ABSTRACT

This thesis discusses three different theories of *de re* modality, i.e., the ways particular individuals could be, or must be. It defends the counterpart theory as the best theory of *de re* modality for modal realists. In other words, I argue that Ruth is 'at possible world *w*' by having a counterpart that is distinct from and yet suitably similar to our Ruth, at world *w*.

Chapter I will be a brief introduction. In Chapter II, I will define my terms and spell out my assumptions. In Chapter III, I will describe the three theories of *de re* modality: counterpart theory, trans-world identity theory and trans-world fusion theory. In Chapter IV, I will present a version of counterpart theory based on Lewisian modal metaphysics, provide four independent utility arguments for counterpart theory, and respond to Humphrey's objection to counterpart theory. In Chapter V, I will present Lewis's version of trans-world identity theory based on Lewisian modal metaphysics and his objections against such a view. I will explain two alternative versions of trans-world identity theory based on alternative modal metaphysics and then argue against such attempts. In Chapter VI, I will spell out trans-world fusion theory in detail, present an argument from vagueness for trans-world fusion theory and argue against it. In Chapter VII, I will provide a short conclusion.

Extension Through Logical Space

Presented to the faulty of Mount Holyoke College in partial fulfillment of the requirements for the degree of Bachelor of Arts with Honors in Philosophy.

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April 2019

ACKNOWLEDGMENT

I express my most profound gratitude to my thesis advisor, Professor Nina Emery, for introducing me to the field of metaphysics, the study of which has become my greatest joy ever since. Although she does not share my crazy view on modal metaphysics, our disagreement has never, even for a moment, compromised her ability to advise and support me during my inquiry.

I am also extremely grateful to my academic advisor at the Politics Department, Professor Christopher Pyle, who has been incredibly understanding and encouraged me to spend my fifth year at Mount Holyoke College in pursuit of my interest and curiosities in the field of philosophy.

I have been unbelievably fortunate to be surrounded by remarkably intelligent and supportive people at the Department of Philosophy. Thank you Yuan, Gabrielle, Fiona, Marge, Maliha, Naieka, Nadia, Phoebe, Mara, for being my philoso-friends and engaging with my annoying questions outside of classroom. I also thank Professor James Harold, Professor Katia Vavova and Professor Samuel Mitchell for their love, support and patience to bear with my prolonged presence at the Philosophy Department.

Finally, I thank my family for their understanding and unconditional support throughout my undergraduate career.

This thesis is dedicated to an otherworldly counterpart of mine who pursues a Ph.D. in Philosophy.

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I. INTRODUCTION

Ruth Bader Ginsburg is doing her workout at the gym. Although she is only directly aware of the physical objects around her — dumbbells, TRX straps, weight machines and so on — there are a series of increasingly more inclusive situations: the neighborhood her gym is located, Washington DC, the North American continent, the Earth, the solar system, the galaxy, and so on. One might think this, the maximally inclusive situation Ruth inhibits, is a *world*. Call this world we reside in the *actual world*. Our actual world does not have to be the way it is: the materials constituting our sun in our solar system might never have organized well enough to give light; Homo sapiens could have died off in evolution; the world history could have been entirely different. One might think that the actual world is an actualized possibility among the realm of *possibilia*, i.e., the actual world is just one world among many possible worlds.[1]

Possible worlds are good theoretical tools for philosophers to understand notions of truths. Truths can be divided into two kinds: *non-modal truths* describing ways the world is, and *modal truths* describing ways the world could

[1] This example is inspired by Menzel (2017)

be, or must be.[2] It is helpful to think of ways the world could be as ways other possible worlds are. By doing this, we provide an analysis of modal truths in terms of non-modal truths, i.e., to analyze modal notions such as 'could be' and 'must be' in terms of the way other worlds are.[3] For example, instead of claiming "the sky *could be* green," one can analyze the claim as "there is a possible world at which the sky *is* green." Instead of claiming that "all dogs *must* be mammals," one can analyze the claim as "at every possible world all dogs *are* mammals." Doing so reduces truths of *de dicto* modal claims, i.e., claims describing the way the world could be, or must be, into truths of *de dicto* non-modal claims, i.e., claims describing the way other possible worlds are.

My thesis focuses on the analysis for *de re* modal claims, i.e., claims describing the ways a particular individual could, or must be. Consider Ruth Bader Ginsberg. There are a number of non-modal truths about her: her biological sex, her age, and her eye color. Ruth being a Supreme Court Justice of the United States is a non-modal truth about Ruth, the living and breathing individual in our world. Claims such as 'Ruth could be a philosopher' and 'Ruth must be human'

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[2] The distinction I note here has been put as the distinction between modal truths and categorical truths in Bricker (2008). I think it is much clearer to put it as the distinction between modal truths and non-modal truths. So I chose not to adopt Bricker's terminology.

[3] Possible worlds are useful theoretical tools. They provide clear and intuitive analysis of modality and, hence, allow philosophers to explicate concepts and formulate theories in areas ranging from theoretical metaphysics to philosophy of language, philosophy of science, epistemology, and ethics. Bricker, Phillip (2008). Concrete possible worlds. In Theodore Sider, John Hawthorne & Dean W. Zimmerman (eds.), Contemporary Debates in Metaphysics. Blackwell. pp. 111–134.

are *de re* modal claims describing the ways Ruth could be, or must be. Presumably, such modal truths about Ruth can be analyzed in terms of non-modal truths at other possible worlds. For example, one might say that Ruth *could be* a philosopher if and only if there is a possible world at which Ruth *is* indeed a philosopher; Ruth *must be* human if and only if Ruth *is* human at all possible worlds where she exists.

This thesis answers what, exactly, do we mean when we claim that Ruth is such a such way *at* a possible world. Does Ruth have a counterpart at another possible world that is suitably similar to our Ruth? Does Ruth herself wholly exists at multiple possible worlds? Or rather, does she have multiple parts spreading out across multiple possible worlds? Those are three different theories of *de re* modality, i.e., the ways particular individuals could be, or must be. My thesis defends the counterpart theory of *de re* modality. In other words, I argue that Ruth is 'at possible world *w*' by having a counterpart that is distinct from and yet suitably similar to our Ruth, at world *w.*

In Chapter II, I will define my terms and spell out my assumptions. In Chapter III, I will describe the three theories of *de re* modality: counterpart theory, trans-world identity theory and trans-world fusion theory. In Chapter IV, I will present a version of counterpart theory based on Lewisian modal metaphysics, provide four independent utility arguments for counterpart theory, and respond to

Humphrey's objection to counterpart theory. In Chapter V, I will present Lewis's version of trans-world identity theory based on Lewisian modal metaphysics and his objections against such a view. I will explain two alternative versions of trans-world identity theory based on alternative modal metaphysics and then argue against such attempts. In Chapter VI, I will spell out trans-world fusion theory in detail, present an argument from vagueness for trans-world fusion theory and argue against it. In Chapter VII, I will provide a short conclusion.

II. DEFINITION AND ASSUMPTIONS

This paper is an attempt to find the best theory of *de re* modality, i.e., the best way to understand the modal truths about a particular individual. For the simplicity of my discussion, I will assume that modal realism is true. I will make no attempt to argue for modal realism in my thesis. My definition of modal realism follows David Lewis,[4] which I take consists of four parts:

i. The actual world is just one of a plurality of worlds.

ii. For every way a world can be, there is a world that is that way.

iii. Each of these worlds exists simpliciter.

iv. Each of these worlds is of a kind with the actual world.

The first part of the definition characterizes modal realism as one version of *possibilism*, which holds that merely possible worlds exist, as opposed to *actualism*, which holds that only the actual world exists. The way the actual world is is obviously a way the world could be, thus, the actual world is a possible world. But not all possible worlds are actual worlds; we call those non-actual *merely* possible worlds. Actualists do not think that *merely* possible worlds exist, whereas the possibilists do. Notice that the first part of the definition is silent on

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[4] Lewis, (1986), pp. 1-5. Thanks to Professor Nina Emery's Handout in her Fall 2017 Metaphysics class.

whether merely possible worlds are ontologically on par with the actual world. It only asserts that merely possible worlds exist, without specifying the manner of their existence.

The second part of the definition distinguishes modal realism from nearby theses in physics. Contemporary scholarship in physics provides a number of theories about hypothetical "parallel universes".[5] Although those theses in physics also posit an infinite number of worlds, the specific ways those worlds can be are restricted by physical laws. Modal realism, on the other hand, does not have physical laws restricting the way the worlds can be. It posits that for every way the world can be, there is a world that is that way.[6]

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[5] One example of those theses is the many-worlds interpretation of Quantum mechanics, which is a solution to the measurement problem, i.e., the problem that the following three claims cannot be consistent with each other: (1) the wave function always evolves according to the Schrodinger's equation, which is linear and deterministic; (2) the wave function is complete, i.e., the wave function of a system determines all of the physical properties of that system; (3) Measurements have definite outcomes. The many-worlds interpretation maintains the truth of (1) and (2) and explains that measurements appear to have determinate outcomes because each term in the wave function represents a distinct world.

Another example will be the fine-tuning theory, which provides that there are other parallel universes, in which the numerical values of certain physical constants are different from that of ours. For example, the Planck constant can be slightly different in another world, which will not permit life as our universe does.

Both of those physical theories requires there to be an infinite number of worlds, but on both accounts, the infinite number of worlds are restricted by physical laws. One might understand that the number of worlds according to Modal Realism is a much larger infinity than the number of worlds according to those physical theses.

[6] Philosophers may agree on the truth of part ii and disagree on what are the possible ways for the world to be. For example, Lewis thinks that it is impossible for a world to involve contradictions, i.e., a world at which proposition *p* and not *p* are both true; Lewis thus requires all possible worlds to be logically possible. Kripke, on the other hand, requires all possible worlds to be metaphysically possible. For Kripke, laws of metaphysics require that water is H_20, and, thus, there is no possible world in which water is not H_20. Thanks to my thesis advisor, Professor Nina Emery for this comment.

The third part of the definition provides that each of these worlds exists simpliciter. *Existence simpliciter* is a technical term. Something exists *simpliciter* means that there *is* such a thing without any further quantification.[7] An entity exists simpliciter if and only if our unrestricted quantifiers, such as existential quantification ∃x, can directly quantify over it.[8] Notice that such use of existence is different from our use of existence in ordinary contexts, where contextual restrictions have been implicitly applied. For example, when I open my fridge and declare that 'there is no beer', I am not thereby denying that there are beers elsewhere in the world. Rather, I implicitly apply my contextual restriction 'in my fridge'[9] to my utterance of the sentence. By claiming that 'there's no beer' I do not deny beers *exist simpliciter*. Similarly, modal realists believe that our ordinary assertions such as 'there are no talking donkeys' carry contextual restrictions with them: its utterance carries implicit quantifier 'in this world' with it. Thus, the modal realists think that our ordinary assertions as such do not deny that talking donkeys or possible worlds *exist simpliciter*.

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[7] In the following discussion, I will treat the term 'existence' as coextensive with 'being'. This definition of existence simpliciter comes from Bricker (2008), which follows Quine (1961)

[8] Here I am talking about the universal quantifier ∀ and the existential quantifiers ∃. Usually, they quantify over things that exist in some particular domain or under some kind of restrictions. Quantifiers operating under the scope of primitive operators are restricted, and, therefore, not ontologically committing. For example, when I say Davey believes that there is a unicorn, the translation of the sentence into predicate logic will be 'DaveyBelieve (∃x (x = unicorn))'. Since my use of existential quantifier is operating within the scope of Davey's belief, I am not committed to the existence of unicorns. For the rest of my thesis, I take it that we are ontologically committed to the existence of those things our unrestricted quantifiers quantifies over.

[9] This example of beer in the fridge comes from Lewis (1986), pp. 3

The fourth part of the definition holds that the *merely* possible worlds are of the same kind as the actual world, i.e., they are ontologically on par with each other. This part of the definition declares that the actual world and the *merely possible* worlds do not differ in their manners of existence, without specifying in which manner those worlds exist. This gives the modal realists some leeway to disagree with each other. For example, if a modal realist thinks that the actual world is concrete,[10] she will think that other merely possible worlds are concrete as well. If she thinks that the *actual world* is an abstract entity representing the way the world is, then for her, *merely possible* worlds will be abstract entities representing ways the world could be.[11] I take those different views on what worlds are as different ways to be a modal realist. For the rest of my thesis, I will only assume that merely possible worlds are of the same kind as the actual world, without assuming that merely possible worlds are concrete.

I want to note here that the standard modal realism endorsed by David Lewis adds three additional specifications on top of the modal realist thesis,

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[10] The distinction between abstract and concrete are often ambiguous. According to Lewis (1986), pp. 81-86, (1) Worlds (typically) have parts that are paradigmatically concrete, such as donkeys, and protons, and stars. (2) Worlds are particulars, not universals; they are individuals, not sets. (3) Worlds (typically) have parts that stand in spatiotemporal and causal relations to one another. (4) Worlds are fully determinate (an object is *fully determinate* if and only if, for any property or its negation holds of the object. In the case of worlds, this is equivalent to: for any proposition, either the proposition or its negation is true at the world); they are not abstractions from anything else.

[11] David Lewis argues that philosophers who take such position are not *genuine* modal realists but rather ersatzists because he thinks that most people will agree that the *actual* world as concrete. Unlike Lewis, I think there are philosophers who think that both the *actual* and the merely possible worlds are abstract representations. I think they should be considered as modal realists as long as they think that the actual worlds are of a kind as the *merely possible* world.

namely that a) possible worlds are maximally related spatiotemporal sums and, hence, not spatiotemporally to one another,[12] b) the word 'actual' is indexical[13] and c) a counterpart of X represents X at another possible world.[14] I think modal realists can disagree with Lewis what possible worlds are, and what it means for something to be *at* a possible world. Thus, I will not assume the truth of any of Lewis's specifications in my thesis. I am hopeful that lifting those additional specifications will allow modal realists to disagree with Lewis on his counterpart theory and allow me to make a neutral comparison among different theories of *de re* modality.

