

Island Universe Problems

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Abstract: We share a common space-time with everything that we interact with in our world. An island universe would be a spatiotemporally interrelated segment of reality that is isolated from the rest of reality; it would be part of our world but something that we cannot interact with. Spatiotemporal interrelatedness plays an important role in a number of metaphysical theories concerning possible worlds. Here I discuss four problems surrounding the possibility of island universes. I contend the most troubling of these problems gives us good reason to think that island universes are possible; metaphysical theories that cannot make sense of the possibility of island universes end up having bizarre implications about alternate possible worlds.

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1. Introduction

You exist and you share a common space time with everything that you interact with, have interacted with, or could possibly ever interact with in the future. You are spatiotemporally related to all of those things, and you and them are all parts, or inhabitants, of the actual world. Imagine a part of the actual world that was not spatiotemporally related to you - a segment of existence that you cannot interact with. You cannot get there from here. If such a segment actually existed then the actual world would be comprised of at least two *island universes*, where an island universe is a unified space time region that is isolated from other coexisting unified space time regions. The inhabitants of an island universe would be spatiotemporally connected to each other such that they can interact, but inhabitants of one island universe cannot interact with the inhabitants of any other island universes.

Spatiotemporal interrelatedness plays an important role in a number of possible world metaphysical theories. The possibility of island universes creates a number of problems for these theories. In this paper I discuss four distinct problems created by the plausibility of island universes, what I call *island universe problems*, and I offer a potential solution to each.

Metaphysical theories about possible worlds differ greatly, but several prominent metaphysical theories contend that spatiotemporal interrelatedness is necessary for coexistence within a world. The most influential, and notable, of these theories is David Lewis' theory of *concrete modal realism*, which asserts that (a) possible worlds exist, (b) possible worlds are the same kind of thing as the actual world, and (c) possible worlds are spatiotemporally (and causally) isolated from one another.¹ For concrete modal realists like

¹ Lewis (1973; 1986). Divers (2002) offers updated versions of concrete modal realism. Not all

David Lewis talk about modality is talk about possible worlds. The truth of any given modal claim depends upon the contents of the set of all possible worlds. For example, to say "Blue swans are possible" just is to say "There exists at least one possible world, x , such that at x , blue swans exist."

According to the concrete modal realist what it is to be a world is to be a unified space time region, spatiotemporally isolated from each other world, and thus necessarily island universes cannot coexist within a world.

Another prominent possible worlds metaphysical theory is Gideon Rosen's *modal fictionalism*, according to which truth about modal claims are determined by a special fiction, pw , where what the concrete modal realist believes is true is true in that fictional world.² The fictional world of pw is comprised of (a fictional version of) the set of possible worlds that the concrete modal realist believes to exist. According to the modal fictionalist, to say "Blue swans are possible" just is to say "According to the fiction pw there exists a possible world, x , such that at x , blue swans exist."

Still other theories hold that possible worlds actually exist, but that they are somehow different types of things than the actual world, consisting of abstract objects, linguistic constructs, or the like. These theories are generally called *ersatz modal realism* to distinguish them from Lewis's concrete modal realism. For some *ersatz* modal realists

concrete modal realists are committed to all of these contentions; Yablo (2000) advocates a theory he calls *inclusionism*, according to which some worlds may be parts of other worlds. For an analysis of this position, see Parsons (2007).

² Rosen (1990; 1995). For other proponents of modal fictionalism, see Menzies and Pettit (1994), and Woodward (2008). For a solid analysis of modal fictionalism, see Divers (1999).

possible worlds exist as part of the actual world, for others possible worlds are not part of the actual world.³ To say "Blue Swans are possible" for such theories is to say that there exists an abstract object, linguistic construct, or the like x such that according to x blue swans populate x in one way or another. For most *ersatz* modal realist theories, there is no overlap between these abstract entities, linguistic constructs, etc. such that the contents of one world could figuratively interact with those of another. These worlds are causally isolated from one another, in some sense. *Ersatz* modal realists who believe possible worlds are members of the actual world contend that they are somehow abstractly, linguistically, or the like isolated.

