the* porcelain is the stage that exists at the time in question. However, if an object is defined as temporally unextended, it cannot undergo change, as change is difference over time. The stage theorist therefore has no mechanism for adequately explaining change. The most that a stage theorist can say is that there exist porcelain-stages that have the property of unification, and porcelain-stages that lack this property, and that these stages are appropriately counterpart-related. This, I contest, is not enough to capture the nature of change.

Of course, the charge that nothing literally changes may also be levelled at the perdurantist. According to the perdurantist, the porcelain has a temporal part that is unified, and subsequently a part that is not. The unified part at no point breaks, and in a timeless sense is eternally unbroken. However, here the perdurantist may appeal to the spatial analogy. We comfortably assent to statements of the form 'the river changes as it extends southeasterly' when discussing rivers that flow fast and straight in the northwest but become calm and meandering as their course progresses. No spatial segment of the river actually changes from being fast to slow, but the river *does* change in virtue of having parts that differ in their characteristics. On the other hand, the idea of a river (or indeed, any spatially extended object) being extended by virtue of its stages rather than parts is too unintuitive for the stage theorist to make a similar appeal.

3.4.2 Non-instantaneous properties

It is for a similar reason that the stage theorist lacks the metaphysical apparatus to confer non-instantaneous properties upon objects. Let us consider again the example of persons. If we take it that it is a property of Socrates that he is mortal, it must be possible for him to die. However, death is a causal process and therefore can only happen over time. If we are to follow the stage theorist and hold that Socrates is a stage, it will be extremely problematic for us to make utterances like "Socrates is being killed" or "Socrates is dying". The most that the stage theorist can say is that an entity is dying if it is a link in an (appropriately short) chain of counterpart-related stages, the first of which are living and the last of which are dead. However, given that dying is a dynamic process, this definition seems to be a poor attempt of capturing what is actually meant. More generally, the stage theorist's model cannot accurately capture the nature of processes such as aging, growth, decay, acceleration, learning and so on. It is for this reason that an object, as understood according to the stage-theoretic model, cannot be rightly said to have non-instantaneous properties.

The stage theorist might reply that stages may undergo processes and have non-instantaneous properties if they are appropriately temporally counterpart-related to other stages at other points in

time. Mortality, for example, is taken to boil down to being related to a set of different stages at different times such that the process of dying could occur across them. However, I contend that it would be impossible to tell whether a body is alive or recently dead from merely examining a stage of it, because the life processes (growth, respiration, excretion etc) are themselves dynamic. Indeed, whenever there is something inherently dynamic about an object, be it a living animal or a shattering mug, it seems that the appropriateness of describing that object with a temporally sensitive predicate (such as 'living', or shattering') may only be decided by viewing the object in the context of an interval of time over which the process of living or shattering occurs.

3.4.3 Filmstrip continuity

It is clear that the stage-theoretic model is ill-equipped to underwrite the process of change. However, this concern is minor compared to the criticism that the kind of continuity that stage theory implies is insufficient for persistence. Nozick's evaluation of what he dubs 'filmstrip continuity' implies such a criticism.

He argues that an object's temporal continuity cannot be likened to an infinite amount of film stills where one still corresponds to every instant of an object's persistence. In much the same way, spatial continuity is not explained as an object that when filmed would create a continuous footage with no gaps, as multiple spatially proximal objects will do the same thing. (Nozick, 1981, 35). It is therefore not enough to point to a set of stages that follow on from one another and resemble each other, as different but qualitatively similar and temporally proximal objects may exhibit this kind of temporal continuity and yet remain distinct objects.

In order to illustrate this possibility, Nozick asks us to imagine that he has a disappearing machine and a producing machine. He vanishes a vase of flowers with his disappearing machine but sets up his producing machine to produce another (qualitatively identical) vase of flowers. He then sets up both machines to vanish and produce continuously, exactly half a cycle out of sync, so that the moment one vase of flowers is vanished, another is put back in its place (Nozick, 1981, 665 n. 7). It would seem to an onlooker who was unaware of Nozick's machines that there is a single vase of flowers that persists for as long as Nozick continues the experiment (assuming that he ends it by vanishing the final vase of flowers). However, the onlooker would be wrong, because there are instead multiple vases of qualitatively similar flowers. Nozick argues that the vases of flowers are not continuers of the vases that they replace, because their properties do not "grow out of" the properties of the replaced vase (*ibid*). Instead, the properties of the vases are causally dependent on and can be explained by the way the machines have been calibrated.

It does not seem that the temporal counterpart relation that supposedly holds between stages is sufficient for explaining persistence. At worst, all the stage theorist can do is point at a set of discrete but qualitatively similar instantaneous objects that follow on, but do not continue from, one another. There might be something baked into the temporal counterpart relation that specifies that a subsequent object's properties are caused by the properties of its antecedent, but such a

specification would lead to a disunity between the temporal and modal cases.[16] Moreover it seems that such a specification does not necessarily amount to guaranteeing cross-temporal identity, as one object *A* may cause another object *B*'s properties without there being an identity relation between *A* and *B*. For example, if we are committed to the physicalist thesis that a person is identical with their body, when a person dies, a different object, namely their corpse, comes into being. All of the properties of the corpse may be explained by the properties of the live body that preceded it, and yet the corpse is not identical to the person. It is, therefore, much more satisfactory to link a set of discrete but qualitatively similar instantaneous stages by claiming that they are all co-parts of a perduring object.

The worm-theoretic perdurantist, on the other hand, is committed to the possibility of co-located coincident objects on the basis of temporal fission and fusion cases. However, as we shall see later in the discussion of temporary and permanent coincidence in chapter six, the supposed 'preposterousness' of coincident objects is far from disastrous, and should not compel us to adopt stage theory over worm-theoretic perdurantism, especially at the cost of the loss of the most successful answer to the problem of temporary intrinsics.

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[16] Lewis stresses that as modal counterparts are worldbound, there is no trans-world causation.

CHAPTER 4: MODAL ENDURANTISM ANALOGUES

Criticism aside, Sider quite rightly notices an incongruity in Lewis' temporal and modal metaphysics, and provides a counterpart-based account of how objects inhabit time which parallels Lewis' counterpart-theoretic account of how objects inhabit modal space. As will be made clear in the next chapter, I am very much in favour of the idea of aligning the temporal and modal spheres, but believe that Sider's effort to do so is mistaken.

4.1 Brute Identity

At this point it will be useful to review another dual model that is available to advocates of an integrative approach to temporal and modal metaphysics, and to do so, we must briefly return to endurantism. An object that endures is both wholly present at any time at which it exists *and* is identical to itself at any other time at which it exists. As mentioned, this approach runs into the problem of temporary intrinsics. My ripe and later unripe banana; my whole and later broken porcelain; a beautiful and later spoiled view; and the five-year old who is later a fifty-year old are all examples of ordinary objects that change, but not so much that they become different objects entirely.

It will be of no use to rehash the issues inherent within endurantism,[17] but it will further my cause to introduce its modal analogues. The first of these is Kripke's theory of brute identity, which is naturally paired with an eternalist endurantist approach. Later, Yagisawa's five+-dimensional conception of trans-world individuals, and McDaniel's modal realism with overlap will be shown to be examples of modal analogues of two different types of eternalist endurantism. These approaches, as will be explained in the concluding section, are not put forward as live alternatives to the counterpart theory and stage theory modal and temporal pairing. No version of modal endurantism and temporal endurantism will be seriously considered, as I will argue that a temporally or modally enduring object cannot exist at more than one instant or in more than one world. However, the fact that these integrative approaches to both time and modality are available to the proponent of endurantism draws out Sider's key insight that the problems of persistence and cross-world identity should be tackled using the same strategy.

Kripke introduced 'brute identity' in order to make sense of our modal talk. The statement 'you would have had a really good time at the party if you had come' is represented by a set of possible worlds in which 'you' attended the party and (presumably, if I am a good judge of your character), would have enjoyed it. However, here we immediately run into the Humphrey objection to counterpart theory, or what Lewis calls, the 'he himself' intuition (Lewis, 1986).

According to counterpart theory, my assertion that you would have enjoyed the party is made true by a set of possible people who resemble you having a fairly good time at a set of possible parties. Something more meaningful is evidently meant when I make my assertion (further to an attempt

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[17] For a fuller discussion of these issues, see *1.2.1.*

to give you FOMO). There is something special about the sets of possible you-versions and possible party-versions. According to Kripke, all of the you-versions are identical, (as are all of these parties which these you-versions supposedly enjoyed).

It is here that we return to our discussion of essential and accidental properties. To clarify the brief introduction in *2.4*, these properties are defined in modal terms. If I had been born a different height, with a different eye colour, or with a level of musical proficiency, I would still have been myself. I can therefore say that there is a possible world which contains a me-version which is a six-foot brown-eyed professional pianist. Therefore, some possible worlds of the kind mentioned earlier will represent this with a possible but non-actual me-version that exemplifies some of these differences. However, I cannot in good faith say that I could have been a brass door knocker, or a sherry trifle, or the Vatican. Therefore, those close possible worlds where everything is much the same as the actual world except with the substitution of a brass door knocker, sherry trifle or second Vatican, cannot be said to contain a me-version, but rather are truthmakers for the statement that I could have never existed.

There must, therefore, be a set of properties that make me *me*, which are shared by the taller, brown-eyed, piano-playing me-versions but not by a brass door knocker, a sherry trifle, or the Vatican. The set does not include height, hair colour, or skill at playing the piano, because they are all accidental properties. It is for this reason that Takashi Yagisawa rightly notes that to ask about a thing's modal boundaries is really just to ask about its essential properties, in much the same way as to ask about an object's temporal boundaries is to talk about its persistence conditions (Yagisawa, 2009, 113).

It is in this distinction between accidental and essential properties that lies the fatal flaw of brute identity theory. According to Kripke, not every possible world in which a you-version exists represents your going to the party, because having gone to the party is an accidental property. However, if brute identity is correct, each you-version is *you*, despite having gone to the party or not. The identity relation between these you-versions that brute identity theory implies contravenes Leibniz's Law.