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[12] Lewis (1986), pp. 69-81

[13] Lewis (1986), pp. 97-101

[14] Lewis (2986): pp. 192-198

III. THREE THEORIES OF *DE RE* MODALITY

One desirable feature of modal realism is that it reduces modal truths, i.e., truths about ways things *could be*, into non-modal truths, i.e., truths about the way things *are* at other possible worlds. The analysis of *de dicto* modal claims, i.e., claims about the way the world could be, is clear and simple. To do that we simply turn notions of necessity and possibility into quantifications over possible worlds. Here are the truth conditions for modal claims involving notions such as possibility and necessity:

> (It is possible that the Supreme Court of the United States has ten Justices) if and only if (there is a possible world at which the Supreme Court of the United States has ten Justices).
>
> (It is necessary that all Supreme Court Justices are humans) if and only if (in all possible worlds where there are Supreme Court Justices, they are all humans).

Following this pattern, one might propose the truth conditions for *de re* modal claims as the following:

> (It is possible that Ruth Bader Ginsburg is a philosopher) if and only if (there is a possible world at which Ruth Bader Ginsburg is a philosopher).
>
> (It is necessary that Ruth Bader Ginsburg is of the female sex) if and only if (in all possible worlds where Ruth Bader Ginsburg exists, Ruth Bader Ginsburg is of the female sex).

Nonetheless, it is not clear what it means for Ruth to exist *at* another possible world. Here are three ways to understand this:

(1) counterpart theory:[15] a counterpart theorist claims that Ruth is a world-bound individual. Ruth satisfies the formula '*x* is a philosopher' at another possible world *w* in *absentia,* by having a 'counterpart', another world-bound individual that is distinct from and yet suitable similar to Ruth, being a philosopher.

(2) trans-world identity theory:[16] a trans-world identity theorist takes the possible world analysis of *de re* modal claims at the face value. She will claim that Ruth, the one and only object, wholly exists at multiple possible worlds.

(3) trans-world fusion theory:[17] a trans-world fusion theorist claims that Ruth is a trans-world individual, i.e., a composite object that is only partly located at our world. Ruth satisfies the formula[18] '*x* is a philosopher' at world *w* by having a world-bound modal part that is a philosopher at world *w*.

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[15] The analysis of modality *de re* in terms of counterpart relations was first introduced in Lewis (1968)

[16] See Plantinga's (1973) and Plantinga (1974)

[17] See Yagisawa (2010). Also, see Wallace (2014 a)

[18] This locution of 'satisfying formula' follows Lewis, (1986), pp. 9

IV. COUNTERPART THEORY

The central question in the analysis of modality *de re* is how Ruth, the living and breathing Supreme Court Justice in our world, lives a life as a philosopher *at* another possible world. Counterpart theory answers the question by claiming that she does not. Counterpart theorists do not take the possible world analysis of *de re* modal claims at the face value. For them, Ruth is a world-bound individual that only exists at one possible world. Nonetheless, Ruth satisfies the formula '*x* is a philosopher' at another possible world w *in absentia*. She has the modal property 'possibly P*'* in virtue of having an otherworldly 'counterpart' *w* who has that property *P* at another possible world. Thus, according to the counterpart theory, Ruth satisfies the modal formula 'possibly, Ruth is a philosopher' in virtue of her counterpart at *w* who is indeed a philosopher.

For counterpart theorists, individual *x* has property *F* at world *w* if and only if *x* has a counterpart at *w* which is *F.* The thesis of counterpart theory consists of two parts. First, the distinctive thesis: an individual's existence *at* another possible world is insured by another object that is distinct from that

individual, i.e., her counterpart. Second, the similarity thesis: whether *x* is a counterpart of *y* if depends on whether *y* is similar to *x* in certain ways.[19]

The particular version of counterpart theory I am exploring here is developed by David Lewis.[20] Recall from the earlier section, David Lewis's modal metaphysics adds three additional specifications on top of the thesis of modal realism: a) possible worlds are maximally related spatiotemporal sums and, hence, not spatiotemporally related to each other, b) the word 'actual' is indexical, and c) a counterpart of X represents X at other possible worlds.

The Lewisian counterpart theory depends on the Lewisian notion of spatiotemporal sums and actuality. For Lewis, a possible world is concrete in the sense that it is an inclusive spatiotemporal sum; an object is *at* a world by being a spatiotemporal part of that world. Two objects are at the same world if and only if spatiotemporal relations hold between them. For example, the Earth, the solar system, the entire Milky Way are all spatiotemporal parts of our world because they are spatially connected to us, i.e., they are at some distance and direction from where we are. Similarly, the ancient Romans in the past or the dead dark stars in the future are also part of our world because they are temporally

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[19] The similarity relations here will allow inconstancy, which will later be shown as a theoretical benefit of counterpart theory. I did not explore the similarity relation in this version of my draft, but I will in later versions. See Woodward (2012), pp. 62-63

[20] I chose to present the Lewisian version of counterpart theory because I think it is particularly clear and intuitive. This by no means implies that the Lewisian version of counterpart theory is the only plausible version of a counterpart theoretic account of *de re* modality.

connected to us, i.e., they are some time before or after or simultaneous with the moment we experience as now. Other possible worlds are not spatiotemporally related to us: they exist, but we, as spatiotemporal part of the actual world, can never reach them. Lewis thinks other possible worlds are as real as our world in the sense that they are all spatiotemporal and concrete. Other physical objects, including breathing and living human beings, resides in those possible worlds just as we reside in the actual world.

For Lewis, what the word 'actual' is an indexical term just as 'here', 'I', and 'now'. Just as which geographical location I am referring to depends on location I am at when I utter the word 'here', whether a world is 'actual' depends on the context of its utterance.[21] While the world we live in is "actual" for us, it is not "actual" for other possible individuals residing in other worlds. Nonetheless, I can speak truly when I claim that my world and my world-mates are "actual" because for Lewis, 'actual' just means 'this-worldly', or 'is part of my world'[22]. Given the context of Lewis's metaphysics, being actual is equivalent to being spatiotemporally related to the speaker.

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[21] Some modal realists who are also counterpart theorists think that something being indexical does not mean they are relative. For example, Phillip Bricker agrees with Lewis that actuality is indexical and yet thinks that actuality is absolute. Bricker thinks that a predicate is *indexical* if it expresses different properties relative to different contexts of use. For example, the indexical predicate 'is nutritious' expresses different properties relative to different speakers (depending on age, or state of health). But, on each use, the property expressedis absolute, not relative: something is nutritious (for the speaker) in virtue of its chemical nature, not in virtue of its relative properties; if two things are chemical duplicates of one another, then either both or neither are nutritious (for the speaker). For details, see Bricker (2008), pp.

[22] See Bricker(2008), pp. 26

With the Lewisian framework in mind, let us consider again the claim 'Ruth is not a philosopher, but it is possible for her to be one'. Remember our goal is for Ruth to satisfy the modal formula 'possibly, *x* is a philosopher' and not satisfy the formula 'x is a philosopher'. To do that we want some possible world *w* such that Ruth satisfies the formula 'x is a philosopher' at *w.* Lewis proposes that Ruth can satisfy the formula in *absentia*[23], by having her counterpart representing her at world *w* in virtue of their similarity relations. Lewis takes possible worlds, in general, as a way to represent modality. For him, *merely* possible worlds represent ways our world can be; *merely* possible individuals at other possible world represents[24] the way individuals can be. Lewis thinks that Ruth is represented at the actual world by being part of our world herself; she is represented at another possible world by having a counterpart as part of that world. Thus, Ruth is represented *in absentia* at another possible world, just as she can be represented *in absentia* at a museum, with a picture, a waxwork statue, or even a 3D augmented reality system in our world.

Most people, unless in the grip of some philosophical theory, agree with counterpart theorists that individuals only exist at the actual world. After all, we never experienced life at other worlds. Counterpart theory respects our

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[23] See Lewis (1986), pp. 9

[24] For comments on how the Lewisian modal metaphysics is representational, see Woodward (2008). pp. 59 - 60

commonsensical self-conceptions of world bound individuals. That is one reason to be a counterpart theorist. Nonetheless, there are even better reasons for a modal realist to be a counterpart theorist. In the following, I will argue that counterpart theory gives rise to numerous theoretical benefits without having any obvious theoretical cost.

In section 4.1, I will argue that counterpart theory allows for inconstancy, and thus is best suited for our analysis of *de re* modal judgments. In section 4.2, I will argue that counterpart theorists have a good solution to puzzles related to material constitution. In section 4.3, I will argue that counterpart theory can provide a good analysis of what omissions, events that fail to occur, are. In section 4.4, I will argue that counterpart theorists have a better analysis of modal claims involving the plural *de re*. In section 4.5, I will respond to the so-called Humphrey's objection and argue that the objection should not dissuade a modal realist from be a counterpart theorist.

4.1. Inconstancy

One reason to be a counterpart theorist is that counterpart theory allows inconstancy[25] in our modal judgments. Our modal judgments, i.e., judgments about what is possible and what is necessary, rely heavily on the context of our utterance. To begin with, there are different notions of possibilities. In some

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[25] See Woodward (2012), pp. 62 - 63

contexts, we assert that nothing travels beyond the speed of light because one of our best theories of physical science, i.e., the special theory of relativity, forbids that. In another context, however, we assert that it is possible for an object to travel beyond the speed of light, for traveling at superluminal speed does not violate the law of non-contradiction. Those two modal judgments seem in conflict, but not really. This is because we invoke different notions of possibilities depending on the contexts of our modal judgments. What we mean is that it is not *physically* possible for an object to travel beyond the speed of light and that it is *logically* possible for an object to do so.

The truth value of a modal claim changes depending on the context of its utterance. Thus, the correct analysis of modal claims should be able to capture such contextual inconstancy. Imagine that a philosophy professor located at South Hadley was invited to give a talk at MIT, Boston. If she were asked whether she could give the talk at 1:30 on Thursday, she might answer that it is not possible because she has a class ending at 12: 45. This sounds plausible, for it takes at least one hour and a half to drive from South Hadley to Boston. However, if we were provided the context that it is standard practice for the philosophy department at MIT to provide helicopter transportation for their speakers, it will instead be possible for the philosopher to give the talk at MIT at 1:30. Notice that the truth

value of the very same modal claim changes, and yet both judgments are perfectly sensible in the context of their utterance.

Such contextual inconstancy is not surprising. Every modal realist can pick out appropriately similar possible worlds and capture contextual restriction as such. For example, when we claim that it is not possible for the philosopher to drive at Boston at 1:30, we are restricting our attention to the class of possible worlds that are sufficiently similar to our world. Here it is presumed that there will not be any "gratuitous departure"[26] from the way our world usually is. Thus, we ignore worlds at which human can travel beyond the speed of light, worlds at which philosophers can afford private jets and worlds at which MIT offers helicopters for their lecture series. When helicopter has been introduced as a salient possibility, our world suddenly becomes appropriately similar to worlds at which MIT offers helicopters for their lecture series. Every modal realist, regardless of their view on *de re* modality, can make use of such similarity relations between possible worlds to capture contextual restrictions of our modal talk; counterpart theorists will not be particularly better off than the trans-world identity theorists or trans-world fusion theorists in this respect.

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[26] D. Lewis (1986), pp. 21

Nonetheless, there are some modal judgments that require the kind of contextual inconstancy only counterpart theory can provide.[27] The similarity thesis of counterpart theory states that a counterpart relation holds between an individual in one world and a distinct individual in another world in virtue of their similarity: whether one thing is a counterpart of Ruth depends on whether it is similar to Ruth in an appropriate way. As a result, it allows weighing different respects of similarity while making *de re* modal judgments in different contexts. Whether someone at another world is appropriately similar to Ruth and, thus, a counterpart of Ruth, depends on the particular features of that person we care about in the context of our utterance.

Here's an example where counterpart theory can provide a good analysis of *de re* modal judgment whereas other theories of *de re* modality cannot. Specifically, it is an example that shows that one may legitimately disagree on whether a particular individual can be a certain way even if we hold fixed the similarity relation between possible worlds. To see this, consider whether it is possible for Bernie Sanders to not be a radical socialist. A natural answer is that

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[27] David Lewis, for example, thinks that there never is a determinant answer as to the way a particular individual can be. He thinks that there is no fact of the matter as to whether Ruth can be an angel, whether Ruth can be born to different parents, whether Ruth can be born in ancient Egypt, whether Ruth can be a robot, a clever donkey that talks, an ordinary donkey or even a poached egg. Lewis thinks that all of those *de re* modal claims may turn out as a salient possibility given some appropriate contextual guidance. But such a view is controversial. Some philosophers will argue that being human is an essential property of Ruth that at every possible world at which Ruth exists, she must be a human. Fortunately, we do not need to agree with Lewis on his view about origins and essential properties so as to see the theoretical benefits of inconstancy afforded by counterpart theory. See Lewis (1986), pp. 251

the answer will vary because the relevant aspects of similarity depending on the particular context of our utterance. Imagine the *de re* modal claims is made in a political context, i.e., when political analysts are trying to determine the chance of Bernie winning the presidency if he chooses to be a moderate democrat. One natural answer is that it is not possible for Bernie to do this, for being a radical socialist is an important part of Bernie's political identity. But if the *de re* modal claim is made at a dinner table among Bernie's family members, the truth value for such *de re* modal judgment will change. It is surely plausible for Bernie's son to think that his father can live an entirely different life. In this context, Bernie does not have to be a radical socialist or even a politician; it is genuinely possible for Bernie suddenly becomes a novelist, a philosopher, or even a ballet dancer.

Notice that the political analyst and Bernie's son can reasonably disagree even if their attention has been drawn to one particular world. Suppose that we focus our attention on a world that is exactly the same as the actual world, except that Bernie Sanders is a moderate democrat. Bernie's son and the political analysts can legitimately disagree on whether that other-worldly individual who is maximally similar to Bernie in every other way *represents* our this-worldly Bernie Sanders.

Such inconstancy involving *de re* modal judgments can be captured and analyzed by counterpart theorists because counterpart relations rely solely on the

appropriate similarity relations an individual bears to another other-worldly individual. Different contextual guidance evoke different similarity relations and thus determine whether an other-worldly moderate Democrat who looks exactly like Bernie at another world bears counterpart relations to Bernie in our world. As a result, a counterpart theorist can easily explain reasons why the truth value of the claim 'it is possible for Bernie to be a moderate Democrat' varies in different contexts.