The concept of island universes creates a number of problems for each of the theories about possible worlds discussed above. Here I will present the problems as problems for concrete modal realism (from now on "modal realism"), but these problems would just as easily be applicable to modal fictionalism or *ersatz* modal realist theories that take spatiotemporal interrelatedness to play a vital role in distinguishing worlds. In each of the four sections below I discuss a different universe problem - what I call the interpretation problem, the justification problem, the regress problem, and the implications problem. I contend that the last of these problems is the most severe, and offer three possible solutions to this problem.

³ For the former, see Plantinga (1974; 1976) and Stalnaker (1976). For the latter, see Bricker (2001).

2. The interpretation problem

The first island universe problem arises because there is an apparent contradiction between the following two claims:

(1) Island universes are possible.

(2) Something is a possible world if and only if its parts are spatiotemporally interconnected and every possible world is spatiotemporally isolated from each and every other possible world.

For the modal realist, (1) means:

(1^{MR}) There exists a world x , where at x there are two or more spatiotemporally isolated regions.

For the modal realist, (1^{MR}) is false by definition. What it is to be a world is to be a unified spacetime, but a world with two island universes would be comprised of two disconnected spacetimes. If possible worlds talk is talk about actually existing concrete possible worlds of this kind, (1) is not only false, it's incoherent.

The interpretation problem is that the modal realists seem to take a perfectly coherent sentence (1) and interpret it as an incoherent sentence (1^{MR}); the modal realist's interpretation makes a perfectly understandable sentence out to be gibberish. Even if we're committed to the belief that coexisting island universes are impossible, there is no mistake about what (1) is proposing, thus if the modal realist's interpretation of (1) makes it out to be

incoherent, we have good reason to believe the modal realist fails to properly interpret modal terminology. The realist owes us an explanation as to why we think we understand (1) when the realist's interpretation of (1), (1^{MR}), is incoherent.

It is uncontroversially true that the modal realist translation (1^{MR}) fails to capture what we think we mean by (1), but perhaps this is because (1) is strictly speaking incoherent, but is meant to convey a different, coherent claim. For example, the following sentence is strictly speaking false but is meant to convey something other than what it literally conveys:

(3) At first my car didn't want to start this morning, but it changed its mind.

When someone utters (3), it would be inappropriate to interpret them as meaning to convey that their car has a mind and desires. Instead, we understand the speaker probably means something like this:

(3^A) At first I had trouble starting my car this morning, but then it started.

If we interpret (3) literally, it is false, but figuratively, it may be true. The modal realist might interpret (1) figuratively as follows:

(1^A) It is possible that there are two or more spatiotemporally isolated regions.

Of course the modal realist is committed to the existence of a large number of concretely existing spatiotemporally isolated regions. Modal realism just is the theory that there are multiple concrete possible worlds that are spatiotemporally isolated from one another. Each possible world just is an island universe in a sense.

No doubt the concrete modal realist is not happy with (1^A), modal terminology ("It is possible") on their theory applies within a single possible world and thus (1^A) is still, strictly speaking, false. However the modal realist believes that *more things exist* than the layman, for them all possible worlds are concrete, each its own actual world. If the layman is to be understood as using "It is possible" to discuss the contents of the set of all possible worlds, (1^A) is true. There are actually island universes in the set of all possible worlds because all possible worlds are spatiotemporally isolated regions for the modal realist, and there are many such worlds.

The solution to this problem turns on the idea that the speaker of (1) isn't taking the care to use modal language carefully. However a skeptical modal realist might assert (1) though mean (1^{MR}) with the intent to challenge the realist's conception of a world as an isolated spacetime region. If modal realism is to be a satisfactory theory of modality, it cannot allow for the interaction between isolated worlds, but it need not require the interaction between all parts of a world. Similarly it is plausible that a scientist wants to discuss what exists without the ontological and metaphysical burden foisted upon it by modal realism; for example one might want to investigate the notion of island universes without the metaphysical assumption that all island universes are worlds that belong to a set of concrete worlds that exhaust all possible worlds.

The assertion that multiple isolated spacetime regions might populate a single possible world, rather than the set of possible worlds, doesn't seem to have any immediate conceptual advantages apart from capturing the uncertainty of the layman intuition that island universes merely might exist. Regardless of whether island universes can coexist within a single possible world, the modal realist holds that they inhabit the set of all possible

worlds - and this might be enough to be consistent with our commonsense intuitions about possible worlds.