This problem should sound familiar. This is because, just as brute identity posits that for any possible object *x*, *x* is both wholly present at every possible world at which it exists, and identical to every possible *x*-version, endurantism posits that objects are both wholly present at every time at which they exist, and identical to every other instantiation of themselves at different times at which they exist. Accordingly, the theory of brute identity runs to ground in much the same way as endurantism. Just as objects may change over time, so too may they be different under certain counterfactual scenarios, and therefore across different worlds. We must, therefore, dismiss brute identity theory for the same reason that we dismissed endurantism.

4.2 Yagisawa's 5+-dimensional Hyperworms

The idea that ordinary objects have modal extension is revived by Yagisawa, who introduces the notion of ordinary objects as 'five+-dimensional hyperworms'. Yagisawa's project is comparable to Sider's, in that he applies his temporal model of persistence to his modal picture. To this end he applies the logical structure of Mark Heller's slightly altered argument from van Inwagen (1981) for four-dimensionalism (Heller, 1990) to the idea of a kind of 'modal persistence'.

Heller's argument runs as follows. My body is an object that occupies a certain spatiotemporal region. We shall call the object Body. There is another object, which we shall call Body-minus, which inhabits all of the spatiotemporal region that my body inhabits, except for my left hand. Imagine that at time *t* my left hand gets chopped off. This does not affect Body-minus, so Body-minus persists after *t*. We do not want to say that the loss of my hand ends my body,[18] and so Body persists after *t*. My body does not have a hand attached to it after *t*, so the object that is Body after *t* is the object that is Body-minus after *t*. By the transitivity of identity, it follows that the object that is Body before *t* is the object that is Body-minus before *t*. However, this cannot be true, as Body-minus does not share all and exactly the same parts as Body, so the two cannot be identical. Heller's solution is to say that the reasoning is fallacious because the statement that the object that is Body after *t* is the object that is Body-minus after *t* is false because Body and Body-minus are four-dimensional objects that occupy different regions of space-time that only overlap after *t*. (Heller, 1990, 3-4, 19-20).

The validity of Heller's argument is not at stake. I am convinced by it. Yagisawa applies this to the modal picture, writing that my body exists (as Heller has proved) as a spatiotemporally extended entity (a four-dimensional worm), which we shall call 'Body'. Concurrently there exists a proper part of Body which is constituted by my body except my left hand during the last year of my life, which we shall call 'body-minus'. Suppose also that a me-version exists in world *w*. Let us call her body Body-*w*. It is very much my hope that in the actual world, I do not lose my left hand a year before my death, but it is certainly possible that I do so, given that the property of 'having a left hand at every time at which it exists' is not an essential property of Body.[19] Suppose that *w* represents this possibility by including a me-version that loses her hand in a geriatric sawing accident. Let us call her body Body-minus-*w*.

1) Both my actual body, Body, and an object that occupies all of the spatiotemporal region that my body inhabits except for my left hand, Body-minus, exist. There is a me-version that loses her hand after *t* in *w* (and the actual me-version does not), and her body is called Body-*w*. There also exists an object called Body-minus-*w* that only ever inhabits the space that Body-*w* inhabits up to *w*'s me-version's left wrist.

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[18] Contra mereological constantism.
[19] Contra mereological essentialists like McDaniel.

2) As Body-minus is not affected by the loss of a right hand, Body-minus *is* Body-minus-*w*. As having the property of 'having a left hand at every time at which it exists' is not an essential property of Body, Body exists at *w* as Body-*w*.

3) Given that Body has a hand that Body-minus does not, Body-minus is not identical to Body. However, seeing as identity is an equivalence relation, it follows that Body-*w* cannot be identical to Body-minus-*w*.

4) Body-*w* and Body-minus-*w* occupy exactly the same space and time, but are different objects. Body-*w* is the Body-version that exists in *w*, which overlaps the Body-minus-version that exists in *w*.

Throughout this entanglement of contradiction, Yagisawa rightly remains confident that Body-*w* and Body-minus-*w* occupy exactly the same space and time. However, their non-identity runs counter to the four-dimensionalist's modally relativised Lockean principle that no two (four-dimensional) objects of the same kind occupy exactly the same space (and time) in the same possible world. From this Yagisawa concludes that Body-*w* and Body-minus-*w* are not merely four-dimensional worms, but five+-dimensional hyperworms[20] which extend not only through space and time but also across possible worlds. It is just that Body-*w* and Body-minus-*w* (both construed not as worldbound, but as hyperworms) overlap each other within the region of space which the Body-*w*-version and Body-minus-*w*-version occupy. There is a Body hyperworm that is constituted by a chain of Body-versions across modal space. In the actual world, the Body-version is whole, shorter than 6ft and currently wearing a black jumper but in other worlds, Body may be taller, differently clothed and may lack (or boast extra) parts. However, all of these Body-versions are, according to Yagisawa, identical. There is a shorter hyperworm that is constituted by Body-versions, which is a proper part of the Body-minus hyperworm. Given that the Body-minus hyperworm is a proper part of the Body hyperworm, the overlap is unproblematic.

This approach is the modal analog of an eternalist endurantist approach, because an object is both fully present at any one world, and extended throughout the *n* dimensions of modal space it occupies. An object straightforwardly 'is' itself in every world that it inhabits, despite there being differences between object-versions across different worlds. To push the analogy, it survives 'changes' in its 'modal persistence'.

However, as laid out in chapter *2*, endurantists (even those of the eternalist flavour) contravene the principle of the indiscernibility of identicals when they assert that an object at time *t1* is identical to that (changed) object at time *t2* (and do not provide an adequate solution to this problem, either in the form of relationalism or adverbialism). In much the same way, brute identity theorists like Kripke contravene this principle when they assert that an object *x* in *w1* is identical to an object *y*

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[20] Unlike time and space, modal space is not either one or two-dimensional because it is not linear. Therefore objects which have modal extension are likely to have irregular multidimensional shapes - hence the hyperworms being '5+-dimensional'.

in *w2*, when *y* does not share all and exactly the same accidental properties as *x*. As outlined in section *2.2*, it is this very issue that motivates counterpart theory.

This derails Yagisawa's revised argument from Heller in that it assumes premise 2, which is that the actual Body-minus is identical to the non-actual Body-minus-*w*, despite occupying different regions of spacetime in different possible worlds. It may be thought that the external property of modal location is insufficient to show that by Leibniz's Law, Body-minus and Body-minus-*w* are distinct, because the body-versions 'overlap'. I contend however that this is not the case, and that two modally distant objects cannot be identified with one another. Furthermore, Body-minus-*w* does not have the property of 'being the proper part of a body', which Body-minus does have, which corroborates their non-identity.

4.3 Modal Realism With Overlap

Kris McDaniel attempts to resolve the contravention of Leibniz's Law by advocating a relationalist-style approach to modal persistence. Let us quickly recap the relationalist approach, and assume that it was true of me to say to you that you would have enjoyed the party at the time of writing, because you are somebody who is particularly gregarious and enjoys parties of any kind. However, in 50 years, you develop a particularly acute case of tinnitus and cannot bear to be in the same room as multiple people engaging in loud and raucous conversation. If we take identity across time to be brute, we run into the problem of temporary intrinsics, because the person (or rather part of a person) you are now does not share all and exactly the same properties as the unfortunate person you will become within half a century, especially regarding your enjoyment of parties. To ameliorate this, the relationalist will argue that you do not have the property of being unaffected in 2020, which is lost in 2070, but rather that you that you have the property of unaffected-at-2020, and suffering-at-2070 throughout your entire life.

Let us assume that the condition of tinnitus is not an essential property. This is plausible, because our intuition certainly is not that a person stops being whoever they are once they develop the condition. Therefore, there will be possible you-versions that have tinnitus, which means that my statement is not a necessary truth, as these non-actual you-versions would indeed not have enjoyed the party had you gone, (indeed, it would have been rather insensitive of me to have suggested that you would have).

In McDaniel's terms, the various you-versions 'overlap', in that you are present in multiple possible worlds, and that therefore these possible worlds share a part, namely: you. This makes you, (or indeed your aunt, your car, and your BLT sandwich) a trans-world entity. Both Yagisawa and McDaniel hold that objects are both wholly present at every possible world at which they exist (much like the endurantist holds that an object is wholly present at every time at which it exists), and that objects exist at multiple possible worlds (just as the eternalist holds that ordinary objects exist at different times). The fact that some have the property of having tinnitus and some are unblighted runs parallel to the (temporally) relationalist approach, claiming that an unlucky,

merely possible, present you has tinnitus-at-*w1*, whereas the actual present you is healthy-at-@. I am unaware of any proponents of this view, but one could construct an adverbialist analogue, which would run something along the lines of saying that the unlucky, merely possible, present you has tinnitus in *w1*-y kind of way, whereas the actual present you is aurally healthy in an @-y kind of way.

On the other hand, a much more widely-held form of modal endurantism is actualism, which is the modal analogue of presentism, as the actualist denies the existence of other worlds in much the same way that the presentist denies the existence of other times (Adams, 1981). Just as the presentist avoids the problem of diachronic identity by holding that no past or future stages of objects exist, so the actualist avoids the problems inherent to trans-world identity. I will not rehash the relativistic problems associated with presentism here,[21] but the actualist thesis has provoked criticism, notably from Lewis, who holds that concrete non-actual possible worlds and objects are key to understanding modality (Lewis, 1986, 5-20). Our common modal talk tacitly endorses the idea that non-actual events and objects exist. We're happy to say that 'things could have been different from the way they actually are', which can be paraphrased as 'there are other ways things might have been'. This quanitifies over (and imples the existence of) 'ways things might have been', which is what Lewis means by a 'possible world' (*ibid*).[22] It is the burden, then, of the actualist, to provide a semantics that explains what we mean when we make modal statements that can explain away these implications of our common modal talk.

To reiterate, I do not advance these various flavours of modal endurantism in order to put any of them forward as a live alternative to the pairing of stage theory and counterpart theory. I believe that actualism does not get to the heart of our modal talk, and that the modal relationalist and adverbialist analogues must surely fail to ameliorate the problem of the contravention of Leibniz's Law in much the same way that their temporal predecessors do. However, it is important to note that there exist at least two sets of integrated temporal and modal metaphysics, (namely counterpart theory paired with stage theory and endurantism paired with a modal endurantism analogue) which will be joined by a third that I will introduce in my next chapter.