Other theories of *de re* modality, on the other hand, cannot capture such *de re* inconstancy. For a trans-world identity theorist, that moderate democrat either definitely is the same person as our Bernie in our world, or definitely not the same person. For a trans-world fusion theorist, that moderate democrat is either definitely a modal part of the trans-world composite object Bernie Sanders, or definitely not a modal part of Bernie. Neither of those theories of *de re* modality has adequate theoretical tools to explain why the political analyst and Bernie's son can reasonably disagree when their attention has been drawn to one particular world.

Thus, unless a modal realist chooses to become a counterpart theorist, she will face significant pressure to make sense of such disagreement in *de re* modal judgment where one holds fixed the similarity relations between worlds.

4.2. Solution to Puzzles

Another reason to be a counterpart theorist is that counterpart theory provides a good answer to a series of puzzles involving material composition. Presumably, one may come up with other more or less plausible solutions to those puzzles that are consistent with other theories of *de re* modality. It is not the goal of this section to prove that those solutions fail. The goal of this section is to show that counterpart theory provides an elegant solution to puzzles involving accidental coincidence. A modal realist who finds such a solution appealing will thus have an additional reason to become a counterpart theorist.

To understand what the puzzle of accidental coincidence is, let us consider a statue and the lump of clay out of which it is made of. Intuitively, one might want to claim that the statue just *is* the lump of clay, for it seems absurd to claim that we have a statue and also a statue-shaped bit of clay located exactly wherever the statue is located and weighs exactly as much as the statue weighs. However, the statue and the lump are different in their *de re* modal properties: the statue cannot survive being squashed whereas the lump of clay could. This contradicts the Leibniz's law, which states that identical objects must share all of their properties. In other words, the following three claims cannot all be true:

P1: The statue is identical to the lump of clay.

P2: The statue and the lump of clay have different modal properties.

P3: Identical objects share all their properties (Leibniz's Law)

The case involving the statue and the lump of clay is a puzzle because each one of the claims seems true, and yet one must object to at least one of them to be consistent in one's reasoning.

The counterpart theorists have an elegant solution to this puzzle. They may object to Leibniz's Law by arguing that unlike other properties, modal properties are inconstant depending on the contextual utterance. One and the same object may be referred to in two different ways[28], and the ways the object is referred to confer contextual restrictions on *de re* modal properties the object has.[29] Specifically, the difference in reference picks out different ways to represent the object. When the object is referred to as a 'lump of clay', it is represented as a lump of clay, and, hence, such way of representing the object evokes a particular counterpart relation that satisfies the particular *de re* modal predicate 'could survive squashing'; when the object is referred to as a 'statue', it is represented as a statue, and, hence, such way of representing the object evokes another counterpart relation that does not satisfy the particular *de re* modal predicate 'could survive squashing'.

Although denying Leibniz's Law seems to be a huge theoretical cost, the counterpart theorists may claim that its consequences are not so bad by arguing that one can make a plausible distinction between modal properties and non-

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[28] Lewis (1986), pp. 253

[29] Woodward (2012), pp. 64

modal properties. They can rely on the level of inconstancy counterpart theory has to offer and argue that the reason why an object satisfies contradictory modal predicates is that different counterpart relation has been evoked in different contexts. When the utterance focuses on the relevant respects that make the object a statue, it bears counterpart relation to another object in another possible world in virtue of their appropriate similarities in those particular respects.

By arguing that the counterpart theorists have a good solution to the paradox related to material constitution, I am not claiming that the counterpart theoretic solution is the only solution to the paradox.[30] I am simply providing a clean, simple, and probably less costly solution to other rival solutions. If a modal realist finds such solution attractive, she should count this as an additional reason to be a counterpart theorist.

4.3. Metaphysics of Omission

The third reason for a modal realist to be a counterpart theorist is that counterpart theory provides a promising account for the metaphysics of omission. Omissions are, roughly, events that fail to occur. Causal claims involving omissions are commonplace in our daily discourse. For example, it is natural to think and, hence, claim that a technician failing to perform the safety check is the cause of a plane crash. However, omissions are metaphysically puzzling: it is not

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[30] Paul has conducted an overview of various way to respond to this puzzle, see Paul, (2010). For a defence of double counting, see Fine (2003).

clear how an event that fails to happen may stand in causal relations with actual events.

The metaphysics of omission is extremely controversial because no one knows exactly what omissions are. In this section, I attempt to show that if one endorses a counterpart theoretic account of *de re* modality, she will have adequate theoretical tools to develop a promising theory of what the metaphysics of omission is. Specifically, I will explore Sara Bernstein's proposal,[31] which treats omissions as *de re* possibilities of actual events. To anticipate, Bernstein proposed a framework based on counterpart theory, treating omissions as tripartite metaphysical entities, comprised of an event at the actual wold, the *de re* possibility that actual event and the relation hold between them. If a modal realist finds Bernstein's theory of omission appealing, she will have an additional reason be counterpart theorist.

Consider again the causal claim 'the technician failing to perform the safety check is the cause of the plane crash'. I think by attributing the technician's failure to perform the safety check, we are claiming that, had the technical performed the safety check, the plane crash would not have happened. Here we are using the counterfactual analysis of causality. Counterfactuals are conditionals with false antecedents. The counterfactual analysis of causality provides that for

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[31] Bernstein (2014), pp.1

an event A to cause an event B, B must counterfactually depend on A, i.e., if A had not happened, B would not have happened. Thus, whether event A causes event B depends on the truth of the counterfactual 'had A not happened, B would not have happened'. Thus, whether the technical's to perform the safety check caused the plane crash depends on whether it is true that had the technical performed the safety check, the plane crash would not have happened.

In the standard analysis of propositional logic, when an antecedent is false, the conditional claim is trivially true, regardless of the consequent that follows from the antecedent. Nonetheless, while some conditionals with false antecedents, such as 'had the US presidency been determined by popular vote, Hilary Clinton would have been our president', seem clearly true, other conditionals with false antecedent, such as 'had the US presidency been determined by popular vote, Davey would have started eating carrots' seem clearly false.

Modal realists, in general, can use possible worlds to provide a non-trivial analysis of counterfactuals[32] and resolve substantive disputes over the truths of them. For a modal realist, 'had the US presidency been determined by popular vote, Hilary Clinton would have been our president' is a true counterfactual, if and only if at the *closest* possible worlds where the presidency is determined by popular vote, i.e, a world in every other way the same as our world, except that

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[32] Possible world analysis of counterfactuals are independently developed by Stalnaker (1968) and Lewis (1973).

the presidency is determined by popular vote, Hilary Clinton is indeed the president. With possible worlds as theoretical tools, modal realists can provide non-trivial truth conditions for counterfactuals.

However, counterfactual dependence itself is not sufficient for our causal analysis of omissive events. After all, the plane crash is counterfactually dependent on many *merely possible events* not happening at the actual world, and yet we only identify specific *merely possible* events as the cause of the plane crash[33]. For example, although the counterfactual dependence holds between (*Barack Obama performed safety check*) and (*plane landing safely*), we do not identify Obama's failure to perform the safety check as the cause of the plane crash. What we need is to pick out specific *merely possible* events that are appropriately similar to actual events to stand in causal relation with another event.

Bernstein argues that understanding omissive events as *de re possibility* of actual events helps us pick out the right kind of *merely possible* events. Just as the lump of clay has the *de re* property *possibly a statue* in virtue of a *de re* possible object at another possible world, the actual event (*the technician having sandwich)* has the *de re* property (*possibly, the technician performing a safety*

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[33] For the distinction between absential versus omissive causal claims, see Bernstein (2014), pp.10 - 12.

check) in virtue of having a *de re* possible event (*the technician performing a safety check)* at another possible world.

Counterpart theory is a natural candidate to analyze *de re* possibility of events. Just as objects can bear counterpart relations to one another in virtue of their appropriate similarities, one might think so do events. In fact, Bernstein chooses to adopt the counterpart theoretic account of *de re* modality without even considering the other two options. Specifically, she proposes that omissive events are tripartite metaphysical entities,[34] comprised of an event at the actual world, its *de re* possibility and the counterpart relation between them.

I think it is valuable to consider using trans-world identity and trans-world fusion to analyze the *de re* possibility of actual events, but it is quite obvious why counterpart theory turns out to be a better candidate.

First, counterpart theory is much more intuitive than trans-world identity theory and trans-world fusion theory in the context of merely possible events. Recall the distinctness thesis of counterpart theory. For a counterpart theorist, the entity at the actual world is distinct from the entity at another possible world. Such a feature of counterpart theory captures our intuition of what events are: we usually individuate one event from another when they happen at different times and/or at different locations, so it is natural to treat one event as distinct another

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[34] Bernstein (2014), pp.8

when they happen at different worlds, even if they are exactly the same otherwise. Trans-world identity theory will have a much harder time capturing *de re* possibility of events, for it is not clear how a trans-world identity theorist can individuate actual event from its *de re* possibility. Nor will trans-world fusion theory be in a better position: since events are not material objects, it is not clear how they can compose a trans-world object.

Second, the similarity thesis in counterpart theory is extremely useful in picking out the particular *de re* possible event in our counterfactual analysis of causal relation. To do this, a counterpart theorist can simply extend the primitive similarity relations between persons and objects to similarity relations between events. She might claim that an omissive claim contextually picks out counterpart relations between an actual event and a merely possible one. Just as the lump of clay has the *de re* property *possibly a statue* in virtue of having a counterpart at another possible world that is a statue, the actual event *the technician having sandwich* has the *de re* property *possibly the technician performing a safety check* in virtue of having a counterpart event *the technician performing a safety check* at another possible world. Trans-world identity theory and trans-world fusion theory, on the other hand, do not have such merits. They cannot afford the kind of contextual inconstancy counterpart theory has to provide and thus, will have a

much harder time picking out the particular *de re* possible event we are interested in.

Thirdly, counterpart theory allows the relation between the actual event and its *de re* possibility to be asymmetric and intransitive[35]. A relation is symmetric means that if *a* bears relation R to *b*, then *b* bears relation R to *a*. A relation is transitive means that if *a* bears relation R to *b* and *b* bears relation R to *c*, then *a* bears relation R to *c*. Recall from earlier sections, counterpart relation hold between two objects hold in virtue of their similarity relations. Similarity relations is an intransitive relation: if *a* is similar to *b*, *b* is similar to *c, c* is similar to *d*, it does not follow that *a* is similar to *d*. Moreover, counterpart theory has the kind of inconstancy that allows for additional contextual restrictions on *de* re modality such that counterpart relations are not symmetric.

Thus, counterpart theoretic account of *de re* possibility allows (*the technician having sandwich*) to have *de re* possibility (*the technician performing safety check*) and (*the technician performing safety check*) to have *de re* possibility (*the technician singing while performing safety check)* without requiring (*the technician singing while performing safety check*) to be the *de re* possibility of (*the technician having sandwich*). This is helpful for causal analysis involving omissions because we do not want to identify the technician's failure to

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[35] For example, Lewis's counterpart theory holds that counterpart relation between objects and individuals are asymmetric and intransitive. See Lewis (1968)

sing while performing the safety check as a cause for the plane crash. Counterpart theory also allows (*the technician having sandwich*) to have *de re* possibilities (*the technician performing a safety check*) without requiring (*the technician having a sandwich*) to be the *de re* possibility of (*the technician performing a safety check*). This will also be helpful because the technician's failure to perform the safety check does not require actual events such as (*the technician having a sandwich*); the technician could have had a hotdog instead.

Trans-world identity theory, on the other hand, does not have adequate theoretical tools to allow *de re* possibilities to be intransitive and asymmetrical, for identity relation is transitive and symmetrical. A trans-world fusion theorist cannot allow that either, for the relation 'both being part of trans-world composite X' is also transitive and symmetrical.

Thus, if a modal realist would like a theory of metaphysics of omission, endorsing counterpart theory as the best theory of *de re* modality will provide her adequate theoretical tools to construe a theory that achieves that goal.

4.4 Plural *De Re*

The fourth reason for the modal realist to be a counterpart theorist is that it allows a clear analysis of modality involving plural *de re.* By plural *de re* I mean some kind of modal properties that cannot be reduced to properties of particular individuals at other possible worlds, but rather a plurality of possible

individuals.[36] In the following section, I will argue that a modal realist who chooses to be a trans-world identity theorist or a trans-world fusion theorist will have a much harder time accommodating plural *de re* modality into their theory than counterpart theorists.

To see this, consider the modal claim, 'every philosophy major at Mount Holyoke College might graduate with honor.' Such a claim is ambiguous. There are at least two ways to interpret this claim, one reading involving *de dicto* modality and the other involving *de re* modality,

On the *de dicto* reading, one will think that the modal claim 'every philosophy major at Mount Holyoke College may graduate with honor' is an equivalent to the claim 'possibly, whoever is a philosophy major at Mount Holyoke College graduates with honor', i.e., ◊∀x (PhilosophyMajor (x) —> Honor (x)).[37] Such reading of the modal claim is true if and only if there is a possible world at which every philosophy major at Mount Holyoke College graduates with honor.

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[36] See Bricker (1989). Bricker also develops the argument from plural quantification as an objection to the Lewisian modal metaphysics in Bricker (2001), Pp. 17. As a modal realist and counterpart theorist, he proposes an amended analysis (Plural Quantifier Version), which states that a proposition is (metaphysically) possible if and only if it is true at some worlds, or some worlds. It is hard to incorporate trans-world identity theory and trans-world fusion theory into Bricker's account, and thus, a modal realist who finds Bricker's objection plausible might want find an additional reason to sign up to counterpart theory.

Although the argument from *de re* modality I am presenting here is inspired by Bricker's account, it is different from Bricker's argument. My argument does not have anything to do with plural quantification; it only deals with plural *de re.*

[37] In Modal Logic, diamond ◊ is a primitive modal operator which reads as "Possibly,…".