Below I contend that the implications problem gives us good reason to believe that the modal realist ought to be committed to the possibility that island universes can coexist within a single possible world. However, apart from those reasons, the intuition that multiple isolated spacetime regions coexist within a single possible world, in addition to the coexistence of spacetime regions in the set of all possible worlds, lacks much of a conceptual payout. In either case, spacetime regions are causally isolated from each other and cannot interact - whether they can coexist or not is largely irrelevant.

3. The justification problem

For the modal realist, something is a possible world if and only if all of its parts are spatiotemporally interrelated. However, a problem arises when the skeptical modal realist above asks why we ought to prefer spatiotemporal interrelations as the substrate that holds possible worlds together rather than something else that would be consistent with the coexistence of spatiotemporally isolated island universes within a single possible world.

Consider modal realism^S, which is the claim that something is a possible world if and only if all of its parts exist within substrate *s*, where causal relationships can occur within isolated spacetime regions within substrate *s*, but not between spacetime regions in *s*. Like modal realism, all possible worlds in modal realism^S are causally isolated from one another - the difference is that some worlds can have causally isolated but coexisting spacetime regions; island universes are possible according to modal realism^S. This is to say there exists at least one world, *x*, where, at *x*, there exist multiple isolated spacetime regions. Much as

possible worlds are causally secluded, so too are island universes within a possible world. To exist within substrate *s* is to be interrelated in some way other than spatiotemporally. There are two substantial differences between modal realism and modal realism^S - first is the size of their respective set of possible worlds. The sheer number of possible worlds that the modal realist believes there are is infamously daunting, but the list of concrete possible worlds that the modal realist^S is committed to is far more daunting.

David Lewis (1986) introduced the principle of recombination, in part, to help generate a list of possible worlds. According to the principle anything can coexist with anything else as long as they occupy different spatiotemporal positions (Lewis, 1986, pp. 87-88). For us, at this world, the principle very likely fails to generate a list of all possible worlds, and might conceivably generate a few impossible worlds by mistake; however it is a useful tool for illustrating the sheer number of possible worlds that exist in the set of all possible worlds for the realist. It also offers a clear picture of the kind of worlds the realist postulates.

A similar principle can be employed to understand the world count and contents for modal realism^S. A sub-principle of that principle would include the principle of recombination of island universes, according to which any island universe can coexist with any other island universe, or any number of island universes of the same kind or of different kinds, so long as they are located at different positions along substrate *s*.

According to the principle of recombination, the modal realist can envision a world where there exists only a single atom, then a world where there exists two atoms, then a world where there exists three atoms, and so forth and so on. For each of these possible worlds, the modal realist^S would be committed to the existence of that world, coupled with a world where that world and an identical island universe coexists. And then a world where there are

three identical coexisting universes, and so forth and so on. The set of possible worlds the modal realist^S is committed to dwarfs the already staggering set of possible worlds the modal realist is committed to.

The second difference between modal realism and modal realism^S is the ratio of their explanatory power to their ontological commitment. For the modal realist, every possible set of spatiotemporal relationships is actualized at one and only one possible world in the set of possible worlds. However, for the modal realist^S, every possible set of spatiotemporal relationships is actualized in multiple possible worlds, sometimes multiple times within the same possible world. There might even be a world p , such that at p there exists a set of island universes identical to the set of possible worlds the modal realist is committed to.

Modal realism and modal realism^S have largely the same explanatory value, but they have a substantial difference in terms of their ontological commitments. Although modal realism has a burdensome ontology, modal realism^S has an even more burdensome ontology with apparently nothing to show for it.

This additional ontological commitment could be justified in terms of the explanatory value gained by postulating the existence of every possible relationship between distinct spacetime regions over substrate s - but to do so, the modal realist^S needs to offer some account of what s is, and what kind of relationships could exist over it. Island universes are spatiotemporally isolated from one another, such that the contents of one cannot have an effect on the contents of another. Thus, in principle, even if there existed a substrate s , and there were different relationships possible in s , we, as beings apparently only capable of causally interrelated relationships, might in principle have no conception of what they are.

Anything that might appear to count as explanatory value for modal realism^S then wouldn't count as explanatory value to us.