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[21] For a fuller discussion of these, see *1.2*.

[22] For a less brief sketch of Lewis' argument for modal realism, see *2.1*.

CHAPTER 5: MODAL PERDURANTISM

5.1 Modal Perdurantism

As argued in chapter *3*, Sider is right to point out that Lewis' counterpart-related modal picture is conceptually inconsistent with his perduring temporal picture. However, this intuition need not bias us towards stage theory. It is here that I shall introduce the idea that instead of following Sider and creating a temporal picture that is consistent with our modal one, we might modify our modal picture to bring it into line with our temporal one. In short, a worm-theoretic temporal perdurantism twinned with a 'modal perdurantism'.

Modal perdurantism applies the temporal perdurantist's conception of persistence to modal realism. Just as temporal perdurantism holds that ordinary objects are only partly present at any time in their existence (except in the case of instantaneous entities), modal perdurantism holds that ordinary objects are only partly present in each possible world that they inhabit. As in the case of instantaneous objects, there will be an exception made for those entities which only exist in one possible world. However, according to the view under consideration, such objects are certainly not ordinary objects, but (in the vast majority of cases) merely parts of them.

This view explains statements of modal predication with reference to 'trans-world' objects, which exist across multiple possible worlds. To say that Carfax Tower (which is 74 feet tall), could have been shorter, is to say that Carfax Tower has a part (or 'phase', which is a maximal part in any one world) that is under 74 feet tall.

This claim runs directly counter to the theory of worldbound individuals, which states that objects exist wholly in only one possible world. Lewis will not deny that there are trans-world entities, because he is a proponent of the principle of unrestricted composition, which states that any set of objects (be they actual, merely possible or a mix of the two), is itself an object. My left fingernail, a possible version of the Windrush River (that happens to be two inches shorter than the actual) and the worlds that contain a diamond shaped in the exact shape of the Eiffel Tower are all, therefore, an object. However, these are not ordinary objects, which Lewis maintains exist in only one possible world.

Ordinary objects, such as a set of conjoined twins, Lewis writes, may share a hand in the actual world, but he denies that two genetically identical individuals that live in different possible worlds share parts (contra Kripke, Yagisawa and McDaniel, who maintain that under the right conditions, two genetically identical but modally distant individuals may share all of their parts, being one and the same modaly enduring object). Lewis goes on to write that the notion of trans-world entities "[d]isagrees gratuitously with common opinion" (Lewis, 1986, 220). It may seem intuitively implausible that tables, sandwiches and people are "scattered objects with parts existing in many spatially disconnected locations" (Stalnaker, 1986, 124). However, it is not the claim of the modal perdurantist that modally distant objects share parts, but rather that they *are* parts of a larger trans-world entity.

The choice between counterpart theory, a modal endurantism analogue and modal perdurantism therefore consists largely within a commitment to the kind of thing that an ordinary object is (Lewis, 1986, 217). Just as the stage theorists want to say that ordinary objects are stages, counterpart theorists want to say that worldbound counterparts are ordinary objects. Sider, both a counterpart theorist and stage theorist therefore holds that ordinary objects are the temporal stages of counterparts. In much the same way, just as the endurantists will hold that ordinary objects are wholly present at every time at which they exist, the proponent of a modal endurantism analogue will say that an ordinary object is a trans-world object that is wholly present at every world it exists. The person who holds the synthetic product of the two views is committed to the claim that an ordinary object is the kind of thing that can be wholly present at multiple times and in multiple worlds. On the other hand, just as the worm-theoretic perdurantist will say that an ordinary individual object is the sum of its multiple and discrete temporal parts,[23] modal perdurantists want to say that an ordinary individual object is the sum of its modal parts. A dual temporal and modal perdurantism therefore implies that ordinary individual objects are the sum of both their temporal and modal parts.

5.2. Modal Fission

5.2.1 Lewis' Dishpan Case

Lewis argues that inconstant modal predication poses a problem for those who advocate for an understanding of modality through reference to trans-world objects. As explained in *2.3*, he illustrates this inconstancy with a case wherein a large amount of plastic is divided at the factory on Monday such that each small amount is enough to be poured either into a dishpan or waste paper basket mould (Lewis, 1986, 252). The plastic could have been made into a waste paper basket if the dishpan order had come on Tuesday, but it was actually made into a dishpan. If the dishpan order had come in late, a dishpan would have been made from a different consignment of plastic a day later. The identification of the correct phase of the dishpan in the possible worlds in which the dishpan order had come in late is tricky. There are no completely convincing arguments in preference of it being the waste paper basket, or the dishpan that is made a day later. We could also say that the world represents one thing twice over, either as a young dishpan, or a waste paper basket, both of which work best in different contexts. Generally, we are at least sometimes provided with multiple rivals within one possible world to serve as phases of every actual object, which greatly inflates the number of phases that belong to each concrete object, and might, according to Lewis, create ordinary objects such as dishpans which have parts that are waste paper baskets.

Lewis' problem is illustrative of the criticism of counterpart theory that is discussed in *2.4*. Because it makes sense to talk of the non-actual dishpan as the counterpart of the actual dishpan in one case

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[23] Except in the case of instantaneous objects, when there is at least one time (i.e. the moment that the instantaneous object phenomenalises) that the perdurantist and the endurantist can agree that the object is one and the same thing, which it's instantaneous temporal part.

and the waste paper basket in another, two very disparate counterparts are generated. Extrapolated across the richness of modal space, an even more heterogeneous set of counterparts will emerge, with a vanishingly small number of common properties (perhaps 'consisting of physical matter' being the best and only candidate for such a property).

More generally then, the problem is to decide whether the younger dishpan or the waste paper basket (or both) is the dishpan-version we need to identify as the appropriate dishpan-version on which we should focus. Our choice will determine what the counterpart theorist says is a counterpart of the actual dishpan, what the modal perdurantist will say is a part of the trans-world dishpan, and what the proponent of a modal endurantism analogue will say is straightforwardly identical to the actual dishpan.

Kripke would presumably identify the younger dishpan as a dishpan-version of our actual dishpan,[24] and deny that the waste paper basket is a dishpan-version at all. I suspect that McDaniel would say that the actual world and this non-actual world overlap in sharing a dishpan, but that the non-actual dishpan is a proper part of the trans-world dishpan in that it does not occupy all of the spatiotemporal region that the actual dishpan does. The response I imagine Yagisawa would make is a little more complex than that offered by his modal endurantist peers, and will be discussed in *5.2.2*.

The proponent of modal perdurantism should solve Lewis' problem with a solution analogous to the worm-theoretic perdurantist's solution to the problem of temporal fission. To follow Sider's example discussed in *3.3*, if Ted is an actual person, we might say that it is possible that he could asexually reproduce like an amoeba and become Fred and Ed, or that Ted could have been born as the twins Fred and Ed, or that in some ways Ted could have been Fred, but in other ways, Ted could have been Fred.[25] In any case, some possible world, let us call it *w1*, represents this possibility by containing Ed and Fred.

As mentioned, Lewis explains possibility through appeal to counterpart relations linking alternate versions of possible objects together. Therefore, Ed and Fred would be understood as *w1* counterparts of Ted. Sider complains that Lewis, (a worm-theoretic perdurantist), will say in the case of temporal fission, when Ted becomes Ed and Fred, these two people coincide in their earlier parts, but in the case of modal fission, the two merely possible people Ed and Fred are merely counterpart-related to the actual person Ted (Sider, 1996). Sider is correct to point this discrepancy out. Lewis is committed to a view that ordinary objects are their diachronic sums, such that non-

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[24] Unless he is like an origin essentialist in that he would consider the age of the dishpan to be an essential property, in which case he would deny that there is a dishpan-version that is present in this non-actual world

[25] Say that Ted has a big decision. Does he take the big finance job in the city, or move back to his parent's farm? If *w1* contains Ed, a banker and Fred, a farmer, and Ted could have been either of them, this is a modal fission case. This parallels Lewis' discussion of bodily and personal counterparts, whereby 'I' (both my body and my personality) have bodily counterparts who physically resemble me, and personal counterparts, who more closely resemble my character, both in the same possible world. (Lewis, 1971).

instantaneous objects are only partially present during any non-maximal interval of their existence. In order to apply a uniform solution to his modal metaphysics, Lewis must also say that ordinary objects are their trans-world sums, such that an ordinary object appears only partially in any possible world that it inhabits.

A fully integrated modal and temporal perdurantism might seem to indicate that if it is possible for Ted to have been born as the twins Ed and Fred, the two trans-world individuals (let us call them **ED** and **FRED**) who have either the *w1* Ed-version or *w1* Fred-version as their *w1* phase must overlap in the actual Ted-version in virtue of sharing this Ted-version as their actual part. This seems a good solution from the perspective of *w1*, because from their point of view, the actual world is the truthmaker for the statement 'Ed and Fred could have fused in the womb'. However, this situation is not quite as satisfactory from our perspective, because Ted is not (as modal perdurantism would seem to indicate he is) part of one ordinary object, namely a trans-world entity (let us call him **TED**), but instead part of two ordinary objects, which are the trans-world entities **ED** and **FRED**.

TED, I propose, should not be reduced to **ED** and **FRED**, but rather we should say that **TED** is a trans-world entity that has as its actual part the actual Ted-version, and has two distinct *w1* parts, which are the *w1* Ed-version and *w1* Fred-version (making the statement that **TED** could have been born as twins true). While some phases overlap in some worlds, other phases may consist of multiple and distinct parts. In the case of **TED**, **ED** and **FRED**, we say that the actual Ted-version, the *w1* Ed-version and *w1* Fred-version all belong to the same trans-world individual **TED**, and that the *w1* Ed-version and the *w1* Fred-version are merely halves of the *w1* phase. However, this does not mean that the trans-world entities of **ED** and **FRED** disappear. They are modal worms that exist either as the *w1* Ed-version or the the *w1* Fred-version and coincide in the actual Ted-version. **ED**, **FRED** and **TED** will have a similar set of essential properties, but not entirely so. Therefore the three trans-world entities will most probably consist of a slightly different set of parts, therefore giving them different modal shapes. Whilst they will coincide within a great many possible worlds, they will all span a slightly different region of modal space. Therefore the modal perdurantist will, as Sider points out, apply a uniform solution to temporal and modal fission cases and say that persons can share both temporal and modal parts *whilst* maintaining distinct identities.