Another reasonable reading of the claim will be a *de re* one. One might think that the modal claim 'every philosophy major at Mount Holyoke College may graduate with honor' denotes particular individuals who are philosophy majors at Mount Holyoke College at the actual world. The truth condition for the *de re* reading of the claim needs to be different from the truth condition for the *de dicto* reading of the claim, for the *de re* reading will be falsely satisfied by a world at which an entirely different group of philosophy students graduating with honor. This should not be the case. To provide an appropriate truth condition for the *de re* reading, one must provide a separate analysis, according to which particular individuals who are philosophy majors at the actual world can possibly graduate with honor, i.e., ◊ Honor (*a*) ^ ◊ Honor (*b*) ^ ◊ Honor (*c*) ^ …

All three theories of *de re* modality are capable of providing a *de re* analysis of the claim in question here. I am not planning to argue in favor of one over the other in terms of *de re* modality in general. Instead, I want to focus our attention to the third reading of the claim, which involves plural *de re*. To simplify our discussion, let us suppose that there are only two philosophy majors at Mount Holyoke College. Let us name them Gabrielle and Yuan. Let us further suppose that the contextual guidance of the utterance provides that the claim 'every philosophy major at Mount Holyoke College might graduate with honor' denotes it is possible for everyone who is a philosophy major at the actual world, i.e, both

Yuan and Gabrielle, to graduate with honor. Note that the truth condition for the plural *de re* reading of the claim needs to be different from the truth condition for the *de re* reading of the claim, for the plural *de re* reading will be falsely satisfied by a possible world w_1 at which Gabrielle graduates with honor but Yuan does not and another possible world w_2 at which Yuan graduates with honor but Gabrielle does not. This should not be the case. To provide an appropriate truth condition for the plural *de re* reading, one must provide a separate analysis, according to which it is possible for all individuals who are philosophy majors at the actual world to graduate with honor, i.e., ◊ (Honor (*a*) ^ Honor (*b*) ^ Honor (*c*)…)

Let us stick to the example where there are only two philosophy majors at the actual world. What we need is to find a world at which both Yuan and Gabrielle graduate with honor. The task is relatively easy for counterpart theorists. A counterpart theorist may easily pick out a world where two distinct individual bears counterpart relation to the actual individual, Yuan and Gabrielle at our world. To do that we just need to find a class of world where two individuals that are extremely similar to, and yet distinct from, Yuan and Gabrielle graduate with honor. Clear and simple.

Trans-world identity theorist, on the other hand, will have a much harder time distinguishing the *de re* reading of the claim from the *plural de re* one. It is theoretically impossible for a trans-world identity theorist to distinguish a world

where Yuan and Gabrielle both graduate with honor from a world where Yuan and a mere duplicate of Gabrielle both graduate with honor. This is a problem for the trans-world identity theorist because another individual, even a qualitative duplicate of that individual, does not capture the *de re* possibility of that particular individual at the actual world. For a trans-world identity theorist, a *de re* modal claim is satisfied if and only if the *same individual*, i.e., our Gabrielle at the actual world, satisfied the formula 'graduate with honor' at another world. Unfortunately, the trans-world identity theory does not have the adequate resources to distinguish a world where Yuan and Gabrielle both graduate with honor from a world where Yuan and a mere duplicate of Gabrielle both graduate with honor, and thus, will provide a less convincing analysis of modality involving plural *de re*.

One response on behalf of the trans-world identity theorists will be that the truth condition for the *plural de re* reading of the claim just is for our Yuan, the same individual, to graduate with honor *at a possible world* where our Gabrielle, the same individual, also happens to graduate with honor *at that world*. I think such a move is unappealing because in that case, the trans-world identity theorist will have to privilege one particular individual in her analysis. Such a move seems entirely arbitrary to me. Why are we using Yuan as the basis of our analysis as opposed to using Gabrielle? The problem is even worse if we change our example

and suppose that in addition to Yuan and Gabrielle, there are thirty other philosophy majors at Mount Holyoke College at the actual world. It seems to me that the trans-world identity theorist will have thirty-two ways to provide the analysis for the *plural de re* reading of the claim, each privileging one particular individual as the basis of the analysis. But there is no reason why the trans-world identity theorist chooses one particular individual as the preferred basis for her analysis as opposed to thirty-one other individuals. Such choice seems entirely arbitrary to me. Let us call this the problem of privileged basis.

I do not think the trans-world fusion theorist has the problem of privileged basis as a trans-world identity theorist does. Nonetheless, trans-world fusion theory faces trouble distinguishing a world at which a modal part of Yuan and a modal part of Gabrielle both graduate with honor from a world at which a modal part of Yuan and a mere duplicate of Gabrielle's modal part graduate with honor. Such an analysis should seem unappealing to a modal realist, especially in comparison with the simple and intuitive counterpart theoretic analysis of plural *de re*.

Thus, I believe if a modal realist hopes to have a good analysis of plural *de re* modality, she should choose to become a counterpart theorist.

4.5. Humphrey's Objection

A modal realist might be hesitant about becoming a counterpart theorist because of Humphrey's objection. Humphrey's objection was put forward as an objection to Lewis's counterpart theory by Saul Kripke. In a footnote in his Naming and Necessity, Kripke wrote:

> The counterpart of something in another possible world is never identical with the thing itself. Thus, if we say 'Humphrey might have won the election...' we are not talking about something that might have happened to Humphrey but to someone else, a 'counterpart.' Probably, however, Humphrey does not care whether someone else, no matter how much resembling him, would have been victorious in another possible world. Thus, Lewis's view seems to me even more bizarre than the usual notions of trans-world identity it replaces.[38]

I take it that there are at least three different ways to read Kripke's complaint, and thus three ways to formulate the so-called Humphrey's objection. On the first reading, Kripke is accusing the counterpart theorists of identifying the subject matter of claims like 'Humphrey might have won' as concerning the *de re* modal property of Humphrey's counterpart rather than Humphrey himself. I follow Michael De[39] and take such reading as an infelicitous reading of Humphrey's objection. Such a reading of Kripke's complaint is easy to respond to, for counterpart theorists simply do not talk about what might have happened to Humphrey's counterparts. Recall from the previous chapter, the goal of counterpart theorists who are also modal realists is to reduce modal truth of the

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[38] Kripke (1980), pp. 253–355.

[39] De (2018), pp. 159 -179

actual world, i.e., what might have happened to Humphrey, to non-modal truths of other possible worlds, i.e., what happens to Humphrey's counterpart at another possible world. Thus, counterpart theorists are only concerned with the non-modal property of Humphrey's counterpart.

There clearly is something beyond the infelicitous reading in Kripke's complaint. I think a much better reading of Kripke's complaint is a complaint from truthmaking. The notion of truthmaking is an intuitive one. For example, we might think what makes true of the claim that my chair is red is my chair, the real and concrete object I am sitting on. Thus, the claim about the chair is true in virtue of this chair. Suppose that we define truthmaker as the thing in virtue of which a proposition is true.

When I say that Humphrey could have won the election, one might think it is intuitive to think that the proposition is true in virtue of Humphrey, this worldly individual, who he is, and his character and other facts about the actual world. If that is the thought, we may construe Humphrey's objection as the following: since the truthmaker of the modal claim is Humphrey himself and other relevant facts about the actual world and yet counterpart theory relies on other possible worlds and other world individuals to make true of *de re* modal claims about this worldly individuals, counterpart theory must not be accepted. Let us call this the second reading of Humphrey's objection.

I think there are three reasons why a modal realist should not be persuaded by the second reading of Humphrey's objection. First, a modal realist should be worried about objecting to counterpart theory on such grounds, for such an objection based on truthmaking can be easily modified into a full-blown objection to modal realism. If one thinks that it is unacceptable for a counterpart to "make true" of claims about *de re* modality, she might also think that it is unacceptable for a merely possible world to "make true" of the claims about modality in general.

Secondly, I think there is a clear distinction between truthmaker and truth condition. To see this, consider an oracle who knows the truth value of every single modal sentence. We might have good reasons to consult the oracle whenever we want to know the truth value of a modal claim, but by doing so we are not committed to claiming that the oracle is truthmaker of every single modal claim. Similarly, a modal realist might say that a counterpart theoretic account of *de re* modality identifies the right truth condition for *de re* modal claim, and remain silent on what the truthmaker of those modal claims are.

Third, it is consistent for a modal realist who is also a counterpart theorist to think that the truthmaker of modal claims remains in the actual world. According to counterpart theory, the claim 'Humphrey could have won' is true if and only if Humphrey's counterpart at another world wins the election.

Nonetheless, the distinct individual at another world bears counterpart relation to Humphrey precisely because of facts about Humphrey himself. To the very least, the counterpart relation is made true by Humphrey himself and other relevant facts at the actual worlds. If that is the case, Humphrey's objection, formulated in such a way, should not be treated as a real threat to counterpart theory.

I think it is much more charitable and convincing to construe Humphrey's objection in the following way: Humphrey's objection claims that an analysis of *de re* modality must respect certain attitudes we have towards modal properties, i.e., if a modal property P is analyzed in terms of property Q, the one should care about having P if and only if she also care about having Q.[40] Let us call this the third reading. I think there are at least two responses with respect to the third reading of Kripke's complaint.

The first response comes from Ted Sider, who argues that "a reasonable person can care about a property under one description ('possibly winning') while not caring about the same property under another description ('having a counterpart who wins'), provided that it is not obvious that the description pick out the same property. Correct analysis need not be obvious to competent language users."[41] I think Sider's response sounds convincing. To see this

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[40] De (2018), pp. 4

[41] Sider (2006), pp. 2

consider Annie, who is extremely ignorant of chemistry. Being very thirsty, Annie may care very much about whether there is water nearby and not care about whether there is H_20 nearby, even if water is necessarily H_20.[42] Annie's example shows that a reasonable person can have conflicting attitudes towards one and the same property under two different descriptions without realizing that the descriptions pick out the same property.

Similarly, Humphrey might care about whether he *could have won* the election without realizing that necessarily, he could have won the election if and only if he has a counterpart at world *w* who wins the election. Since it is reasonable for someone to have conflicting attitudes towards the one and the same property CouldHaveWon(x) under two different descriptions, a modal realist should not be hesitant about counterpart theory because of Humphrey's objection.

Second, I think it is, in fact, irrational for Humphrey to not care about someone else winning the election, no matter how much that person resembles him. I think to claim that Humphrey does not care about that counterpart winning the election will be like claiming that one can care about whether her own car can drive 160 miles per hour without caring about whether another car of the exact same model actually drives up to 160 miles per hour.[43] To go this route is to claim that Kripke's complaint is directed at an irrational attitude Humphrey allegedly

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[42] Woodward (2008), pp. 67.

[43] De (2008), pp. 7

has. One might think that counterpart theorists are only bound to respect rational attitudes towards modal properties, and thus dismiss Humphrey's objection to counterpart theory.

Nonetheless, one may object to my reasoning by claiming that our attitudes towards other objects are different from our attitudes for ourselves. In other words, Humphrey's objection targets Humphrey's *de se* modal concerns: he cares about whether he himself could have won the election and do not care about whether an exact same duplicate of him wins the election at another possible world.

While I do not deny that Humphrey might care more about modal properties of himself, I still think that it will be irrational for him to not care about someone who is extremely similar to him winning the election[44]. To see this, imagine Donna, who is applying for a fellowship opportunity. Unfortunately, she was not awarded the fellowship because another competitive candidate, Janice, got it instead. Suppose that Donna was told that Janice has a comparable grade point average, equally good recommendation letters and even similar research proposal as she does. I think Donna should care about Janice getting the opportunity, for the qualities Janice has should convince Donna that she *could have got* the scholarship. I think it is intuitive that the similarity relations between

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[44] See Woodward (2008), also see Miller (1992).

Donna and Janice should count as evidence that Donna has the modal property CouldHaveGotFellowship (x). Even if our attitudes towards ourselves is different from our attitudes towards other people, such difference in attitudes is irrelevant to our judgment about *de re* modality. Thus, Humphrey's objection should not convince modal realist to not become counterpart theorist.

In the next chapter, I will remind the reader of what trans-world identity theory of *de re* modality is, present different versions of trans-world identity theory and argue that a modal realist should not choose trans-world identity theory over counterpart theory.

V. AGAINST TRANS-WORLD IDENTITY

Trans-world identity theory states that Ruth herself wholly exists *at* multiple worlds, including the actual world and *merely* possible worlds. For trans-world identity theory to be true, one single object must exist at more than one possible world. In other words, trans-world identity theorists take the possible world analysis of *de re* modal claims at face value. Ruth Bader Ginsburg, the one and only object, wholly exists at multiple worlds.

There are various ways for a modal realist to be a trans-world identity theorist. In this section, I will present three ways for a modal realist to be a trans-world identity theorist, and then argue that she should not choose to do so. To anticipate, each one of those options will involve a distinct account of what a possible world is and what it means for an object to exist *at* a possible world. In section 5.1, I will introduce the Lewisian account of trans-world identity theory and present Lewis's objections to that. In Section 5.2, I will present what I call Modal Realism with Overlap #1 (MRO1). I will explain how MRO1 avoids lewis's objection to trans-world identity, and why it is not appealing. In section 5.3, I will present Modal Realism with Overlap #2 (MRO2), which McDaniel

argues is the strongest version of modal realism.[45] I will argue that MRO2 is overly similar to actualism and does not do a good job reducing modal notions into non-modal notions. I think these two features are against the spirit of modal realism, and thus should not be accepted by a modal realist.

5.1 Lewisian Account of Trans-world Identity

Lewis's account of trans-world identity[46] is based on Lewisian modal metaphysics. Recall from Chapter II, the Lewisian possible worlds are concrete in the sense that they are maximally spatiotemporally related sum of objects. For Lewis, *w* is a possible world if and only if[47] (i) there are some *x*s such that each one of the *x*s are spatiotemporally related to every object that is one of *x*s, (ii) none of *x*s is spatiotemporally related to any object that is not one of the *x*s, and (iii) *w* is the sum of the *x*s.