One way to illustrate the explanatory value of modal realism is as prescriptive, rather than descriptive. For the modal realist, "It's possible for you to pass the test." is to say that "There exists at least one possible world where you pass the test.", and there is a chance that you exist at one such possible world. To say "It's impossible for you to pass the class." is to say that "There exists no possible world where you pass the class." If this is the case and your goal was to pass the class... your goal is unachievable and you should probably plan accordingly. Modal realism^S can offer no additional prescriptive advice to beings like us beyond that of modal realism. According to modal realism^S, there may exist a world such that a counterpart of you that exists in spacetime region *a* passes the test, and a counterpart of you that exists in spacetime region *b* fails the test, but this is trivial at best. Because spatiotemporally isolated regions are causally isolated, the existence of a possible world that includes *a* and *b* seems to offer no explanatory value that can't be otherwise offered by a pair of modal realist possible world *A* and *B*, where *A* contains *a* and *B* contains *b*.

If there were some additional explanatory value to postulating substrate *s*, then modal realism^S, populated with possible worlds at which multiple island universes coexist, would be a preferable metaphysical theory to modal realism... assuming the explanatory value was worth the additional ontological commitment. In absence of such value, or even a plausible conception of what substrate *s* could be, the modal realist might justify their account of possible worlds as spatiotemporally isolated as preferable to substrate *s*-isolated either because (a) we are committed to the existence of spatiotemporal relationships and not

substrate s relationships, and/or (b) modal realism is less ontologically burdensome than modal realism^s.

It's not at all clear that a diligent skeptical modal realist would be inclined to find either of these justifications satisfactory. First, just because we're committed to the existence of spatiotemporal relationships doesn't mean that they need to play a foundational role in a metaphysics of possible worlds. Just because we don't know what substrate s could be doesn't mean that it might not be what properly ties together worlds.

Second, while it is true that modal realism^s is more ontologically burdensome than modal realism, modal realism quite infamously already demands an incredulous ontological commitment. Suppose you were a gambler and found yourself owing your bookie a hundred million dollars with no plausible way to pay, and that this bookie offers you another bet saying "double or nothing." It strikes me that you owing the bookie two hundred million dollars isn't very much more absurd than owing him one hundred million, and the possible payoff of not owing him anything is substantial. Refusing such a bet would be *prima facie* irrational.

Much as there isn't much difference in owing your bookie two hundred million rather than one hundred million, even with the exponential ontological commitment required by the principle of recombination of island universes wouldn't be too over the top if you can get some benefit from it. Any theoretical, as of yet unspecified, explanatory value of positing substrate s as the bowl that contains the whole of possible universes, rather than the substrate of spacetime, need not be very valuable at all to justify even an exponential explosion of ontology. Even the hint of additional explanatory value may be sufficient to make a commitment to modal realism^s more justified than a commitment to modal realism.

4. The regress problem

Given the already jaw-dropping ontological commitment that comes with modal realism, the idea that substrate s might offer some additional, hereto undiscovered explanatory value at the cost of postulating the existence of, admittedly, quite a few additional possible worlds might not be unreasonable.

The problem with this approach is that once you accept the possibility of one kind of island universes within a single world it's hard to stop. According to the modal realist^S, something is a possible world if and only if all of its parts exist within substrate s ; all parts of a possible world are s -related. Island universes are spatiotemporally isolated, but are still themselves s -related. But for any modal realism^Y, where all parts are y -related, one construct a modal realism variant - modal realism^{Y+1} consistent with the existence of island universes^Y at a single world so long as those island universes^Y are $y+1$ -related. For any substrate we can construct a possible world ontology that posits a more primary container substrate and ask why we should opt for the lesser substrate over the greater substrate.

It is tempting to see the regress problem as response to the justification problem - if a theory leads to an infinite regress, it is reason to reject it. Instead, I think the regress problem is that the regress is *justified* for a diligent modal realist. Above I argued we would be justified in preferring modal realism^S to modal realism if with it came some additional explanatory value. Modal realism is a theory about what exists, not a theory about what we are justified in believing exists. The modal realist is already committed to the existence of spatiotemporally isolated regions at least as members of the set of all possible worlds. Even if we are unable to perceive s -relationships at the actual world, our world is but one of

many concrete possible worlds and it is statistically unlikely that we live in the world where all possible objects and relationships are instantiated, let alone readily apparent to beings like us. As such we have good reason to suspect that there may be any number of fundamentally alien relationships and ways of being interrelated that are, in principle, beyond our comprehension. We are justified in believing that there are *s*-relationships and any number of other relationships that we simply do not know about. To pick out any one of these relationships and define worlds in terms of that relationship would be inherently arbitrary. Instead, it seems, the diligent modal realist concerned with completeness, is justified in either a commitment to (a) an infinite regress of substrates or (b) some unspecified prime substrate *z* that is capable of housing an unspecified number of substrate *z*-1 island universes.⁴

5. The implication problem

Consider World 1, a possible world which is represented below pictorially.