We might apply this solution to Lewis' problem and say that the dishpan-phase is the actual part of the trans-world dishpan that comprises (at least) both dishpan-versions and the waste paper basket. This effectively admits that Lewis is correct in saying that to deny the theory of worldbound individuals is to say that there is a trans-world dishpan that has a waste paper basket as a part.

However, I think this is inappropriate. All phases of a trans-world ordinary object will share a set of essential properties that are associated with the kind of thing that object is. Dishpans have a set of essential properties which differ from those of a waste paper basket. There is a trans-world dishpan which has as parts the actual and non-actual dishpan, and there is a trans-world object that is comprised of all of the objects that the factory made on Monday, which includes the actual

dishpan, the waste paper basket, and no doubt other phases like plastic cutlery, toy trains and tupperware that exist in worlds beyond the actual and *w1*. Dishpans are certainly ordinary objects, and so the hyperworm that includes the actual and non-actual dishpan is an ordinary object, and is in fact *the* object that is referred to when speakers from either world talk of 'the dishpan'. On the other hand, an 'object the factory made on Monday' is not an ordinary object, and so the hyperworm that is comprised of the actual dishpan, the non-actual waste paper basket and the pieces of cutlery, toys and tupperwares at other possible worlds is not an ordinary object.[26]

5.2.2 Yagisawa's response

Yagisawa, unlike his modal endurantist peers, goes to great lengths to explain his solution to fission problems such as Lewis' dishpan and waste paper basket scenario. He utilises Shoemaker's condition that for an object to survive fission, one of its products must be its closest continuer, which was discussed earlier in *3.3*. Yagisawa orders modal space into sets of *n*-dimensional modal chains of worlds. The chains are ordered by the overall similarity of each world, and because of the richness of modal space and consequently the very many ways in which a world can differ from another, (numbering *n*) each world is a link in the *n*-dimensional chain it generates. Each world differs minutely with the worlds that it is closest to. In any world, there will be objects which differ minutely from the objects in the worlds that are closest to them on the chains. Whether or not an object *a* in world *w1134* on chain *c100007* is identical to a minutely different object *b* in a world *w1135* on chain *c100007* will depend on whether *w1135* is *w1134*'s closest continuer.

This approach allows increasingly long chains of worlds to create increasingly bizarre trans-world individuals. The actual Stalin may, Yagisawa argues, inhabit a world which is a link in a chain that ends at some world that is identical to this world except that Stalin is replaced by a poached egg (Yagisawa, 2009, 124). According to Yagisawa, the trans-world individual who exists throughout the chain of worlds beginning at the actual and ending at the world that switches Stalin for this egg is an 'eggerson', because Stalin ceases to be himself at some point in the chain where he loses the properties that are essential to Stalin, and the non-actual egg similarly ceases to be when it loses all of the properties essential to itself. Therefore though this 'eggerson' may be one unique individual, he does not make true the claim that Stalin could have been a poached egg, as the man and the egg do not overlap in the chain.[27]

In fact, Yagisawa goes to great lengths to explain away the idea that these long chains that end in one individual being switched for another make true claims such as 'X could have been Y' regardless of the argument from essential properties. If there is an infinitely dense chain of worlds that start at the actual world where the worlds differ minutely until a world is reached in which Stalin has switched places with Hitler, there will be a being exactly halfway along the chain that neither resembles Hitler nor Stalin more closely. Yagisawa dubs this individual 'Statler'

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[26] Despite certainly being an object of sorts.
[27] Quite what manner of being joins them is best left unimagined.

(Yagisawa, 2009, 124). This is a modal analogue of the temporal Ted, Ed and Fred case, because from the perspective of Statler's world, Statler (modaly) splits into two individuals, both of whom exist in worlds that are equally distant on the chain. *Ex hypothesi*, neither the man who is only minutely more similar to Hitler than him nor the man who is minutely more similar to Stalin than him in the world closest to his world on the chain towards the actual world is his closest continuer. Therefore Statler's hypperworm ends in the modal direction towards the actual world, and the 5+-dimensional Hitler hyperworm and the 5+-dimensional Stalin hyperworm end at the point just before fusion at Statler. As the hyperworms do not overlap, the claim 'Stalin could have been Hitler' comes out as false.

Given the sheer density and richness of possibilities across modal space, Yagisawa's theory implies that any two worldbound objects at any two possible worlds belong to one and the same trans-world individual. In other words, there exist chains of worlds that allow hyperworms to link any two worldbound objects from any two distinct possible worlds. Given that hyperworms intersect, every hyperworm will be part of what Yagisawa calls a 'superblob', which is an *n*-dimensional extension of intersecting hyperworms that contain a worldbound object at every possible world. These superblobs intersect and form 'the hyperblob', which is composed of every superblob and therefore contains every worldbound object in every possible world.[28]

This solution shares some similarities with that put forward by the modal perdurantist, but the two approaches should not be confused. As discussed in *4.2*, Yagisawa makes the mistake of identifying two worldbound objects, namely the actual Body-minus-version and Body-minus-*w*. Therefore, whilst the modal perdurantist will not disagree that both Body and Body-minus are trans-world entities that overlap in every world in which Body is present (because Body is a proper part of Body-minus) they will deny that the actual Body-minus-version is identical to Body-minus-*w*, and that Body-*w* is identical to Body. The modal perdurantist will hold that the actual Body-version, Body-*w*, the actual Body-minus-version and Body-minus-*w* are all worldbound entities, and so no identity relation can exist between them, because Body and Body-*w* (and Body-minus and Body-minus-*w*) are non-identical co-parts of the modally perduring Body.[29]

5.3 The Theory of Worldbound Individuals

Having clarified the modal perdurantist's position, it remains to be shown that this theory should be preferred over counterpart theory.[30] This argument will hinge upon the counterpart theorist's commitment to worldbound individuals. To begin, it will be shown that modal perdurantism should be preferred over counterpart theory in that it preserves the distinction between essential and accidental properties.

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[28] Excluding, perhaps, the empty world.
[29] And similarly that Body-minus and Body-minus-*w* are co-parts of the modally perduring Body-minus, which is not an ordinary object, but an object nonetheless.
[30] For full arguments against a modal endurantism, see chapter four. However, modal endurantism will be briefly mentioned throughout this section to compare to counterpart theory and modal perdurantism.

The modal perdurantist and the modal endurantist will agree that essential properties define the modal boundaries of the set of object-versions. For the modal endurantist, the boundaries delineate which worlds an object can be found within, whereas for the modal perdurantist, the boundaries delineate which worlds a part of an object can be found. These boundaries are meaningless when applied to counterpart theory, because two objects may be counterparts of each other without sharing all essential properties.[31] The revised counterpart theory generates very permissive modal boundaries of the sets of object-versions, allowing there to be object-versions that lie outside the boundaries indicated by the essential properties of the object. For example, the set of object-versions of Slash's favourite guitar includes a tuba, part of a barrel and a further variety of increasingly disparate objects (see section *2.4*). On the other hand, the counterpart relation (revised or unrevised) is much stricter than modal perdurantism and modal endurantism when it comes to the object itself. As explained, the counterpart theorist subscribes to the theory of worldbound individuals, which is the denial of the existence of trans-world entities (except as unrestricted mereological sums) (Lewis, 1968, 1986).

5.3.1 The Problem of Accidental Intrinsics

Arguably, this denial amounts to the dissolution of the distinction between essential and accidental properties. Seeing as no object exists in more than one world, no object exists in any possible world where it has any differentiation in attributes. This is to say that no object could have existed any differently than the way it actually does. Let us say that a world very similar to our own contains *n* electrons. Under this theory each object in that world stands in the same relationship to the most irrelevant properties such as 'being in a world in which there exists *n*+1 electrons' as to attributes that would have considerably more impact upon their context and constitution, such as 'being in a world where all matter is cheese', 'being in a world where Carfax tower is eight million light years tall' or 'being in a world which does not exist at all'. We can no longer make sense of the idea that things could have been different, or that objects could have followed different causal paths or could have had different origins or properties.

Without some trans-world relation, we are unable to conceive of the world having even the most miniscule alteration. We do not merely need possible worlds in order to make sense of modal claims such as '*x* could have been different', but we need a way of quantifying over the ways something could have been. The counterpart theorists say that there is a counterpart relation between all the instantiations of the way an object could have been, but this answer is too weak.[32] The proponents of modal endurantism analogues adopt a much stronger position, and provide the problematic answer that there is a straightforward identity between these different instantiations. The modal perdurantist solves this problem by arguing that an ordinary object has a worldly part that instantiates every way that it could possibly be.

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[31] Though presumably at least some: again, the property of being constituted by matter is a good candidate for a shared essential property that I would imagine obtains between all counterpart pairings.
[32] See the earlier discussion of Kripke's Humphrey objection in *2.4*.

Another implication of the theory of worldbound individuals (and therefore counterpart theory) is that it implies that any sentence that accurately describes an object's properties is necessarily true, and any false descriptions are necessarily false (Plantinga, 1974). The proposition that expresses my mug being red is a necessary truth, and propositions such as 'my mug is black' are necessarily false, because there is no possible world in which my mug exists and is black.

Perhaps counterpart theory can rescue the theory of worldbound individuals. Counterpart theory makes the proposition that my mug could have been black true in virtue of there being worlds which contain black counterparts of my mug, and so my mug's being black is not necessarily false, and so the denial of this proposition is not entailed by the proposition that my mug exists. However, this rescue attempt is too fast. Let us take the proposition 'my mug exists' again. The denial of trans-world identity implies that my mug exists in only one world, (which happens to be the actual), and that this proposition must therefore only be true according to the actual world. The counterpart theorist would have us believe that this proposition is true in all worlds in which there exists some counterpart of my mug. But my mug does not exist in those worlds: it exists only in the actual world. The counterpart theorist is using sleight of hand to introduce a broader sense of existence, whereby an object exists in virtue of having a counterpart (Plantinga, 1974, 110). A similar ploy is being practiced as pertains to our notions of the possession of properties, whereby our normal concept is being substituted with a sense whereby something may have properties vicariously through its counterpart having them. However, objects do not exist and have properties through their counterparts, but through their parts.