For Lewis, an object exists *at* a world by being a spatiotemporal part of that world. To claim that an object exists at more than one world is to claim that there are an object *x* and at least two possible worlds, w_1 and w_2, such that *x* is a part of w_1, *x* is a part of w_2, and w_1 is not identical to w_2.[48] In other words, Lewis

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[45] See McDaniel (2006)

[46] Lewis(1986), pp. 198-209

[47] Lewis (1986): pp. 69-81. This way of formulating Lewisian account of possible worlds follows McDaniel (2004), pp. 139

[48] This way of analyzing Lewisian understanding of possible worlds and parthood relations follows McDaniel(2004):137 – 152.

thinks that trans-world identity theorists are committed to ∃x ∃*w*1∃*w*2 (Part (*x*, *w*1) ^ Part (*x*, *w*2) ^ ~(*w*1 = *w*2)).

Lewis has two objections to trans-world identity theory. First, Lewis thinks that it is implausible to think of one single object to be part of two, or more, *non-spatiotemporally related* worlds. His first objection relies on the following three premises:

P1: If an object exists at two worlds, the object is a spatiotemporal part of both worlds.

P2: Spatiotemporal relations are transitive.

C1: If an object exists at two worlds, those two worlds are spatiotemporally related to each other.

P3: Possible worlds are not spatiotemporally related to each other.

Conclusion: An object cannot exists at two worlds.

P1 follows directly from Lewis's metaphysics, which provides that an object exists *at* a world by being a spatiotemporal part of that world. P2 is true because it is the commonsensical way to understand spatiotemporal relations. A relation is transitive means that if *a* bears relation R to *b* and *b* bears relation R to *c*, then *a* bears relation R to *c*. It is part of our common sense to think that if an object *a* is spatially or temporally related to object *b* and object *b* is spatially or temporally related to object *c*, then object *a* is also spatially or temporally related

to object *c*. Together, P1 and P2 entail the truth of C1. If an object is spatiotemporally related to both possible world w_1 and possible world w_2, and that spatiotemporal relations are transitive, then those two possible world w_1 and w_2 must also be spatiotemporally related to each other. P3 is true because it is also part of Lewis's metaphysics that possible worlds are not spatiotemporally related to each other.

P1 + P2 requires two possible worlds to be spatiotemporally related to each other (C1). P3 negates the consequent of C1 (*two worlds are spatiotemporally related to each other*). By *modus tollens*, one must negate the antecedent of C1 (*an object exists at two worlds*). Thus, if one agrees with Lewis the truth of each of the three premises, she must also conclude that an object cannot exist at two worlds.

Even if a modal realist does not agree with Lewisian modal metaphysics and hence do not agree with Lewis on the truth of P1 and P2, she might still be moved by Lewis's second objection to trans-world identity theory, i.e, the problem of accidental intrinsics. Specifically, Lewis thinks that trans-world identity theory should not be accepted because it faces trouble analyzing objects with accidental but intrinsic properties.

Accidental properties are the kind of properties that are not necessarily instantiated by an object, i.e., properties an object has at one world, but not at all

possible worlds. Intrinsic properties are one-place, non-relational properties. An intrinsic property is the kind of property that can be instantiated by an object without having to specify the relation the object bears to something else. An object's shape is a paradigm example of its intrinsic property, for the shape of an object does not depend on the relations it has to anything else. The property of being North of the equator, on the other hand, is not an intrinsic property, but rather a relational property. Ruth has the intrinsic property of having long hair because a perfect qualitative duplicate[49] of Ruth at a particular time *t* also have the property of having long hair; Ruth has the relational property of being North of the equator only in relations to the equator because a perfect qualitative duplicate of Ruth does not need to bear such a relation to the equator.

Lewis thinks that a trans-world identity theorist will either have to deny there are accidental intrinsic properties or face a contradiction. To see this, let us suppose that the trans-world identity theorist accepts a person's hairstyle as an accidental intrinsic property. Consider again Ruth Bader Ginsburg. Having long hair is an accidental property of Ruth because it is possible for Ruth to have short hair. It is also an intrinsic property, i.e., one-place, non-relational property of hers: Ruth has long-hair *simpliciter*, not in relation to something else.

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[49] Thanks to Professor Phil Bricker's lecture on intrinsic properties and relational properties at UMass Amherst, Spring 2019, Seminar in Metaphysics

Now, the trans-world identity theorist needs to provide an analysis for the claim 'Ruth has long hair, but she could have short hair'. A natural analysis for modal realists is to claim that Ruth has long hair at the actual world and does not have long hair at another possible world, i.e., LongHair (Ruth) at w_0 ^ ~LongHair (Ruth) at w_1. If the trans-world identity theorist agree with Lewis that having long hair is intrinsic property rather than a disguised relation the person has to a possible world, she will need to claim that Ruth, the one and same individual, has long hair and does not have long hair *simpliciter*, i.e., LongHair (Ruth) ^ ~LongHair (Ruth)[50]. However, one and the same individual cannot be both P and not P. This is contradictory. Thus, a trans-world identity theorist must not have a good analysis for accidental intrinsic properties

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[50] A counterpart theorist will not face the same problem because according to counterpart theory, individuals are world bound entities. It will not be Ruth herself having the intrinsic property ~LongHair(x) but rather her counterpart, a distinct individual that is similar to her at another possible world. LongHair(Ruth)^ ~LongHair(Ruth's counterpart) is not contradictory because Ruth and her counterpart are two distinct individuals.

One might worry that by doing this counterpart theory is committed to hyper-essentialism, a view that holds that *all* of an object's properties are essential to it. In fact, Jonathan Schaffer (2010) has complained that counterpart theory is a form of hyper-essentialism:

> The hyper−essentialist looks over her worlds and... sees no individual at more than one world. For if she sees some individual x at a world w, then she will see x as essentially having the property of being in a world with the distinctive features of w. In this respect the counterpart theorist has exactly the same picture of the worlds as the hyper−essentialist. The counterpart theorists and the hyper−essentialist merely have a semantic dispute, as to how to interpret claims in the modal language against their shared metaphysical picture.

Counterpart theory is not a form of hyper-essentialism because counterpart theorist reduces essence to modality. That is, for a counterpart theorist, *x* is essentially *F* if and only if for all worlds at which *x* exists, *x* is *F*. For more on this topic, see Woodward (2008), pp. 65 - 66

Lewis takes the problem of accidental intrinsics as a strong reason to rejects trans-world identity theory. I think there are two ways for a trans-world identity theorist to avoid the problem of accidental intrinsics. The first option is to argue that there is really no such thing as accidental intrinsic properties. A modal realist might claim that an object does not have a property *simpliciter*; rather, it instantiates a property in relation to a world. To pursue that route, she probably needs to insist that what we think of as intrinsic properties, such as shape, are, in fact, disguised relations the object has to a particular world. That does not seem appealing but is certainly one way to avoid the problem of accidental intrinsics.

Her second option is to argue that properties are world bound entities, i.e., the property instantiated by an object at one world is distinct from the property instantiated at another world. I think such a position entails undesirable consequences such as denying the existence of *merely possible* objects and requiring primitive notions of modality. I will explore those two options in more detail in the following two sections.

5.2. No Accidental Intrinsic Properties (MRO1)

In Modal Realism with Overlap (2004), McDaniel suggests that a trans-world identity theorist may develop her theory as a modal analog of endurantism, a view about how objects persist over time.

To see his point let us consider endurantism. Endurantism is a negative thesis: it denies perdurantism, which states that an object has instantaneous temporal parts at various times.[51] For example, a perdurantist will claim that Ruth earned a Juris Doctor degree from Columbia by having a temporal part earning a Juris Doctor degree from Columbia in 1959, but that temporal part of Ruth is not identical to the temporal part of Ruth that exists in 2019.

The endurantists deny that objects persist over time by having temporal parts. For the endurantists, material objects occupy various locations in time, parthood relation between material on material objects is a three-place, temporally indexed relation, and material objects have properties only relative to a particular time *t.* Thus, Ruth herself wholly exists in both 1959 and 2019; Ruth had a particular hair as her part sometime in 1959, i.e. Part (Ruth, Hair, 1959), but that hair is not a part of Ruth in 2010, i.e., ~Part (Ruth, Hair, 2019); Ruth does not have the property of being the supreme court justice of the United States in 1959, i.e., ~SupremeCourtJustice (Ruth, 1959), but she has the property of being the supreme court justice of the United States in 2019, i.e., SupremeCourtJustice (Ruth, 2019).

The endurantists face the problem of temporary intrinsics in the same way as trans-world identity theorists face the problem of accidental intrinsics. The

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[51] This description of endurantism comes from Professor Ned Markosian, during his office hour at UMass, Amherst.

problem of temporal intrinsics is the following. When an object undergoes changes through an extended period of time, an object may have an intrinsic property at time t_1 and do not have that intrinsic property at time t_2. Recall from the previous section, shape is an intrinsic property. When Ruth sits, she is bent; when Ruth stands, she is not bent. Both of those shapes are temporal intrinsic property: Ruth has them only at some times, but not at other times. Nonetheless, since an intrinsic property is a one-place relational property, Ruth must have that property simpliciter, not in relation to a particular time *t*. But Ruth cannot be both bent and not bent. Thus, the endurantists face the problem with temporary intrinsics.

A natural response from the endurantists is to claim that it is natural to think that an object has a property only in relation to a specific time.[52] For example, Ruth Bader Ginsburg has the property of being young at 19:35, March 15, 1950, and she has the property of not being young at 23:19, November 13, 2018. But it is inaccurate for us to claim that the same person, Ruth Bader Ginsburg, has the properties of both being young and not being young. Those properties of Ruth are always related to a specific time *t*.

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[52] My thesis advisor, Professor Nina Emery points out that an endurantist might also respond by claiming that intrinsic properties are much more complicated, and thus cannot be defined as one-place, non-relational properties. To simplify the discussion, I will assume that the endurantists will respond by saying that intrinsic properties should be temporally indexed for this draft version of my paper.

McDaniel argues that a trans-world identity theorist can solve the problem of accidental intrinsics in the same way as an endurantist solves the problem of temporal intrinsics. To do that, MRO1 redefines what a world is and what it means for an object to be *at* a possible world. An MRO1 theorist sees possible worlds as maximally continuous spacetime regions.[53] According to MRO1, *w* is a possible world if and only if

(i) *w* is a region of space-time;

(ii) every part of *w* is spatiotemporally related to every other part of *w*;

(iii) no part of *w* is spatiotemporally related to every other part of *w'*.

An MRO1 theorist also thinks that material objects are present *at* different possible worlds by occupying non-overlapping spacetime region. Contrary to our commonsensical belief, an MRO1 theorist will argue that an object can be wholly present at a space-time region without being a part of that region.

More specifically, an MRO 1 theorist think that spacetime regions and material objects that occupy space-time regions belong to two ontological categories. She will further argue that those two ontological categories have two different kinds of part-whole relations: a two-place part-whole relation for spacetime regions and a three-place, spatiotemporally indexed part-whole relations for material objects: for two space-time region R_1 and R_2, *R1* can be a

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[53] McDaniel (2004). pp.147

part of R_2 *simpliciter*; for two material objects *x* and *y, x* can be part of *y* only in relation to some spacetime region *R*. Since possible worlds w_1 and w_2 are two regions of space-time, space-time region R_1 is part of w_1 simpliciter. Since Ruth and her index toe on her left foot are martial objects, Ruth's index toe is part of Ruth only in relation to a particular space-time region. For example, her index toe is part of Ruth only related to R_1 but not a part of Ruth related to R_2. Moreover, such an account allows objects to have properties only in relation to some spacetime region *R*. Thus according to MRO1, a property *P* is at least a two-place predicate: P(*x*, *R*).

According to MRO1, an object *x* exists *at* a world *w*[54] if and only if there is some spacetime region *R* such that (i) *x* is wholly present at *R* and (ii) R is a part of w; a region *R* exists *at* a world if an only if it is a part of that world. Suppose that space-time region R_1 is part of w_1 and space-time region R_2 is part of w_2, Ruth has index toe on the left foot *at* possible world w_1, but she does not have index toe on the left foot at possible world w_2.

McDaniel[55] thinks that the endurantists have a strong reason to agree with MRO1 theorists that parthood relations are *spatiotemporally indexed* rather than *merely temporally indexed* and that properties are always related to a specific spacetime region *R* rather than a specific time *t* because of the special theory of

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[54] McDaniel (2004), pp. 147

[55] McDaniel (2004), pp. 145

relativity. Since the special theory of relativity[56] gives us strong reasons to think that there is no fact of the matter as to whether a material object *x* has property *P*

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[56] According to the special theory of relativity, there is no such thing as absolute simultaneity. There is no fact of the matter as to whether a material object a has property P at time *t*, because whether a having property P is simultaneous with time *t* depends on a particular the reference frame *F* we use. In the following paragraphs, I will state what I mean by 'there is no fact of the matter as to *p*', define what a reference frame is, and explain relevant aspects of the special theory of relativity that establishes *No Absolute Simultaneity.*

By 'there is no fact of the matter as to *p*' I mean that there is no non-perspective-relative or non-observer-relative, fact as to whether *p* (This follows footnote 7 of Emery(2018)). This will be compatible with there being facts as to whether *p* relative to some salient restriction or quantifications. For example, the claim that 'there is no fact of the matter as to whether Matías is to the left of Ava Hope' is compatible with the fact that Matías is to the left of Ava Hope *when you look at them from my perspective*. What is at stake here is that there is no way to determine whether Matías is to the left of Ava Hope without referring to a particular perspective.

By *reference frame*, I mean a way of identifying points, and thus measuring distances, in space and time (This definition comes from Professor Nina Emery's handout, *The Relativity Objection,* from her Philosophy of Time Seminar in Fall 2018 at Mount Holyoke College). It is natural to think that there is no fact of the matter as to whether an object is moving since whether an object is moving depends on the particular *reference frame* used by the observer. Consider two observers, Alice and Bob(The example here also follows Professor Nina Emery's *The Relativity Objection* handout), traveling at constant speed relative to each other. Alice is sitting on a north-bound train that travels past a train platform at a constant, high velocity, while Bob is standing on the train platform. It is natural for Alice to use the reference frame in which objects inside the train are at rest. Call this *Alice's reference frame*. It is natural for Bob to use the reference frame in which objects on the platform are at rest. Call this *Bob's reference frame.*

Consider the question of whether the table in front of Alice is moving. According to *Alice's reference frame*, the table is not moving; according to *Bob's reference frame*, the table is moving at a constant high velocity to the north. There is no fact of the matter as to whether the table is moving because Alice and Bob are both correct relative to their own *reference frame.* This is the Galilean relativity theory, according to which there is no such thing as absolute rest. Call this *the relativity of rest*.