⁴ In Bricker (1996), he distinguishes his modal realism from Lewis'; where Lewis contended that possible worlds were spatiotemporally isolated, Bricker (1996, p. 226) contended that possible worlds were "absolutely isolated". Of course Lewis, too, was committed to absolute isolation, the difference is that Lewis contended absolute isolation was spatiotemporal isolation. According to the justification and regress problems, we have no reason to think that spatiotemporal interrelatedness is the most foundational kind of relationship. By stipulation, being *z*-related is the most foundational kind of relationship, and it might turn out that substrate *z* just is spatiotemporal interrelatedness. Regardless, to be *z*-isolated is to be absolutely isolated in the sense Bricker is worried about.

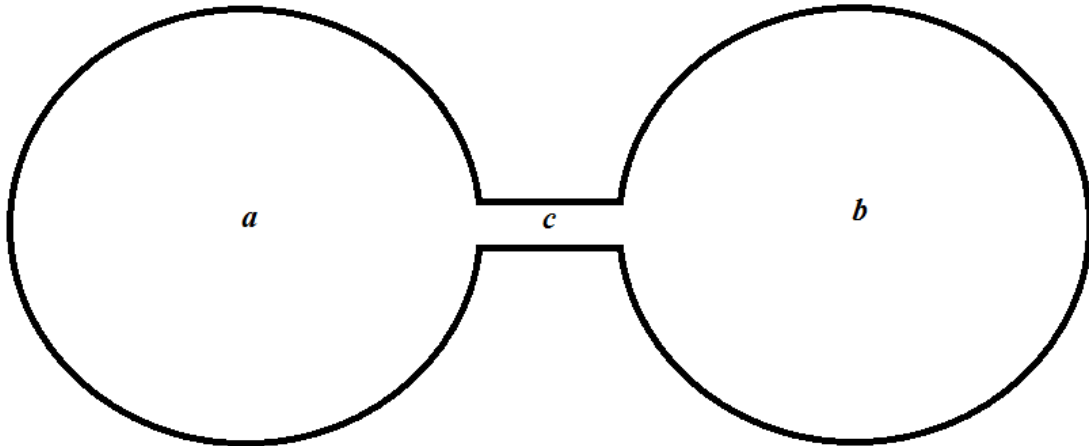


Figure 1: World 1 is comprised of three spatiotemporally related regions - regions *a*, *b*, and *c*.

World 1 is comprised of three spatiotemporally related regions - regions *a*, *b*, and *c*. Regions *a* and *b* are spatiotemporally connected by region *c*.

One of the benefits of modal realism is that there is a fact of the matter about modal claims that is determined by the existence of possible worlds. For example, we might wonder how the world would have been different if Adolf Hitler had never been born, and sure enough insofar as it is possible that Adolf Hitler could have never been born, there is at least possible world where Adolf Hitler was never born. Some things about that world are different, others are the same. There is a concrete fact about the matter, for example, of whether at a particular world in which Adolf Hitler was never born Germany started a second world war, of whether the United States developed nuclear weapons, so forth and so on.

The principle of recombination allows for the subtraction of objects from possible worlds to generate our conception of how alternate possible worlds are. Just as we are allowed to

ask what the world would be like without Hitler, so too are we allowed to ask what World 1 would look like without region *c*. More specifically, we can ask what the closest possible world to World 1 would look like without region *c*. It strikes me that the answer would be 'World 2', which is represented below pictorially.