At this point it would be reasonable for a modal endurantist to argue that the modal perdurantist does no better than the counterpart theorist. Under modal perdurantism, no phase has accidental properties because phases are worldbound. The modal perdurantist cannot therefore say that my actual mug could have been red. In short, statements of the form 'the actual x is p' must always come out as true or false necessarily for the modal perdurantist. On the other hand, modal endurantism holds that one and the same object may exist at multiple modal locations and that the object may instantiate a wide range of accidental properties across modal space, meaning that they are truly able to say that *the* object that we see before us could have been different. The modal endurantist may say that my actual mug is one and the same mug as a merely possible mug that is in fact red, which bears out the truth of the statement that my mug could be red, just as they say that my present mug is one and the same mug as the mug that I filled with tea this morning and am drinking from now.[33]

However this is of no great disadvantage to the modal perdurantist. Both the proponent of a modal endurantism analogue and the modal perdurantist may still make the claim that 'the X could be p' true where X is an ordinary object, as for both theories, ordinary objects span modal space.

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[33] However this is not an unproblematic view, as such a statement contravenes Leibniz's Law. For a fuller discussion of the analogous problems inherent endurantism-style forms of identity, see *1.2.1* for the temporal version and *4* for the modal version.

Furthermore, the modal space that a particular object occupies is the same under both theories, and so statements of the form 'the *X* could be *p*' come out as true or false in exactly the same way. When it comes to talk of the actual, the modal perdurantist must hold that the truth of statements of the form 'the actual *x* could be *p*' is borne out by the referent of 'the actual *x*' being a co-part of 'the *X*' with an object that is *p*.

This does not present too much of a problem when a more holistic view is taken. Let us stipulate that at *w1*, my mug is balck. The statement 'my *w1* mug is black' is necessarily true, because my *w1* mug does not exist outside of *w1*. This is not problematic. The mug cannot be any other colour but black except through having a part in another possible world where it is not black, which it does, through having a part in the actual world where it is red. Similarly, my cousin Tim was 4ft 6in tall in 2004, but is 6ft 2in tall in 2020. The temporal part of Tim that existed during 2004 is straightforwardly 4ft 6in in a way that is analogous to the modal part of my mug that exists at *w1* and is black. Tim *was* 4ft 6in in a way that is analogous to my mug *possibly being* black. The present Tim and my actual mug are not 4ft 6in and black respectively, but parts of Tim and my mug are. In short, for it to be possible for a worldbound *x* to be *p* is to belong to some *X* that has a modal part at *w* that is *p*, in much the same way that for a person *Y* to have been *q* is for them to have a temporal part *y* that was *q* at *t*.

5.3.2 Trans-modal Causation

Lewis rejects this analogy of temporal parts with modal phases which form "a superperson or superbody consisting of persons or bodies in different worlds" (Lewis, 1971). He argues that though both temporal parts and modal phases have qualitative similarity, it is a relevant difference that temporal parts, but not modal phases, causally depend upon each other (as there is no trans-world causation).

Yagisawa attempts to ameliorate this problem by appealing back to Nozick's notion of filmstrip continuity, which was introduced in *3.4.3*. To reiterate, Nozick imagines a scenario whereby a 'disappearing machine' and a 'producing machine' are set up perfectly in sync so that the moment the producing machine produces something the disappearing machine vanishes it, and the moment the disappearing machine vanishes something the producing machine generates something qualitatively identical to take its place (Nozick, 1981, 665 n.7). Yagisawa disagrees with Nozick that this kind of continuity does not constitute the persistence of a single object. He instead asks us to imagine that there is a god that ensures the persistence of all things, not by keeping them in existence but by vanishing them every instant and replacing them as soon as they are vanished. The god produces the new objects such that the new object behaves exactly as an object that was on the causal path of the object it replaces would behave in that moment. The scenario is later reimagined without the presence of a god, in the form of a universe in which all objects exist for only an instant before being replaced in such a way that the behaviours of the objects are indistinguishable from the behaviours of objects that persist and undergo causal processes. It is stipulated that there is no natural law that causes new objects to phenomenalise in this way, but

that it just happens. Yagisawa uses the example of Nixon, who he stipulates is an ordinary transtemporal individual who is composed of appropriately lined up temporal stages which are not causally related. He argues that it is more plausible to say of this situation that Nixon exists through time but causation fails to work in the way that we actually think it does than to say that in this situation Nixon does not exist though time at all (Yagisawa, 2009, 113). It is for this reason that Yagisawa concludes that not only do the objects in this universe (theistic or godless) persist, but also that this example shows that causation is not necessary for cross-temporal identity. As was argued at length in chapter three, filmstrip continuity is insufficient for persistence because (temporally counterpart-related) stages cannot undergo causal processes, and so Yagisawa's solution to my mind fails.

However, modal parts are not required to be strictly analogous to temporal ones. They are, in this sense, more akin to temporally unextended spatial parts. It is coherent to imagine that the spatial parts of oneself need not be causally connected with each other (I may have a blister on one of my big toes that has absolutely no effect upon my eyelid). Furthermore, according to special relativity, no instantaneous spatial parts of an ordinary object may causally affect others, as spatially distant events cannot affect others that lie upon one and the same hypersurface of simultaneity.

Lewis also notes that a temporally perduring person usually has a rational self-interest in their future.[34] It is true that most people and a great number of animals are linked by reflexive "prudential unity relations" (McMahan, 2001) that obtain between each of their temporal slices and spatial parts. A modally perduring person, he supposes, cannot have a rational self-interest in what happens to phases of herself that exist only in other possible worlds. However, surely this is in contradiction with our ordinary attitudes towards counterfactual scenarios that contain us. We are obsessed by ideas of what could have been, and often rejoice or lament the happening of specific past events that caused us to actualise in a certain way. We constantly imagine the lives we could have had if we got better grades, went to the gym more, were taller, etc. This, I contend, is our interest in our modal parts. A co-parthood relation binding modal phases to a trans-world individual far more accurately captures our deep fascination and concern with statements of modal predication compared to the somewhat impersonal counterpart relation.

5.3.3 The 'he himself' intuition revisited

It becomes easier now to see how counterpart theory falls foul of the Humphrey intuition, or what Lewis dubs the 'he himself intuition' (Lewis, 1986). To reiterate, it can be broadly asked how a counterpart of some y having property p is relevant to the idea that y could be p-like, but specifically in the case of individuals, it can be asked why we should care about our counterparts having differing properties to our own. If I say that I could have been taller, it is hardly likely to comfort me that I have counterparts who in fact are. Nor is it relevant.

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[34] And also in their spatial parts!

It could be similarly argued that this objection applies to the modal perdurantist picture, and that no phase of Humphrey should care whether victory befalls any other phase. Indeed, if part of a sum does something, and part of them does not, surely one part does not care what another part does, any more than one slice of salami cares about what happens to another (Lewis, 1986). However, any part of a person surely does care what happens to its co-parts. In the spatial case, my brain cares about what happens to my hand, and the temporal case, my earlier parts care about what happens to my later parts (I would be horrified for example to learn that I die in an explosion tomorrow, or even in ten years). Similarly, my actual phase, (construed as a mere part of a trans-world entity), will care about each part that I (construed as a trans-world entity) am composed of. This captures the true meaning of statements I make as pertain to the possibility of being six foot tall and explains my interest in them. Several modal parts of me are indeed six foot tall, which makes the proposition that I might have been six foot tall true.

It submit that we should take up worm-theoretic perdurantism in the light of the worm-theoretic perdurantist's authoritative and highly credible answer to the problem of change and persistence. In addition, the modal perdurantist's ability to successfully capture the true meaning of modally predicated statements is evidence enough to establish modal perdurantism as theoretically superior within modal metaphysics. We should therefore be dual worm-theoretic and modal perdurantists purely on the merits of each theory, abstracted from one another. However, the benefits of adopting both theories in tandem extend beyond those that each theory can individually offer. When combined, a consistent metaphysical picture emerges. I shall also propose that this hybrid perdurantist model is preferable to the (admittedly equally self-coherent) stage theoretic perdurantism and counterpart theory pairing, given the novel and compelling answers to the problems of coincidence that a dual integrated modal and temporal perdurantism provides in *6.4*.

CHAPTER 6: COINCIDENCE

The standard account of coincidence does not identify an object with the parcel of matter which constitutes it. A statue, therefore, is not identical to the lump of marble from which it is made. When Michelangelo sculpted David, he created a novel object, namely *David*, which fully overlaps the marble block, (let us call this MB) that constitutes *David*. The reasoning behind the standard account is clear and compelling, and boils down to this: an object typically does not share all and exactly the same properties with the matter from which it is constituted, and so, given Leibniz's Law, cannot be identical with it. In the case of temporary coincidence, these properties will be both historical and modal, meaning that the perdurantist will count the objects as distinct. However, in the case of permanent coincidence, these properties will be merely modal ones. I will discuss some authors who deny that these kind of properties are those which count when assessing identity claims. However, given the strong analogy between modal and historical properties, which presumably are incontrovertibly of the kind which count when assessing identity claims, I conclude that *David* and MB are distinct even when permanently coincident. This will in turn show that the orthodox perdurantist reasoning behind counting *David* and MB as distinct when temporarily coincident is misguided. However, first the stage theorist's account of coincidence will be considered, as it will serve as a contrast for the perdurantism that will make up the main discussion of this chapter. Finally, the modal perdurantist's account of coincidence will be examined, and teamed with worm-theoretic perdurantism, which will offer an integrated metaphysics for the problems of change, modal expression and coincidence cases.

6.1 Stage Theory

As discussed in *3.3*, Sider denies that multiple objects may coincide on account of the non-additivity of properties. He argues that if the object we point to when we point at *David* really is two objects, we should expect *David* to instantiate double the magnitude of properties of MB (Sider, 1996, 11).[35] He further writes that *David* and MB are identical because the *David*-stages and the MB-stages share all and exactly the same parts when *David* exists. There is nothing that belongs to a *David*-stage that does not also belong to the MB-stage that exists simultaneously. Of course, there will be mere MB-stages that occur before the creation of *David*, and so Sider says that *David* and MB are only temporarily identical in normal cases (Sider, 1996, 446). This is true insofar as the aggregate of MB stages (what the worm-theoretic perdurantist would call *the* MB) differs from the aggregate of *David*-stages (what the worm-theoretic perdurantist would call *the David*) because the *David*-stages are temporally counterpart-related to only other *David*-stages, whereas the MB-stages are temporally counterpart-related not only to other *David*-stages but to a longer chain of MB stages also.[36] This is not a problem for the stage theorist, as they are perfectly at liberty to allow that different sets of ordinary objects differ from others.