At the end of the twentieth century, physicists collected a series of empirical data that shows the following fact: the speed of light remains the same regardless of the velocity of the source from which that light is emitted(Nina. (2018) pp. 6-9). In other words, light travels at the same speed in both Alice's reference frame and in Bob's reference frame. This means that if Alice is making a judgment using Alice's reference frame and Bob is making a judgment using Bob's reference frame, they will, at least sometimes, disagree about whether certain pairs of events are simultaneous.

Suppose that Alice is sitting in right the middle of the north-bound train and turns on a light bulb. Let FRONT be the event of the light emitted by the light bulb reaching the front wall of the train and BACK be the event of the light reaching the back wall. Since light travels at a constant speed *c* and the front and back wall of the train are of equal distance from the light bulb, FRONT and BACK happens simultaneously in *Alice's reference frame*. In *Bob's reference frame*, however,

at time *t* unless we specify a particular reference frame *F,* McDaniel thinks the endurantists have strong reason to have the part-whole relations and property instantiation spatiotemporally indexed, instead of merely temporally indexed. This allows MRO1 to have the exact same view of part-whole relations and property instantiation with endurantism, which is a much more popular view.

An MRO theorist can solve both the problem of temporal intrinsics and the problem of accidental intrinsics. She may claim that Ruth has the property of being young relative to a spacetime region R_1 and the property of not being young relative to another spacetime region R_2. She may also claim that Ruth has the property of not having short hair related to a spacetime region R_1, which is part of one possible world w_1 and that Ruth has the property of having short hair related to a spacetime region R_2, which is part of another possible world w_2. For both the endurantist and the trans-world identity theorist, it is not the case that ~ShortHair (Ruth) ^ ShortHair (Ruth), but rather, ~ShortHair (Ruth, R_1) ^ Short (Ruth, R_2). Since in this case, 'Ruth not having short hair at the actual world' and 'Ruth having short hair at another possible world' are consistent, an MRO1 theorist neither has a problem with temporal intrinsics nor accidental intrinsics.

Nonetheless, one might have independent reasons to be hesitant about MRO1. First, unlike Lewisian Modal Realism, MRO1 cannot straightforwardly define properties as sets of possible objects, for properties are had by objects

relative to regions of spacetime.[57] If one chooses to be a Lewisian modal realist, it is rather easy to give an account of what properties are.[58] She may simply identify redness as a set of actual and merely possible objects that are red.[59] For her, what it means for an object to instantiate a property is for that object to be a member of the set of red objects. An MRO1 theorist, on the other hand, claims that an object instantiates a property only relative to the particular spacetime regions. On MRO1, it is not clear how the modal realist can explain what properties are and what it means for an object to instantiate a property.

Second, MRO1 claims that to be possible is to be at a world, which means to occupy a region of spacetime. This implies that necessarily, everything is spatiotemporal. A modal realist might balk at MRO1 because such a requirement is overly restrictive and does not capture the full realm of possibility.

Third, MRO1 is committed to an ontological distinction between regions and their occupants. An MRO1 theorist must believe that that there are material objects and there are space-time regions that can be occupied by material objects, and thus she must also believe that spacetime regions are fundamental constituents of reality and are not merely derivative of the relations material

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[57] McDaniel (2006), pp. 307.

[58] With Lewisian definition of possible worlds what it means to be *at* a world, it is easy to define a property as a set of objects from different possible worlds. See Lewis (1986), pp. 50 - 69

[59] One may or may not agree with this account of property. Such worry was pointed out by Sider (1996), which is in turn based on Forrest and Armstrong (1984). But for those who do, this will be a reason to look into other theories of trans-world identity.

object bears to one another. MRO1 requires a substantivalist account of spacetime,[60] but presumably, not every modal realist agree with substantialism.

Fourth and lastly, MRO1 denies that there is such thing as accidental intrinsic properties.

I think those four consequences of MRO1 should dissuade a modal realist to be an MRO1 theorist. Of course, a trans-world theorist might be willing to bite those bullets and endorse MRO1. She probably should not because there is another version of trans-world identity theory that avoids each of those four undesirable consequences. To see how that works let us take a look at Modal Realism with Overlap 2 (MRO2).

5.3. No Merely Possible Objects (MRO2)

MRO2 is inspired by Douglas Ehring's endurantist solution to the problem of temporal intrinsics, which appeals to tropes.[61] There are two ways to understand properties:[62] to say that properties are universals[63] or to say that properties are a set of tropes.[64] Theorists of universals and theorists of tropes disagree on what it means for two objects to share a property. A universal theorist

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[60] This is because MRO1 requires that there are at least two ontological categories, i.e., regions of spacetime and material objects. See McDaniel (2004) pp. 142.

[61] Ehring (1997), pp. 254–258

[62] See Lewis (1986), pp. 64 -69.

[63]See Armstrong (1978). Also see Lewis (1968), pp. 64

[64] See Williams (1953) and Goodman (1951)

thinks that one and the same property can either be instantiated by different objects and, thus, properties are universals. A trope theorist thinks that objects instantiate different properties, i.e., tropes, although some tropes are maximally similar to each other and other tropes are not. Consider the property greenness: both my shirt and the grass on Skinner Green are green, i.e., Green(shirt) and Green(grass). For a theorist of universals, both my shirt and the grass instantiate the same universal of greenness. For the trope theorists, on the other hand, the shirt instantiates a trope of greenness and the grass instantiates another trope of greenness, although those tropes perfectly resemble each other. Those tropes are duplicate tropes of each other. For trope theorists, the property greenness is a maximal set of duplicate tropes of greenness.

In his solution to the problem of temporal intrinsics, Ehring assumes the truth of the trope theory of properties and maintains that tropes are *momentary,* i.e., no trope lasts longer than an instance.[65] The trope of whiteness of this piece of paper instantiates itself at t_0, and then another trope of whiteness at t_1, and then another at t_2. Those momentary tropes are distinct, and yet perfectly resembles each other. They are duplicate tropes: they belong to the maximal set of duplicate white tropes. On such an account, each trope of whiteness is a temporary and yet

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[65] Although Ehring shows that this solution helps solve the problem of temporary intrinsics, it is not clear whether Ehring himself endorses the claim that tropes are momentary. See McDaniel (2006), footnote 29.

intrinsic property of this piece of paper. An object that endures change instantiates a series of dissimilar intrinsic momentary tropes. In this case, no intrinsic property is defined in relation to a specific time *t;* each of the intrinsic property lasts no longer than the particular instance in time.

In his 2006 paper, McDaniel argues for a modal analog of Ehring's trope theory. Rather than taking properties as merely *time-bound* tropes*,* McDaniel proposes that one may take them as *world-bound*[66]. Just as each trope is instantaneous, i.e., confined in a single moment in time, "each trope can exist only at one possible world in virtue of occupying exactly one spatiotemporal region that is part of that world".[67] Ruth who has long hair but could have short hair may instantiate a longness trope that is bound to the actual world and a shortness trope that is bound to some other possible world.

MRO2 is a version of trope theory, and thus, according to MRO2, properties are maximal sets of duplicate tropes. Here we need a definition of a maximal set of duplicate tropes. McDaniel provides the following: a set S of tropes is a maximal set of duplicates[68] if and only if

(i) every trope in S perfectly resembles every other trope in S, and

(ii) no trope not in S perfectly resembles some trope in S.

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[66] McDaniel (2006), pp. 311

[67] McDaniel (2006): pp. 311

[68] McDaniel (2006): pp. 313

According to MRO2, both tropes and spatiotemporal regions are world-bound entities; material objects that instantiate tropes and occupy spatiotemporal regions are not world-bound entities. According to MRO2, a maximal set of duplicate sets are *spread* across possible worlds. Some trope that belongs to set S exists in one world while another trope that belongs to the same set S exists in a different world.

MRO2 also defines possible worlds as a maximal structured fusion of tropes; for an object *x* to be *at* a world is for *x* to instantiate a part of that maximal structured fusion of tropes. According to MRO2, *w* is a possible world if and only if *w* is a maximal structured fusion of tropes. *w* is a maximal structured fusion of tropes if and only if there are some tropes *t*s such that[69]

(i) for each t_1 that is one of the *t*s, there is a *t2* that is naturally related to *t1,*

(ii) *there is no trope* such that is not one of the *t*s yet is naturally related to one of the *t*s, and

(iii) w is the fusion of the *t*s.

According to MRO2, a trope *t* exists at a world *w* if and only if *t* is a part of *w*; a material object *x* instantiates a part of *w.* For an MRO2 theorist, *x* is possibly P if and only if there is a world *w* such that *x* instantiate a P-trope *t* that is

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[69] McDaniel (2006), pp. 314

part of the maximal structured fusion of tropes *w*. Thus, according to MRO2, Ruth could have short hair means that there is a world *w* that has a short-hair trope as its part, and at that world *w* Ruth instantiates that particular short-hair trope. This ensures that the same individual, Ruth Bader Ginsburg, enjoys trans-world identity across different possible worlds.

Although MRO2 can successfully avoid many undesirable outcomes faced by MRO1, I do not think a modal realist should be an MRO2 theorist for two reasons. First, I think MRO2 will hold that *merely possible* objects such as Pegasus and unicorns do not exist. Second, I think MRO2 does not provide a clear and easy way to reduce modal notions into non-modal notions, i.e., it requires some primitive notions of modality to distinguish what is possible from what is impossible.

To begin with, it is not clear how MRO2 will allow merely possible objects in its ontology. Presumably, MRO2 theist will claim that only actual objects are material objects that exist,[70] for we do not find *merely possible* objects in our world. Thus, neither Pegasus nor talking donkeys exist; all there are are *this-worldly* horses and donkeys having *other-worldly* properties by instantiating *world-bound* tropes such as having wings or being able to talk.

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[70] See McDaniel (2006), pp. 324, where McDaniel discusses actualist Possibilism.

Such a position seems problematic to me. According to MRO2, the modal claim 'possibly, Pegasus exists' if and only if there is a material object instantiating the trope t_1 of having wings and the trope t_2 of looking like a horse, and t_1 and t_2 are part of the maximal structured fusion of trope *w*. However, it seems arbitrary for an MRO2 theorist to point to a particular *this-worldly* material object and claim that that object instantiates tropes as such. Moreover, it seems to me that the truth of a modal claim about a *merely possible* object should not be dependent on *this-worldly* material objects, for even if all material objects are wiped out from our universe, 'possibly, Pegasus exists' remains a true modal claim.

Another reason why a modal realist should not be an MRO2 theorist is that MRO2 cannot distinguish ways the world can be from ways the worlds cannot be without appealing to some primitive notions of modality. Suppose that we want to determine whether the cupola at Berkeley College can be both round and square.[71] For a modal realist, the cupola at Berkeley College can be both round and square if and only if there is a possible world at which the cupola at Berkeley College is both round and square. If a modal realist is also an MRO2 theorist, the cupola at Berkeley College can be both round and square if and only if the cupola at Berkeley College instantiates the world-bound trope of roundness

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[71] This example is quite famous. It was used by Quine in Quine (1961).

and a world-bound trope of squareness, and both tropes are part of a world *w, i.e.,* a maximally structured fusion of tropes.

But clearly roundness and squareness are inconsistent properties: it is impossible for an object to be both round and square. The MRO2 theorist must find a way to declare that there is no world has cupola's world-bound trope of squareness and a world-bound trope of roundness as parts. Presumably, she will argue that no such maximal structured fusion of trope because such structured fusion of trope will be a consistent one.

I do not think MRO2 can distinguish a maximal structured fusion of trope from an inconsistent structured fusion of tropes without appealing to some primitive notions of modality. That is, I do not think MRO2 has adequate theoretical tools to reduce modal notions into non-modal notions without relying on some pre-theoretical intuitions about what is possible and what is impossible. I take it that one of the most important reasons to adhere to modal realism is that a plurality of possible worlds provides a reductive account modality, i.e., explicating modal notions without having to appeal to any primitive modal notion. If MRO2 ends up relying on some primitive notion of modality in their analysis of modality, it should not be acceptable to a modal realist.

So much for Trans-world identity. Let's take a look at Trans-world Fusion.

VI. AGAINST TRANS-WORLD FUSION

Trans-world fusion theory states that objects extend through logical space by having modal parts at various possible worlds. According to the trans-world fusion theory, Ruth Bader Ginsburg is a trans-world individual, a composite object that partially locates at our world and partially locates at other possible worlds. Ruth satisfies the formula '*x* is a philosopher' at world *w* by having a world-bound modal part that is a philosopher at world *w*. Although one modal part of Ruth is a Supreme Court Justice, not all of her modal parts are.

Trans-world fusion theory is the modal analog of perdurantism. *Perdurantism* is the view that objects persist over time by having temporal parts at various times. The perdurantists draw an analogy between extension through space and persistence over time.[72] Just as my hand and my feet are spatial parts of mine that occupy different locations in space, I also have temporal parts that occupy different locations in time. The trans-world fusion theorists take the analogy space and time for granted and draw a further analogy between persistence over time and identity across possible worlds. Just as tables extend

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[72] The analogy here comes from Sider, (1997), pp 55

through space and objects perdure over time, trans-world individuals are spread out across different possible worlds.

Most people[73] who are interested in trans-world identity theory are motivated by the argument for perdurantism. It seems that arguments in favor of perdurantism can be easily modified into an analogous argument in favor of trans-world fusion theory. Among them is an argument from Vagueness for modal parts, modeled after Ted Sider's argument for temporal parts. I take the argument from vagueness as the strongest argument for trans-world fusion theory.