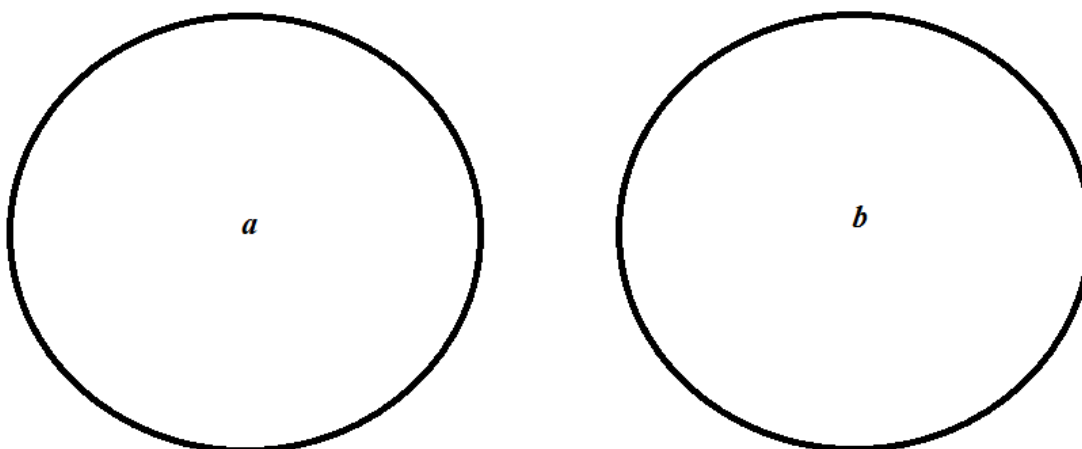


Figure 2: World 2 is comprised of two regions – *a* and *b* – which are not connected spatiotemporally. World 2 is an impossible world, by definition.

Figure 2 offers the notion of a world single where *a* and *b* still exist, but where region *c* doesn't exist. In World 1, *a* and *b* are spatiotemporally connected by *c*, such that the contents of region *a* are spatiotemporally connected to those of region *b*. However, in World 2, because *c* doesn't exist, the contents of *a* are spatiotemporally isolated from the contents of *b* and vice versa. The problem here is that *a* and *b* are island universes, and island universes cannot coexist in a single possible world according to the realist. World 2 is an impossible world, by definition. The problem is that by removing *c*, it seems as if we have cut the world in two. If we subtract region *c* from World 1, rather than a

single possible world, it seems as if we get two different possible worlds, call them World 3 and World 4. World 3 and World 4 are represented below pictorially.

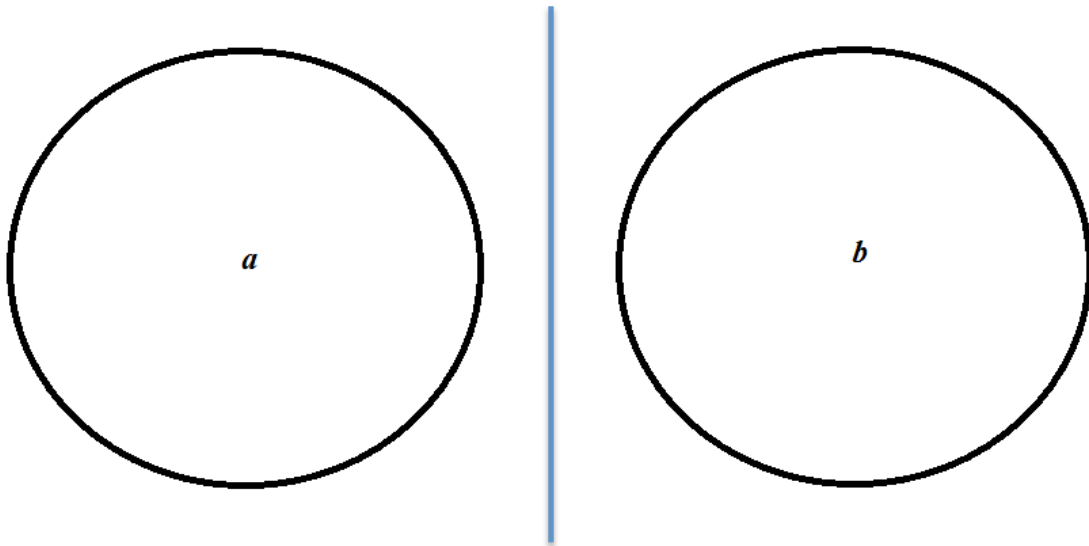


Figure 3: The line down the middle represents the fact that spatiotemporal regions *a* and *b* belong to different worlds – World 3 (to the left of the line) and World 4 (to the right of the line), respectively.