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[35] For example, if the marble block that constitutes the statue weighs 200kg, the statue, upon its completion, should (according to Sider) weigh 400kg.

[36] Assuming neither the mere lump nor statue-lump (significantly) changes in its constituent matter.

It is arguable however that no genuine cases of temporary coincidence occur according to the stage theoretic model. Given that (according to stage theory), ordinary objects are stages, and that stages exist only momentarily, it follows that both *David* and MB are exactly the same age - namely the youngest age it is possible to be, having just come into existence at that very instant.

Moreover, it is not clear that the arcane temporal counterpart relation is enough to ground a difference in the MB-stages' historical properties compared to those of the *David*-stages. MB is temporally counterpart-related to some objects that *David* is not, but if this does not amount to claiming that MB is older than *David*, the historical property of 'having existed before the creation of *David*' cannot be said to be instantiated by MB. It was speculated in section *2.4* that the modal property 'could have won' is unsuccessfully secured by appeal to a modal counterpart relation with a modally distant person who wins. The real Humphrey, as Kripke argues, should not care that a non-actual version of him bests Nixon and wins the election (Kripke, 1980, 45). Sider places emphasis on the analogy between the modal and temporal counterpart relation, and indeed it seems that Sider's project is to create a temporal metaphysics that runs parallel to Lewis' counterpart theory (Sider, 1996, 439). It therefore seems fair to work from analogy and say that it is certainly dubious that the historical property of 'having existed before the creation of *David*' is secured by appeal to a temporal counterpart relation with prior stages of MB. Therefore, Leibniz's Law is not contravened when asserting the identity of *David* and MB under counterpart theory, if historical properties are the only consideration.

Nevertheless, identity between *David* and MB will still be ruled out if the two differ in modal properties. Michael B. Burke reduces the modal properties of objects to their persistence conditions (Burke, 1992, 15). The paradigm modal property of 'would survive squashing' is applicable to a lump of clay but not the statue that it was made into, because in the possible worlds where a statue-version is squashed, the statue-version ceases to exist but the lump-version does not. As was argued in section *3.4*, stage theory implies that objects do not undergo change. A stage cannot undergo the process of being squashed, and so under stage theory, *David* cannot be squashed. In short, ordinary objects cannot be given persistence conditions under stage theory because ordinary objects do not persist - they are merely temporally counterpart-related to other ordinary objects. If Burke is correct in saying that if a statue differs from its constituting matter, the only differences are in their historical properties and persistence conditions, then there seems to be a clear way that the stage theorist can argue that Leibniz's Law is not contravened when Sider asserts the identity of *David* with MB.

However, Burke is too fast in his reduction of modal properties to persistence conditions. Let us imagine that I own a clay statue that satisfies the modal property 'could have been an amphora'. The world which represents my clay statue as having been made into an amphora is (in a scenario much like Lewis' dishpan/ waste paper basket case) a world, *w1*, in which the statue order comes in late to the kiln. The piece of clay-version in *w1* is still a piece of clay, but the actual statue-version is not a statue. There seems to be a sense in which a clay statue could have been an amphora in which a piece of clay could not. In this sense, a piece of clay can only ever have been be a piece

of clay. The statue-version in *w1* is represented as living out a different modal possibility than that which (from our point of view) it is actually doing, whereas the *w1* lump of clay-version is not. This would be true of the lump of clay for a world, *w2*, which represents the possibility of more pigmented sediment being deposited in the ancient riverbed where the clay was formed. Let us say that the lump of clay is actually white clay, but in this world, it is red clay. In *w2*, the lump of clay is living out a different modal possibility and so the lump of (white) clay-version in *w2* is doing a similar thing to the statue-version in *w1* (from the perspective of the actual world). It seems, therefore, that different modal properties can be rightfully ascribed to the statue and the lump of clay, and that an assertion of identity between the two would contravene Leibniz's Law. Though stage theory removes the 'preposterousness' of the non-additive properties of coincident objects by asserting an identity relation between objects such a statues and lumps of clay, the reduction of objects to instantaneous objects fails to get around the thorny issue of the contravention of Leibniz's Law.

6.2 Sorts and sortals

Proponents of the standard account follow Wiggins' principle that no two things *of the same sort* (that is, no two things which satisfy the same sortal or substance concept) can occupy exactly the same volume at the same time, but that two objects of different kinds may completely overlap any or all of the eachother's parts (Wiggins, 1968).

Michael B. Burke is not convinced by Wiggin's answer, and provides an account of how some singular object may appear to be two without actually being so. He writes that when it seems that there are two different objects of two different sorts, one sortal overrides another and restores singularity. To return to the example, Burke argues that a collection of matter ceases to exist *qua* being a mere collection of matter once it is shaped into a statue (Burke, 1994, 605). If *David* is created at *t1*, the block of marble before *t1* that occupied the spatial region which *David* occupies after *t1* is not identifiable with the statue, because it no longer exists. At *t1*, a statue comes into being and the sortal 'statue', being higher in the hierarchy of sortals, dominates the sortal 'block of marble' and eliminates it. Instead, the statue is constituted by a different block of marble, MB2, which takes on the persistence conditions associated with the sortal 'statue' and specifically of the statue *David*. Given that MB2 comes into existence at the same spatiotemporal location as *David*, MB2 and *David* share their historical properties.

As mentioned in *6.1*, Burke mistakenly takes an object's modal properties to be its persistence conditions. Therefore, by stipulating that when the sortal 'statue' dominates the sortal 'block of marble', MB2 comes into being and takes on the persistence conditions associated with the sortal 'statue'. Therefore according to Burke, MB2 and *David* share both their historical and modal properties and Leibniz's Law is not contravened when it is claimed that they are identical. However, as argued in *6.1,* Burke's reduction is unsuccessful, and so MB2 and *David* have different modal properties, so Burke's account would have to stipulate that when the sortal 'statue'

dominates the sortal 'block of marble' and MB2 comes into being, MB2 takes on the modal properties of *David*.

This stipulation would however not save Burke's account, given that it can be shown that MB1 and MB2 are indeed identical. E.J. Lowe does just this. To this end, he introduces two new sortals, namely, 'piece of marble*', which is satisfied iff an object is a piece of marble and complies with the persistence conditions associated with the term "piece of marble", and 'statue*', which is satisfied iff an object is a piece of marble and complies with the persistence conditions associated with the term 'statue' (Lowe, 1995, 173).

MB1 is a piece of marble*, because it is a piece of marble - it consists of marble and is all of one piece - and complies with the persistence conditions associated with the term 'piece of marble'. Lowe explains that pieces of marble can be any shape including statue shapes, and points out that even Burke allows that some pieces of marble, namely MB2, are statues. Therefore MB1 does not cease being a piece of marble* when it is formed into a statue. There is no reason to suppose that the persistence conditions associated with the sortal term "piece of marble" forbid an object which complies with these conditions from taking on the shape of any possible statue*. From these terms and this plausible assumption emerges Lowe's argument, which runs as follows:

1) A piece of marble* can take the shape of a statue* without ceasing to exist, because the persistence conditions associated with the sortal term "piece of marble*" do not rule out such a possibility.

2) The piece of marble* does not however thereby become a statue* (because there are different persistence conditions associated with pieces of marble* and statues*.

3) (from 1+2) When a piece of marble* takes on the statue* shape, a statue* is created.

4) (From 1) The piece of marble* continues to exist when it is made into a statue.

5) (From 3+4) There exist two numerically distinct coincident objects, namely the piece of marble* and the statue* (Lowe, 1995, 173-178)

If we were to assume by *reductio* that there is a new piece of marble, namely MB2, which obeys the persistence conditions of a statue and is identifiable with *David*, there will still be, co-located with *David*, another piece of marble, because, as the above argument shows, MB1 still exists and is coincident with *David*. Of course if we are to take the sortal 'piece of marble*' seriously, then there being this sort of coincidence is allowed by the standard account because MB1 is a piece of marble*, whereas MB2 is a piece of marble. However, Lowe's argument is not supposed to show that the *David* case represents two coincident objects MB1 and MB2, which satisfy the sortals 'a piece of marble*' and 'a piece of marble' respectively. As Lowe points out, 'a piece of marble*' and 'a piece of marble' are synonymous, because they pick out all and exactly the same objects (Lowe, 1995, 173). Therefore there is only one piece of marble, MB, which persists through the

creation of *David*, which, due to both its modal and historical properties, cannot be identified with MB.

6.3 Perdurantist Accounts of Coincidence

Having rejected these attempts to identify the statue with the matter by which it is constituted in cases of both temporary and permanent coincidence, I will move on to the perdurantist approaches that only attempt to do so in the case of permanent coincidence. Sections *6.3.2-6.3.4* will examine three such attempts, and *6.3.1* will explain why so many perdurantists[37] are motivated to make them.

6.3.1 The orthodox perdurantist view

Perdurantists like Lewis take the problem of coincidence to be that when ordinary objects like statues are made, the constituting matter, (in this case MB) has differing historical properties, as the matter has to be crafted and worked upon in such a way that it becomes a statue. If any statue (with a normal origin story) *x* comes into being at time *t*, the matter that constitutes it has the historical property of having existed before *t*. *David* was created in the early sixteenth century, but the marble itself was formed from sedimentary limestone far before civilization began. Furthermore often a collection of matter outlives the object it constitutes, (as in the case of metal statues being melted down for railings or munitions), meaning that the object itself has a much shorter lifespan than its constituting matter. To adopt talk of temporal parts, an object typically *overlaps* a temporal midsection of the matter from which it is constituted. In such cases the orthodox perdurantist says that the object and the matter are temporarily coincident.

The orthodox perdurantist view denies that the constitution relation entails the identity relation in this case and agrees with the standard account insofar as *David* and MB being different objects, but disagrees because they will hold that *David* is a part of MB. That is to say, *David* is identical to MB when they are coincident, but that MB has temporal parts which extend beyond *David*. On this conception, *David* is to MB as my hand is to my body.