Nonetheless, I do not think that a modal realist should choose trans-world fusion theory over counterpart theory. I hereby provide two reasons for thinking that way: first, I think arguments in favor of perdurantism also equally support *exdurantism*, the temporal analog of counterpart theorist; second, to the extent that the argument from vagueness for modal parts relies on an analogous argument from vagueness for unrestricted composition, I worry that trans-world fusion theorist will end up providing a trivial truth condition for *de re* modal claims.

In this chapter, I will use Meg Wallace's definition of modal part and present my reconstruction of argument from Vagueness for modal parts. I will

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[73] Some trans-world fusion theorists are moved by the many worlds interpretation of Quantum Mechanics. There obviously are good arguments to be made in favor of the many worlds interpretation of Quantum Mechanics, but there are also independent worries for such a view. I am not planning to evaluate those arguments here.

then argue against choosing trans-world fusion theory over counterpart theory. To anticipate, I will first present Ted Sider's argument from Vagueness for the Thesis of Temporal Locality, which entails that objects have temporal parts, and then my analogous argument from Vagueness for the Thesis of Modal Locality, which entails that objects have modal parts. I will then explain my reasons against trans-world identity in further detail and conclude that the vagueness argument for perdurantism should not convince modal realists to prefer trans-world fusion theory over counterpart theory.[74]

Before we begin, let us be clear about what Ted Sider's definition of temporal part, and, hence, Meg Wallace's definition of modal parts. There are three notions that are important here. First, we need the notion of *atemporal parthood relations*. A temporal part theorist is interested in whether something is part of an object *simpliciter*, rather than whether something is part of an object in relation to a given time.[75] Being part of an object *simpliciter* means that something is part of an object without specifying a particular time or temporal perspectives. Such notion of atemporal parthood relations differs from our everyday understanding of parthood relations since we usually index a

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[74] Lewis also has an argument from impossibility against trans-world individuals, which says it is impossible for an individual to be extended across possible worlds because according to modal realism, something is possible if and only if it is so at one particular world. I am not presenting this argument here because once a modal realist embraces Phillip Bricker's amended version of modal realism, this argument against trans-world individuals will no longer have any force.

[75] Here Sider follows Leonard, Henry, and Nelson Goodman (1940), pp. 45-55.

particular time *t* in our discussion of parthood relations: the end of my fingernail is part of me at T_1, but is not part of me at T_2 because I have clipped it off sometime in between. The temporal part theorists, on the other hand, talk about parthood relations without indexing a particular time *t*. They need the notion of atemporal parthood relations so as to claim that my fingernail end's temporal part at T_1 is part of my temporal part at T_1 *simpliciter* and that my fingernail end's temporal part at T_2 is not part of my temporal part at T_2 *simpliciter*.

With temporal parthood relations, temporal parts theorists are allowed to define what *mereological fusion* is. the *mereological fusion* of a class of objects is an object that contains every member of the class as a part and is such that each of its parts overlaps some member of the class. For the perdurantists, individuals are the *mereological fusions* of a class of temporal parts; for trans-world fusion theorist, individuals are the mereological fusions of a class of modal parts.

Secondly, we need the spatiotemporal relations of *existence-at* a particular time. Such notion is supposed to be similar to our everyday understanding of time: Ruth Bader Ginsburg exists at the present time but not at times before 1933; Dinosaurs existed in the distant past but do not exist at the present time. Temporal part theorists think that existing at a particular time is

analogous existing at a spacial location. Just as Ruth Bader Ginsburg takes up five feet one inch in space from the ground to whether the top of her head is located, an object also takes up a particular *time span* in time from T_0 to T_1. According to *perdurantism*, an object exists *at* a time if and only if it has a temporal part that exists at that time. According to *trans-world fusion theory*, an object exists *at* a possible world if and only if it has a modal part that exists *at* that world.

Sider's definition of temporal parts relies solely on atemporal parthood relations and spatiotemporal relations. x is a *temporal part*[76] of y at instant t $=_{df}$ (i) *x* exists at, but only at *t*, (ii) *x* is part of y at *t*, and (iii) *x* overlaps at *t* everything that is part of *y* at *t*. Similarly, for Wallace, *x* is a *world-bound modal part* of *y* at a world *w* =df (i) *x* exists at, but only at, *w*, (ii) *x* is part of *y* at *w*; and (iii) *x* overlaps *at w* everything that is part of *y* at *w.*[77]

Recall from the previous section, perdurantism states that objects persist overtime by having different temporal parts. Endurantists, on the other hand, deny that there is such thing as temporal parts; they think the object wholly exists at various times. Sider's argument from Vagueness for temporal parts is an attempt to object to *endurantism* and establish the existence of temporal

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[76] Here I used Sider's definition of an instantaneous temporal part, but Sider's view will clearly embrace a temporal part that takes up an extended period of time.

[77] Wallace (2014 a)

parts. To do that, Sider claims to provide an argument for the Thesis of Temporal Locality i.e., for any object *x*, and for any non-empty, non-overlapping sets of times T_1 and T_2 whose union is the time span of *x*, there are two objects x_1 and x_2, such that (i) x_1 and x have the same parts at every time in T_1, (ii) x_2 and x have the same parts at every time in T_2, and (iii) the time span of $x_1 = T_1$, while the time span of $x_2 = T_2$.[78] Imagine an object that exits only at T_1 and T_2. If the thesis of temporal locality is true, then an object *x* will persist over time by having two instantaneous temporal parts at T_1 and T_2. Thus, given Sider's definition of temporal parts, the Thesis of Temporal Locality entails that objects have temporal parts.

With such background in mind, let's take a closer look at Sider's argument from vagueness for the Thesis of Temporal Locality.

1. Unrestricted Mereological Composition

Sider's argument for perdurantism is parallel to an argument for unrestricted mereological composition, according to which any class of objects has a fusion. Unrestricted mereological composition will entail that just as two distinct objects, the lid, and body of my water bottle, compose a fusion, my nose, and Eiffel tower, Davey and a water molecule, and any class of objects

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[78] The kind of perdurantism Sider present in his essay is a strong one; it implies that every subset of the time set of an object has a temporal part. Sider's Thesis of Temporal Locality also states it is metaphysically necessary for objects to have temporal parts; David Lewis disagrees. I think this dispute is irrelevant for my purpose, so I took the necessary operator out.

also compose a fusion. Sider's reconstruction of an argument from vagueness for Mereological Composition runs as follows:

> **P1:** If not every class has a fusion, then there must be a pair of cases connected by a continuous series such that in one, composition occurs, but in the other, composition does not occur.
>
> **P2**: In no continuous series is there a sharp cut-off in whether composition occurs.
>
> **P3**: In any case of composition, either composition definitely occurs, or composition definitely does not occur, but not both.
>
> **Conclusion-C**: Composition always occurs.

P3 + P1 entails that if not every class has a fusion, there must be a sharp cut-off in the continuous series as to whether composition occurs. P2 negates the consequent of this sub-conclusion. Thus, by *modus tollens*, one is compelled to conclude that every class has a fusion, i.e., composition always occurs.

(i) Defense of P1

To see what Sider's means by "a pair of cases connected by a continuous series such that in one, composition occurs, but in the other, composition does not occur", consider a pair of cases Case 1 and Case N. Case 1 is a certain class of particles P_1, P_2, …P_n that compose a table. This is a case

where most people will agree that composition definitely occurs. Now consider removing P_1. The remaining class of particles P_2, …P_n should still compose a table. Now remove P_2. The remaining class of particles P_3, …P_n should still compose a table. Suppose that we remove one particle at a time in each consecutive cases, such that in Case N, there is only one particle left, namely P_n. Most people will agree that in Case N, where there is one particle left, composition definitely not occur. By continuous series of cases, Sider means the finite series of cases connecting Case 1 and Case N, in which each case in the series is extremely similar to the cases next to it.

Most people agree that the antecedent of P1 is true, i.e., composition happens in some cases but not in other cases. After all, we do think there are composite objects in the world such as tables, chairs, and persons. Sider's first premise states that if one thinks in that way, there must be at least one pair of cases such that in one, composition occurs, but in the other, composition does not occur, and those two cases are connected by a continuous series of cases connecting those two cases.

Notice that Sider's first premise does not claim that not every pair of cases can be connected by a continuous series. For Sider's first premise to be true, he only needs at least one pair of cases differing over whether composition occurs to be connected by a continuous series, if one agrees that it is not the

case that every class has a fusion. The class of particles composing chair and the last particle that does not compose a chair can easily serve this purpose.

The only way to deny P1 is to maintain that not every class has a fusion and yet there is no pair of cases contented by continuous series such that in one, composition occurs, but in the other, composition does not occur. Notice that there is one easy way to resist the truth of P1, namely to insist that no class ever has a fusion. If composition never occurs, then there will be no continuous series connecting one case where composition occurs to another case where composition does not occur. This view is mereological nihilism. On this shocking view, ordinary objects, such as tables, do not exist because small particles such as table molecules do not compose a further object, i.e., a table.

I do not think that Sider has conclusive reasons to deny mereological nihilism,[79] but I think we have good reasons to not be a nihilist about

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[79] Sider rejects mereological nihilism because of the possibility of infinite descent. He thinks that mereological nihilists will claim that composition never occurs and that ordinary object and persons are merely atoms arranged object-wise and person-wise. Sider denies such a position because he thinks it is empirically possible for us to discover infinitely small particles that constitute that a mereological nihilist may take as a mereological simple, i.e., things that do not have proper parts. We used to think that molecules are small are mereological simples, but we now know there are even smaller particles, such as electrons and quarks, that compose a molecule. It is empirically possible for us to discover even smaller particles that compose electrons and quarks. Since this view relies on the assumption of mereological simples, and yet cannot give us a satisfying account of what mereological simples are, Sider thinks that one should not reject his first premise by claiming that composition never occurs.

I do not think that Sider's argument from the possibility of infinite descent provides conclusive reasons to object to *mereological nihilism*, for there is another version of *mereological nihilism* that avoids the possibility of infinite descent, namely existence monism. An existence monist will claim that composition never occurs because there is only one thing that exists, namely the world. For an existence monist, the world itself is a mereological simple, and ordinary objects and persons are merely different aspects of the same thing. For details, see Schaffer (2007)

composition. For example, one motivation would be that it is intuitive that ordinary objects such as tables and chairs exist and have proper parts, and that persons exist and have proper parts. Given that many people do not want to be nihilist about composition, it is quite plausible to accept the truth of P1.

(ii) Defense of P2

By sharp cut-off Sider means a pair of adjacent cases in a continuous series such that in one, composition definitely occurs, but in the other, composition definitely fails to occur. Sider's second premise is intuitively compelling because the adjacent members in a continuous series are, by definition, extremely similar in respects as to whether composition occurs. We may even introduce more cases such that adjacent members of the series are made exactly similar in respects such as qualitative homogeneity, spatial proximity, and comprehensiveness of causal relations. Given this, it will be arbitrary to point to an adjacent pair of cases and claim that in one, composition definitely occurs, but in the other, composition definitely fails to occur. For there to be an adjacent pair as such is implausible; thus, we should agree with Sider's second premise, i.e., in no continuous series is there a sharp cut-off in whether composition occurs.

(iii) Defense of P3

Sider's claim here must be distinguished from the traditional Sorites paradoxes, which involves vague predicates, i.e., terms with unclear, "blurred" or "fuzzy" boundaries of application.[80] Sider claims that composition can never be vague, i.e., composition either definitely occurs or it definitely fails to occur, because it is never vague as to how many concrete objects exists.

By concrete objects Sider means things other than sets and classes, numbers, properties and relations, universals and tropes, possible worlds and situations and any other abstract entities one might believe in. Sider thinks that if P3 can be violated, it can surely be violated in a world with only finitely many concrete objects. In that world, it will be vague as to whether some numerical sentences, sentences asserting that there are exactly *n* concrete objects where n is a finite number, is true. A numerical sentence for two concrete objects will be $\exists x \exists y [Cx \& Cy \& \sim(x = y) \& \forall z (Cz \rightarrow [x = z \vee y = z])]$. We can easily spell out a numerical sentence asserting *n* as the number of objects in that finite world in logical terms. Sider thinks that most philosophers will agree that concreteness is not a vague predicate and that logical terms are paradigm case for precision. Although Sider does not have conclusive reasons

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[80] For example, consider baldness. Since whether a head is bald depends on the distribution of the hair on one's head, we can line up a continuous series of heads, each head differing from its adjacent by only one hair, with the one on the very right to be definitely hairy and the one of the very left to be definitely bald. There is a "fuzzy" area in the middle whether it is no fact of the matter as to whether the vague property 'baldness' can be applied to those heads. Sider's third premise prohibits precisely such "fuzzy" area in cases involving composition.

to prove that P3 is true, he thinks that the endurantists will agree with him that numerical sentences can never be vague.

(iv) Conclusion-C

Unless one disagree with Sider's on the truth of one of his premises, one is compelled to conclude that every class has a fusion.

2. Unrestricted Minimal Diachronic-fusion

Sider then provides an analogous argument for unrestricted Minimal Diachronic-fusion targeting the endurantists, those who believe that objects persist over time by wholly existing at various times. Sider argues that unless the endurantists are nihilists about diachronic-fusion, they are compelled to accept that diachronic-fusion always occurs. Sider argues that endurantists cannot be nihilists about diachronic fusion because the endurantist must accept that one and the same object can gain and lose part over time. He then argues that in order to accommodate the thought that one and the same object can gain and lose parts over time, the endurantists need the notion of diachronic fusions, i.e., things that are fusions of different classes at different times.

Sider thinks that endurantism requires notions such as diachronic fusions because the endurantists must provide an account for how a persisting object gain and lose part over time. Sider thinks that a neutral way to spell out the thoughts the endurantists have is to characterize objects gaining and losing

parts at various times as a function $f(t)$ that assigns to one or more times a corresponding non-empty class of objects as exists at those time. A *minimum* diachronic-fusion is an "enduring object" that exists only at times in the function's domain. For example, Sider's minimal diachronic-fusion is a function that assigns to each time at which Sider exists a corresponding class of particles that are part of Sider at that time.