It is odd that this particular exercise of the principle of recombination yields two distinct possible worlds, but what is more odd are the implications of this split. Suppose at World 1, spatiotemporal region *a* was populated by 500 planets, spatiotemporal region *b* was populated by 500 planets, and spatiotemporal region *c* was populated by 50 planets, such that at World 1 there were 1,050 planets. Now suppose we were to ask the following question: How many planets would exist at the closest possible world to World 1 that didn't have spatiotemporal region *c*? I suspect we are inclined to say that only 1,000 planets exist at such a world, however according to modal realism the closest possible world would have 500 planets. (I suspect we'd be inclined to say that either World 3 or World 4 are the

closest to World 1 without *c*, for the modal realist. Which of these worlds is closer, ultimately, depends upon what else regions *a* and *b* contain.)

Another problem is that there doesn't seem to be too much difference between asking what World 1 would look like without region *c*, and what World 1 would look like without region *c* and one of its more populated regions. In both cases, the closest possible world would be either World 3 or World 4.

Problematic implications like these give us good reason to think that island universes can coexist at within a world. If World 2 were possible, it would be populated by 1,000 planets - exactly as one would expect the closest world to World 1 that lacked region *c* to be populated. It's important to note that even if World 2 were a possible world, its objects would have a significant amount of different relationships - notably in World 1, all of the planets in *a* are spatiotemporally related to all of the planets in *b*, but in World 2 this is not the case. However such a radical change in spatiotemporal relationships is to be expected when removing spatiotemporal bridging sections like *c*.

Consider two landmasses separated by an ocean so deep that it never freezes. Suppose a single bridge connects these two landmasses, and that people can walk from one landmass to the other by this bridge. Now suppose this bridge didn't exist, said people would be unable to walk from one landmass to the other. World 2 seems to fit with our notion of what World 1 would be like if we removed the bridging region *c*.

Our commitment to the plausibility of World 2 requires that we reject the modal realist's claim that worlds are necessarily spatiotemporally interrelated. Here I will present three

possible solutions to this problem, listed in order of ontological complexity from most burdensome to least burdensome.

First, the realist can reject the notion that a world is a spatiotemporally interrelated region. However we cannot rectify the theory simply by postulating a new substrate *s* as we would have the same intuitions regarding *s*-isolated regions as we do about spatiotemporally isolated regions, leading to either an infinite regress or a substrate *z* that ends the regress, where substrate *z* appears arbitrary from our perspective.

Second, rather than positing some alternate substrate to spacetime, one might posit the existence of possible World 2 in terms of its relationships to counterfactual worlds. A possible world would be any world whose parts are spatiotemporally interrelated or any grouping of spatiotemporally isolated regions that are jointly sufficiently close to a world whose parts are spatiotemporally connected. The question of closeness in possible world talk is a rather thorny one, but it is uncontroversial that World 2 is closer to World 1 than either World 3 or World 4, and by a wide margin.

Thirdly, the modal realist might contend that the spatiotemporally isolated parts of World 2 have the same relationships to each other as World 3 has to World 4. To ask how many planets would exist at 1 without region *c* just is to ask how many planets exist in both World 3 and World 4. The modal realist groups parts together if and only if they are spatiotemporally interrelated. To ask what World 1 would look like without spatiotemporal region *c* just is to ask what *a* and *b* would look like without a spacetime bridge between them, and this is fully explicable in terms of World 3 and World 4 for the realist. If we can explain counterfactuals about World 1 by appealing to the grouping of Worlds 3 and 4, then

World 2 is superfluous - it offers no additional explanatory value than Worlds 3 and 4 offer on their own.

6. Conclusions

It is worth noting, I think, that we probably don't have very many intuitions about island universes at all. In fact, one of the more salient objections to modal realism is that because possible worlds are spatiotemporally isolated, in principle our modal knowledge cannot come from the existence of alternate possible worlds. Similarly, any intuitions we have about island universes coexisting at a single possible world would be unfounded, but without even the theoretical explanatory value the modal realist believes their theory offers. Despite this, much of this paper has been devoted to explaining how an intuition that island universes might exist is to be understood by the modal realist. A better question might be: how do we explain the intuition that island universes might not exist, given that the modal realist believes in the existence of multiple possible worlds that are themselves island universes in a sense, each spatiotemporally isolated from one another? But this question strikes me as one of many that can be subsumed under the famous objection to modal realism that is the incredulous stare the modal realist is confronted with when articulating their theory, and as such should be answered in the same way the modal realist addresses that response.

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