It will be argued here that this model fails. In order to elucidate these failings of the identification of a statue with a part of its constituting matter, we must examine cases of permanent coincidence, where an object and the matter it is constituted by are both created and then later destroyed at exactly the same instant. Gibbard uses the example of the sculptor Myron creating the statue *Goliath* by welding two pieces of pre-cast bronze together, such that the unified piece of bronze (BP) came into existence at exactly the same time as *Goliath* (Gibbard, 1975). He asks us to further imagine that *Goliath* was smashed at some later date, such that BP was destroyed simultaneously. In this case, *Goliath* and BP share all their historical properties, as all of the temporal parts of

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[37] See Lewis (1971), Gibbard (1975), Gupta (1980), Noonan (1988), Robinson (1982) *inter alia.*

Goliath overlap all of those of BP. Therefore, the orthodox perdurantist view rejects the standard account in this case and concludes that *Goliath* and BP are identical.

This, however, ignores the notable ways in which even permanently coincident objects differ from their constituting matter. *Goliath* has a set of different modal properties to BP, from which we may derive the persistence conditions of both. Just because *Goliath* and BP were in fact destroyed simultaneously does not entail that such a dramatic ending *had* to be the case. We can easily imagine a scenario whereby Myron dislikes his initial rendering of *Goliath*'s left toe, cuts it off and welds another prefabricated piece onto *Goliath*'s foot. *Goliath* survives this replacement, but BP does not. On the flip side, *Goliath* cannot survive being melted down and being made into wire, but provided the wiring is left in one physically unified piece, BP continues to exist. Given this further and more persistent difference in properties between objects and their constituting matter, adherents of the standard account conclude that statues, sandwiches, tables and the like are non-identical to the matter from which they are composed.

However, three notable attempts of salvaging the 'constitution as identity' model have been made. All three revolve around the denial that modal predicates are in some way 'proper' predicates which would entail that the identification of an object with the matter from which it is composed constitutes a contravention of Leibniz's Law.

6.3.2 Gibbard

Gibbard writes that holding that a statue is an entity over and above the clay lends statues a "ghostly air" (Gibbard, 1975, 191). Concrete objects like lumps and statues, he argues, consist of 'point-instants' (what I have referred to throughout this thesis as space-time points). If there are two names for a thing that shares all of and exactly the same point-instants, (as in the case of *Goliath* and BP) then those two names must designate one and the same object (Gibbard, 1975, 192 & 214-220).

Objects can be of different kinds, and different kinds have different persistence conditions. For example, the fresh cut flowers in the vase on my table are also a piece of matter. Presumably, the piece of matter will outlive the fresh cut flowers, as the flowers will not drop petals (destroying the piece of matter) until they are no longer fresh. However, it is possible that an atom bomb will go off in London, in which case the flowers (along with a good deal else) will be vaporised. Let us say that the possible world that represents this also represents a case of permanent coincidence, because all of the flowers are added to the bunch simultaneously rather than one by one. Gibbard argues that in cases such as this and *Goliath*, an object is of multiple kinds which have different persistence conditions, rather than there being multiple objects that coincide.

It is from this commitment to the identity of permanently coincident objects that Gibbard starts his argument that modal properties are not the kind of properties which count when assessing identity claims. He says that it does not make sense to attribute a modal property to an object independently of the way that it is designated. Whilst it is meaningful to ask whether a *Goliath*-version would

survive squashing *qua* statue, it does not make sense to ask whether the object would survive squashing without reference to it being designated as a statue or a lump. A property must apply or not apply to a thing independently of the way it is designated. It does not make sense to talk of a thing being squashable if it is of multiple kinds that have different persistence conditions, so being of the sort that would survive squashing is not a real property. Gibbard concludes that expressions constructed with modal operators do not give properties of concrete things (Gibbard, 1975, 201).

However, his argument against the idea that expressions constructed with modal operators are real properties of the kind that Leibniz's Law refers starts from the assumption that permanently coincident objects must be one and the same. The premise that modal expressions do not apply to concrete things independently of the way that they are designated is committed to there being one thing that can be designated in different ways, rather than there being multiple but coincident objects. Gibbard therefore assumes his conclusion, ignoring the possibility that if, (as is reasonably claimed) *Goliath* is a statue and only a statue, and BP is a lump and only a lump, it of course can be meaningfully asked whether *Goliath* or BP will survive squashing.

6.3.3 Lewis

For Lewis, to differentiate *Goliath* from BP "reeks of double-counting", and he too alludes to the non-additivity of properties (specifically the property of weight), that Sider found so preposterous (Lewis, 1986, 252). This is because *Goliath*, even when the name is used *de re*, is not referentially transparent. Lewis defends the materialist thesis by arguing that when it seems that there are two coincident objects that satisfy different sortals, we are merely confused by the way that we substitute different names for the same thing depending upon which properties of the object we want to pick out.

His paradigm example is persons. As mentioned in *2.3,* Lewis, as a physicalist, must defend the claim that a person is identical to their body. To this end, he explains that the term 'I' is referentially transparent, because it might refer either to my physical body or to my person (Lewis, 1971, 204-211). 'I' supports the substitution of the names 'Christabel' and 'Christabel's body', which codesignate the supposedly singular object that is gestured to when somebody points at me.

When we make the choice as to which name to use to refer to this supposedly singular object, we are signaling within which context we wish to discuss it. This is because according to Lewis, these names indicate a particular counterpart relation that allows us to partition the universe into objects that are counterparts of 'Christabel', counterparts of 'Christabel's body', counterparts of both, and counterparts of neither. Within some close possible worlds, there may exist some people who differ from me only very slightly as regards personality. They may have the same opinions, beliefs, tastes, dreams and fears as I do. These personalities, however, might inhabit bodies that are wildly disparate to mine. Some of these worlds will be worlds in which these people live alongside others whose bodies very much resemble mine. In such worlds, I will have both personal counterparts, who are picked out by the counterpart relation indicated by the name 'Christabel', and bodily

counterparts, who are picked out by the counterpart relation indicated by the name 'Christabel's body'.

This does not necessarily imply that Christabel and Christabel's body are distinct, because the revised counterpart relation allows one and the same object a wide variety of objects as potential counterparts, depending upon the context in which we are considering the object. (Recall the *2.3* example of Slash's favourite guitar and the bevy of counterparts to which it is potentially related).

In much the same way, the counterparts picked out by '*Goliath*' and 'the piece of bronze that constitutes *Goliath*' are different. As Johnson writes, the name *Goliath* has associated with it a "set of necessary and sufficient qualitative conditions for tracing *Goliath* across the worlds" (Johnson, 1992, 90). The 'piece of bronze' counterpart relation yields different results. Lewis is committed to the principle that anything that could have happened to an object is what has happened to at least one of its counterparts. Therefore the truth values of modal predication are sensitive to which counterpart relation is invoked by the names used (perhaps in conjunction with context), and so Lewis argues that we cannot refer to *Goliath* as 'the piece of bronze that constitutes *Goliath*', as it makes true modal claims about *Goliath*, such as "*Goliath* could survive being cast into a giant 3rd place trophy" true. Obviously this is true of BP, but not of *Goliath*. The modal properties of BP are therefore apparently eliminated.

It is unclear that Lewis' approach to coincident objects is any more successful than Burke's argument that when coincident objects fall under different sortals, one sortal 'dominates' the other, and eliminates the modal and historical properties of the constituting matter. Just as coincident objects may fall under different sortals, they may also be referred to using different names. Though I am reluctant to disavow the materialist thesis that a person is identical with their body, I am comfortable in disavowing that a person is identical with the matter they are constituted by. In much the same way, *Goliath* is distinct from BP, and the fact that *Goliath* and BP pick out different sets of counterparts (or more rightly, object-versions), should indicate that *Goliath* and BP are distinct.

6.3.4 Noonan

In a similar vein to Lewis, Noonan discounts modal properties on account of their being 'Abelardian'. He borrows this notion from Quine and Willard, who explain that the predicate 'was so-called because of his size' is Abelardian because the property denoted by it is determined by the subject term to which it is attached (Quine & Willard, 1943, 116-117). For example, this predicate stands for the property 'being called 'Andre the Giant' because of his size' when attached to the name 'Andre the Giant' and for the property 'being called 'Tiny Tim' because of his size' when attached to the name 'Tiny Tim'.

Modal predicates, according to Noonan, are Abelardian predicates because their reference is determined by a component of the *sense* of the subject expression to which they are attached (Noonan, 1988, 135). He argues that the property denoted by the predicate 'might have been

melted down and not destroyed' in the true sentence "BP might have been squeezed into a ball and not destroyed" is not the same property as that denoted by that predicate in the false sentence "*Goliath* might have been squeezed into a ball and not destroyed". This approach allies itself well with counterpart theory. The predicate 'could have been melted down and not destroyed' stands for the property 'has a counterpart under the statue counterpart relation which is melted down and not destroyed' when attached to *Goliath*, and stands for the property 'has a counterpart under the bronze piece counterpart relation which is melted down and not destroyed' when attached to BP. If we accept the counterpart theorist's interpretation of modal predication, and follow Noonan in assuming that a predicate denotes a real property so long as it denotes the same property regardless of the sense of their reference, modal properties will not pose a problem for the speaker who asserts that *Goliath* and BP are identical in the case of permanent coincidence, and Noonan will be right to accuse those who maintain the distinction as "manifest[ing] a bad case of double vision" (Noonan, 1988, 222).

However, Noonan's arguments, much like Lewis', primarily serve to illuminate the difficulty of maintaining that *Goliath* and BP are identical. According to Noonan and Lewis, in cases such as these we have two names for one and the same thing, which relate differently to other possible worlds depending upon which name is used to describe the object. However, it is much more plausible that *Goliath* and BP relate differently to *Goliath*-versions because they are different objects.

6.3.5 Modal and historical properties

It seems appropriate to ask any perdurantist who attempts to ameliorate the problem of permanent coincidence why modal properties are in some way 'second class' or ersatz, whilst historical ones are not. If historical properties are couched in terms of how a present object relates to its past, and modal properties are couched in terms of how an actual object relates to merely possible versions of itself, the analogy becomes clearer, and it seems that the orthodox perdurantist might be accused of being *ad hoc*.