Now, here is a puzzle for the endurantists. Under what condition does an enduring object, for example Ted Sider, goes out of existence over time?[81] Consider Cases 1, where Sider, an individual, is composed of a class of particles P_1, P_2, …P_n at t_1. In this case, most people will agree that composition definitely occurs because Sider, the person, is a composite object composed by the class of particles. Sider keeps gaining and losing parts over time, and, thus, we may construe a continuous series of cases, where each case corresponds to a class of particles that composes Sider at that particular time. Now consider Case N, which occurs after Sider dies and is cremated, in which his molecules are scattered across Milky Way. In this case, most people will agree that composition definitely not occurs: Ted Sider no longer exists. The question is: where, in the continuous series, lies the sharp cutoff, i.e., the pair of cases such

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[81] One may think of this as the diachronic version of Van Inwagen's Special Composition Question. See Van Inwagen (1990)

that in one case the class of particles definitely composes Sider and in the other case the class of particles no longer composes Sider?

Such puzzle inspires an analogous argument unrestricted minimal diachronic-fusion, modeled on the argument from vagueness for unrestricted composition. Such an argument runs as follows:

> **Q1**: If not every assignment has a minimal diachronic-fusion, then there must be a pair of cases connected by a continuous series such that in one minimal dichromic-fusion occurs, but in the other, minimal dichromic-fusion does not occur.
>
> **Q2**: In no continuous series is there an abrupt cutoff in whether minimal diachronic-fusion occurs.
>
> **Q3**: In any putative case of minimal diachronic-fusion, either minimal diachronic-fusion definitely occurs, or minimal dichromic-fusion definitely does not occur, but not both.
>
> **Conclusion-M**: Minimal diachronic-fusion always occurs.

Q3 + Q1 entails that if not every assignment has a minimal diachronic-fusion, there must be a sharp cut-off in the continuous series as to whether minimal diachronic-fusion occurs. Q2 negates the consequent of this sub-conclusion. Thus, by *modus tollens*, one is compelled to conclude that every

assignment has a minimal diachronic-fusion, i.e., Minimal diachronic-fusion always occurs.

Sider thinks that the reasons to support the truth of those premises are exactly the same as the reasons to support the truth of P1, P2, and P3. If a person agrees with Sider the truth of Q1, Q2, and Q3, she will be compelled to conclude that every assignment has a minimal diachronic-fusion.

Sider argues that Conclusion-D entails the Thesis of Temporal Locality, which entails that objects have temporal parts. The Thesis of Temporal Locality states that for any object x, and for any non-empty, non-overlapping sets of times T_1 and T_2 whose union is the time span of x, there are two objects x1 and x_2, such that (i) x_1 and x have the same parts at every time in T_1, (ii) x_2 and x have the same parts at every time in T_2, and (iii) the time span of $x_1 = T_1$, while the time span of $x_2 = T_2$. Conclusion-D tells us that some object x_1 is a minimal D-fusion of an assignment *f* with domain T_1, which assigns some class of objects that compose x at T_1 to every member of T_1. The time span of x_1 would be T_1 since x_1 exists only at times in *f*'s domain; similarly for x_2. Thus, the Thesis of Temporal Locality is true, which entails that objects have temporal parts.

3. Unrestricted Minimal Trans-world-fusion

The argument from vagueness for modal part starts relies on a parallel definition of modal parts based on the definition of temporal parts, and a parallel Thesis of Modal Locality based on the Thesis of Temporal Locality.

Trans-World fusion theories define modal parts based on Sider's definition of temporal parts. Recall from the previous section, *x* is an *instantaneous temporal part* of *y* at an instant *t* =df (i) *x* exists at *t,* but only at, *t*, (ii) *x* is part of *y* at *t*; and (iii) *x* overlaps at *t* everything that is part of *y* at *t.* Thus, *x* is a *world-bound modal part* of *y* at a world *w* =df (i) *x* exists at, but only at, *w*, (ii) *x* is part of *y* at *w*; and (iii) *x* overlaps *at w* everything that is part of *y* at *w*.[82]

Similarly, a Thesis of Modal Locality can be provided based on Sider's Thesis of Temporal Locality. Recall from the earlier sections, the Thesis of Temporal Locality states that for any object x, and for any non-empty, non-overlapping sets of times T_1 and T_2 whose union is the time span of x, there are two objects x_1 and x_2, such that (i) x_1 and x have the same parts at every time in T_1, (ii) x_2 and x have the same parts at every time in T_2, and (iii) the time span of $x_1 = T_1$, while the time span of $x_2 = T_2$.[83] Similarly, a thesis of Modal

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[82] See Wallace (2014 a), pp. 358

[83] The kind of perdurantism Sider present in his essay is a strong one; it implies that every subset of the time set of an object has a temporal part. Sider's Thesis of Temporal Locality also says it is metaphysically necessary for objects to have temporal parts; David Lewis disagrees. I think the dispute is irrelevant for my purpose, so I took the necessary operator out.

Locality[84] will be that for any object x, and for any non-empty, non-overlapping sets of possible worlds W_1 and W_2 whose union is some trans-world extension of x, there are two objects x_1 and x_2, such that (i) x_1 and x have the same parts everywhere at W_1, (ii) x_2 and x have the same parts everywhere at W_2, and (iii) the location of x_1 = W_1, while the location of x_2 = W_2. Imagine an object that exits only at W_1 and W_2. If the Thesis of Modal Locality is true, this object is extended across possible worlds by having two world-bound modal parts at W_1 and W_2. Given Meg Wallace's definition of modal parts, the Thesis of Modal Locality entails that objects have modal parts.

Specifically, anyone in the *de re* modality debate needs to make sense of the following puzzle[85]: imagine that at W_1 Ruth is composed of a class of subatomic particles P_1, P_2, …P_n. And imagine that W_2 that is in every other way same as W_1 except that at W_2 part p1 has been removed, and the Ruth candidate is composed of only parts P_2, …P_n. W_3 differs from W_2 only with respect to part P_2; at W_3, the Ruth candidate is missing P_2 and is only composed of parts P_3, ..., P_n. And so on. We can imagine a continuous series of such worlds, each one differing only slightly from the preceding one, and only with respect to the parts composing the candidates that might represent Ruth at W_n. Clearly, at W_n

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[84] I have no idea what Sider might have meant by temporal locality here. I coined the term modal locality only to parallel Sider's terminology.

[85] This example follows Wallace (2014 b), pp. 363, which is inspired by the sorites series mentioned in Chisholm (1967).

where the Ruth candidate is composed of just one particle P_n, that Ruth candidate no longer represents Ruth at W_n. Thus we have a pair of cases such that in one case, composition definitely occurs and in the other case, composition definitely not occur, and a series of continuous series connecting those two cases.

Just as whoever in the temporal persistence debate needs to give an account for how object gain and lose part over time, one might think that any modal realist needs to give an account for how a particular individuals can gain and lose parts and still be represented as *de re* possibility of herself at a distinct possible world.

One might think that neutral way to spell out such thoughts is to characterize objects gaining and losing parts at various times as a function *f*(*w*), which assigns to one or more possible world a corresponding non-empty class of objects as existing at those possible worlds. A *minimum* trans-world-fusion is a trans-world entity that exists only at worlds in the function's domain. Thus, x is a trans-world fusion of a function *f* if, and only if, for every world, *w*, in *f*'s domain, *x* is a fusion-in-*w* of *f* (*w*). *x* is a minimal fusion of an assignment *f* if, and only if, (i) *x* is a trans-world-fusion and (ii) *x* exists only in those worlds in the domain of *f.*[86] For example, Ruth's minimal trans-world-fusion is a function

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[86] Wallace (2014), pp. 361

that assigns to each possible world at which Ruth exists a corresponding class of subatomic particles that are part of Ruth at that world.

An analogous argument from vagueness for the conclusion that minimal trans-world-fusion always occur will run as follows:

> **R1**: If not every assignment has a minimal trans-world-fusion, then there must be a pair of cases connected by a continuous series such that in one minimal trans-world-fusion occurs, but in the other, minimal trans-world-fusion does not occur.
>
> **R2**: In no continuous series is there an abrupt cutoff in whether minimal trans-world-fusion occurs.
>
> **R3**: In any putative case of minimal trans-world-fusion, either minimal diachronic-fusion definitely occurs, or minimal trans-world-fusion definitely does not occur, but not both.
>
> **Conclusion-T**: Minimal trans-world-fusion always occurs.

R3 + R1 entails that if not every assignment has a minimal trans-world-fusion, there must be a sharp cut-off in the continuous series as to whether minimal trans-world-fusion occurs. R2 negates the consequent of this sub-conclusion. Thus, by *modus tollens*, one is compelled to conclude that every assignment has a minimal diachronic-fusion, i.e., Minimal trans-world-fusion always occurs.

The reasons to support the truth of those premises are exactly the same as the reasons to support the truth of P1, P2, and P3. If one agrees with the truth of R1, R2 and R3, one is compelled to conclude that every assignment has a minimal trans-world-fusion.

Conclusion-T entails the Thesis of modal Locality, i.e., for any object *x*, and for any non-empty, non-overlapping sets of possible worlds W_1 and W_2 whose union is some trans-world extension of x, there are two objects x_1 and x_2, such that (i) x_1 and x have the same parts everywhere at W_1, (ii) x_2 and x have the same parts everywhere at W_2, and (iii) the location of $x_1 = W_1$, while the location of $x_2 = W_2$. Conclusion-T tells us that some object x1 is a minimal trans-world-fusion of an assignment *f* with domain W1, which assigns some class of objects that compose x at W1 to the domain. The spread of x1 would be W1 since x1 exists only at possible worlds in *f*'s domain; similarly for x2. Thus, the argument from Vagueness will show that the Thesis of Modal Locality is true, which entails that objects have modal parts.

4. My Analysis

To begin with, I do not think the argument for unrestricted minimal Diachronic-fusion and unrestricted minimal trans-world fusion are as strong as the argument for unrestricted composition. Specifically, I think the reasons for P1 are much stronger than the reasons for Q1 and R1. Although it is not very

plausible to insist that composition never occurs, I think it is not a radical position to take to insist that diachronic fusion and trans-world fusion never happens.

Specifically, I think endurantism does not need diachronic fusion to claim that one and the same object can gain and lose parts over time. For example, the endurantist may simply appeal to ersatz temporal parts and pair up the object x and time t by constructing ordered sets $<x, t_1>$, $<x, t_2>$, $<x, t_3>$[87]… That is, rather than defining the composite object as a function that assigns to each time it exists a mereological fusion of a class of objects, her function may assign to each time an abstract, set theoretical object $<\{O\}, t>$. In that case, the endurantists are not compelled to accept unrestricted diachronic composition, for the assignment they use no longer concerns dichromic-fusion.

The solution for identity across possible worlds is even more obvious in the modal context. One does not need a function $f(w)$ that assigns to one or more possible world a corresponding non-empty class of objects as existing at those possible worlds, since one can simply choose to be a counterpart theorist and use inconstant counterpart relation to represent particular individuals at different possible worlds. Thus, the argument from vagueness does not compel a modal realist to accept trans-world fusion theory.

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[87] Such an option is discussed by Sider (1997), Haslanger& Kurtz (eds.) (2006), pp 61. For a more detailed discussion, see Perry (1975).

Secondly, if anything, Sider's argument from vagueness for temporal parts is an objection to endurantism rather than a direct argument for perdurantism. However, perdurantism and endurantism are not the exhaustive answer to the question of how objects persist over time. One might also consider the temporal analog of counterpart theory, i.e., exdurantism[88]. Exdurantism is the view which claims that, counter to our commonsensical intuitions, objects do not persist over time; all there are instantaneous object stages that exist at various times.

I think exdurantism and perdurantism have little disagreement in metaphysics. If an exdurantist accepts unrestricted composition, she will agree with a perdurantist that there is a composite object, Ruth Bader Ginsburg, that has and only has various instantaneous temporal parts of Ruth as parts, although that composite entity is no more ontologically privileged than composite objects composed of random objects such as my nose and Eiffel tower, Davey and a water molecule. Thus, the disagreement between exdurantism and perdurantism is really just whether the utterance of the name 'Ruth Bader Ginsburg' *refers*[89] to the instantaneous object or a diachronic composite object.

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[88] The terminology here follows Haslanger& Kurtz (eds.) (2006). pp. 3.

[89] For more, see Weatherson (2013)

Similarly, I think the disagreement between counterpart theory and trans-world identity theory is a disagreement about reference. If a counterpart theorist also endorses unrestricted composition, the only disagreement between her and a trans-world fusion theorist is the following: while a counterpart theorist thinks Ruth Bader Ginsburg is a world-bound individual, a trans-world fusion theorist thinks Ruth Bader Ginsburg is a trans-world object, composed of world-bound modal parts. If that is the case, there is no genuine metaphysical disagreement between a counterpart theorist and a trans-world fusion theorist.

Thirdly, if a trans-world fusion theorists accept unrestricted composition, then she will end up providing a trivial truth condition for *de re* modality. For a trans-world fusion theorist, Ruth fulfills the modal formula 'x could be a philosopher' if and only if our Ruth at the actual world is a modal part of a trans-world individual, which has another modal part who fulfills the formula 'x is a philosopher' at another possible world. But notice that if a trans-world fusion theorist accepts unrestricted trans-world composition, she must also accept that Ruth composes a trans-world composite object with any other object(s) in the realm of possibilia, and thus trivially satisfy every single *de re* modal formula. I think this should be unacceptable for any modal realist. Thus, by *reductio*, a modal realist should not be a trans-world fusion theorist.

VII. CONCLUSION

In my thesis, I argued that assuming modal realism is true, counterpart theory is a much better theory of *de re* modality than its alternatives, i.e., trans-world identity theory and trans-world fusion theory.

To support my argument, I presented a version of counterpart theory based on Lewisian modal metaphysics, provided four independent utility arguments for counterpart theory, and responded to Humphrey's objection to counterpart theory. I then presented Lewis's version of trans-world identity theory based on Lewisian modal metaphysics and his objections against such a view. I explained two alternative versions of trans-world identity theory based on alternative modal metaphysics and then argued against such attempts. In the end, I presented an argument from vagueness for trans-world fusion theory and argued that it is inferior to counterpart theory.

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