Let us assume that these authors are correct, and that statues are identical to the parcels of their constituting materials when they permanently coincide with them. According to Gibbard, *Goliath* and BP, being permanently coincident, are merely mistaken for being distinct objects, because the object we gesture at when we point at *Goliath* is of two different kinds that have two different associated sets of persistence conditions. It does not make sense to ask whether this object could be melted down without designating it either as a statue or as a piece of matter, and so whether or not it could be melted down is not a property of this object.

However, it seems that whether or not it could be melted down is not the only kind of property that this object loses when Gibbard's view is taken seriously. Let us specify that *David* is finished by Michaelangelo at time *t*, but MB, having existed before *t*, is not identical with *David*, because *David* is a proper part of MB. It seems very reasonable for an admirer of Michaelangelo to visit

the studio, to point at *David* and ask "how old is this?". The statue *David* has an age equal to that between *t* and the utterance of the speaker, but MB has a vastly greater and much less epistemologically accessible age. Without specifying that he is talking about the object the admirer gestured to *qua* statue or *qua* piece of marble, Gibbard cannot answer either way.

It is much more obvious that historical properties are of the kind that matter when we are ascertaining whether an assertion of an identity relation contravenes Leibniz's Law. Though Gibbard, as an othodox perdurantist, thinks that it is only the modal properties that he must belittle, he forgets that historical properties are very much analogous to modal properties, and that his rejection of modal properties implies a further rejection of historical properties, which are explicitly taken to be important properties by the orthodox perdurantist camp.

A similar charge may be levelled at Lewis and Noonan. Under counterpart theory, BP and *Goliath* indicate different sets of counterpart relations across modal space. The counterparts that are picked out by these relations make counterfactuals of the form 'O could possibly P' variously true or false. For many substitutions of P, such as 'be a scrambled egg', the counterfactual will be false regardless of whether we choose BP or *Goliath* to stand for O. For some substitutions of P, such as 'be made of matter', the counterfactual will be true regardless of whether we choose BP or *Goliath* to stand for O. However, it is important that for some substitutions of P, such as 'survive being melted down', the counterfactual will have a different truth value depending upon whether we choose either BP or *Goliath* to stand for O. Therefore, according to Lewis, predicates constructed with modal operators do not indicate real properties.

Let us return to Michaelangelo's studio. The statement 'O existed before *t*' is true when we substitute in MB, but false when we substitute in *David*, and so the predicate 'existed before *t*' does not indicate a real property. Furthermore Noonan seems no better equipped to answer the admirer's question, as the property of having existed before *t* is clearly Abelardian, because whether or not an object instantiates this property depends entirely upon how the object is referred to.

It seems, therefore, that an attempt to challenge the legitimacy of modal properties is also an assault on historical ones. Given the fact that historical properties are conventionally taken to be real and do significant philosophical work, this move is controversial. Indeed, there exists a school of philosophy, namely origin essentialism, which not only takes historical properties to exist, but takes them to be *essential* properties. Kripke, for example, writes that Queen Elizabeth could not have been born as the result of the joining of a totally different sperm and egg pairing (Kripke, 1980, 113). Whilst it is beyond the purview of this thesis to evaluate origin essentialism, the existence of the considerable support of origin essentialism indicates the philosophical weight of throwing the historical baby out with the modal bathwater, and it should be put to the orthodox perdurantist that they sacrifice too much when arguments like Gibbard's, Lewis' and Noonan's are made.

6.4 Modal perdurantism

In any case, none of these arguments are to my mind successful, and so the perdurantist cannot continue to hold that statues like *Goliath* are identical to the parcels of matter that permanently coincide with them. However, a model that makes use of a full integration of temporal perdurantism with its modal analogue will show that the distinction between objects like statues and the matter which constitute them need not lead to such an unpalatable metaphysics after all.

It has been argued elsewhere (see *5.3.1*) that modal perdurantism should be preferred over counterpart theory in that it preserves the distinction between essential and accidental properties. Modal perdurantism has, therefore, the benefits of Kripke's theory of brute identity (namely, the ability to carve out sensible sets of appropriately related object-versions based on the essential properties of any given object), without falling foul of the modal analogue of the problem of temporary intrinsics. To recap, the modal perdurantist will partition modal space in much the same way that a brute identity theorist will. Any object will have a set of essential properties. Every object that instantiates this set will be an object-version of this object. However, whilst the brute identity theorist will claim that all modally distant object-versions are identical, (despite instantiating a wide variety of differing accidental properties), the modal perdurantist avoids this contravention of Leibniz's Law by holding that all object-versions are co-parts of the trans-world entity which constitutes *the* ordinary object we are talking about when we talk about chairs, people, sandwiches and the like.

It seems plausible that the melting point of a substance might be one of its essential properties. It seems even more plausible that a substance's ability to be melted down will count as essential. BP therefore has the essential property described by the predicate 'can survive being melted down'. Given that the temperature of BP seems to be more than likely an accidental property, many possible worlds represent the possibility of BP being a different temperature by including BP-versions that are variously hotter and colder than the actual (let us stipulate room temperature) BP. The trans-world ordinary object BP (let us call this object **BP**) has a part, or a phase, in all of these worlds.

On the other hand, *Goliath* does not. Form is arguably an essential property for at least some statues, and let us stipulate that this is the case for *Goliath*. Therefore, in those worlds that are truthmakers for the possibility of **BP** being hotter than the melting point of bronze, there are no *Goliath*-versions, and therefore no *Goliath*-phases. However, in those worlds where BP-phases are sculpted into *Goliath*, there are *Goliath*-phases. Therefore the trans-world object that consists of all the *Goliath*-phases (let us call this object **Goliath**) partially overlaps **BP.**

This is not to say that **Goliath** is a proper part of **BP**, as this ignores the possibility of any *Goliath*-phases undergoing substitution, of being made of a different bronze piece, of being made from a

smaller or larger piece of bronze, or of being made from another material entirely.[38] Imagine that Myron is hard up and is casting iron instead of bronze. Though it is almost certainly an essential property of BP that it is made of bronze and not iron, it is not immediately clear that this is the case for *Goliath*. There are therefore *Goliath*-phases in the worlds where Myron-versions are hard up but no BP-phases. Furthermore, *contra* mereological essentialism, it is possible that *Goliath* loses his left big toe, so there is some possible world that contains a *Goliath*-phase with a missing toe. This *Goliath*-phase is bigger than the BP-phase that resides in the same world, (assuming that they were created simultaneously) because the *Goliath*-phase inhabits a region of spacetime located after the time at which the toe is lost, whereas the BP-phase does not. The two trans-world objects therefore have different but partially overlapping modal shapes. The integrated worm-theoretic temporal and modal perdurantist can therefore explain coincidence cases as multiple and distinct phases of differently shaped trans-world entities overlapping at one possible world.

Ordinary objects, according to the worm-theoretic perdurantist, are the kinds of things that can overlap, as evidenced by the sharing of temporal parts in the Ed, Fred and Ted temporal fussion and fission cases. In much the same way, the modal perdurantist will hold that ordinary objects can overlap, (as seen in the Ed, Fred and Ted modal fission and fusion cases whereby the Trans-world entities **ED** and **FRED** overlap in the actual person of Ted). *Contra* Sider and Lewis, this overlapping is not too great a problem, as it seems to parallel our actual world. Table legs overlap tables, the set of velociraptors overlaps the set of dinosaurs, and *Goliath* overlaps BP.

Given that perdurantism is, as has been argued in the first two chapters of this thesis, the best solution to the problem of change, and that modal perdurantism is, as was argued in the previous chapter, at least as tenable a modal theory as counterpart theory and modal endurantism, and also given that the orthodox perdurantist model requires an account of the elimination of modal properties that seems both dubiously motivated and thus far mysterious, the solution offered by the dual worm-theoretic and modal perdurantist should be taken seriously as a contender to answer the problems of temporary and permanent coincidence.

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[38] This is assumed to be possible, *contra* origin essentialism. However, the assumption does not much affect the argument, as presumably most origin essentialists would agree that a statue can survive small substitutions such as the substitution of the toe, as described below.

CONCLUSION

Sider's project of aligning his temporal and modal metaphysics is based upon a good idea. The principle that the most explanatorily powerful answer to the question of how objects may differ from themselves should inform both our modal and temporal ontologies is a virtuous one. However, Sider's attempt to bring his temporal metaphysics into line with Lewis' modal metaphysics was misguided. It is Lewis' temporal metaphysics that should be taken as a starting point, given the explanatorily elegant solution that worm-theoretic perdurantism offers to the problem of temporary intrinsics. The worm-theoretic model of persistence aptly captures the idea that my grandmother once wore a cotton bathing suit in Cornwall but now wears a cardie in Edinburgh by positing that she has temporal parts that do both. The modal perdurantist model ably explains the idea that my grandmother could have gone to space with reference to her having a part that is on the moon and wearing a spacesuit.

Worm-theoretic perdurantism is the best theory of persistence because it provides the best answer to the problem of temporary intrinsics. Modal perdurantism is a credible modal theory because it makes good sense of our modal claims, and provides a good middle way between counterpart theory, which does not do enough to emphasise the relation between sets of particular object versions, and a modal endurantism analogue, which overstates the relation between these sets of modally distant objects by stipulating that they are numerically identical. In addition, modal perdurantism provides the most personal answer to the Humphrey objection, (namely that a part of Humphrey, rather than a distant counterpart, wins) without stipulating that the losing Humphrey-version and the victorious Humphrey-version are one and the same and (thus incurring the problem of accidental intrinsics, which any modal endurantism analogue will inevitably do).

These reasons, along with the principle that where possible, we should seek to conceptually align our temporal and modal answers to the question of how objects differ from themselves, are evidence enough to take seriously a dual integrated temporal and modal perdurantism. Furthermore, this hybrid model boasts the advantage of consistency in answering the problem of temporary and permanent identity: namely that there is no problem, and that two ordinary objects overlap in some particular world in which they both have parts.

For these reasons, a dual temporal and modal perdurantism should be considered as a real alternative to a dual counterpart-theoretic approach to persistence and modality.

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