

Center Indifference and Skepticism

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Abstract

Many philosophers have been attracted to a restricted version of the principle of indifference in the case of self-locating belief. Roughly speaking, this principle states that, within any given possible world, one should be indifferent between different hypotheses concerning *who one is* within that possible world, so long as those hypotheses are compatible with one's evidence. My first goal is to defend a more precise version of this principle. After responding to several existing criticisms of such a principle, I argue that existing formulations of the principle are crucially ambiguous, and I go on to defend a particular disambiguation of the principle. According to the disambiguation I defend, how we should apply this restricted principle of indifference sensitively depends on our background metaphysical beliefs. My second goal is to apply this disambiguated principle to classical skeptical problems in epistemology. In particular, I argue that Eternalism threatens to lead us to external world skepticism, and Modal Realism threatens to lead us to inductive skepticism.

1. Introduction

When a range of different hypotheses are compatible with your evidence, how should you distribute your confidence between them? Life would be very simple if we just had to follow a naive version of the principle of indifference:

Naive Indifference: If $H_1, H_2, \dots, H_n$ are mutually exclusive and jointly exhaustive epistemic possibilities that are compatible with your evidence, then you are rationally required to assign a credence of $1/n$ to each of them.

Unfortunately, **Naive Indifference** is inconsistent. Suppose I am about to roll a die. According to **Naive Indifference**, I should assign a credence of $1/2$ that I will roll a '1', since either I will roll a '1' or I won't. At the same time, I should also assign a credence of $1/6$ that I will roll a '1', since there are six possible numbers that I could roll.

Even if we set aside these contradictions, a major flaw of **Naive Indifference** is that it assumes that we can never have reasons to favor one hypothesis over another if both hypotheses are compatible with our evidence. The clearest counterexamples to this assumption involve objectively chancy processes. For example, since there is an objective chance of $1/6$ that I will roll a ‘1’ with a fair die, I shouldn’t be indifferent between my rolling a ‘1’ and my not rolling a ‘1’.¹ Other philosophers have argued that we should favor hypotheses that conform to various theoretical virtues over ones that don’t. For example, perhaps we should favor simpler theories over more complex theories, or perhaps we should favor more explanatory theories over less explanatory ones, etc.²

In spite of these problems with **Naive Indifference**, there are still *some* contexts where it is very natural to apply the principle. Consider the following case:

Two Rooms: There are two indistinguishable rooms: R_1 and R_2 . Each room contains a single agent, and both agents are duplicates of each other at any given time. Given that they both know that this is happening, how confident should any one of them be that they are in room R_1 ?

The obvious answer is “ $1/2$ ”. While it may be perfectly consistent for them to assign a credence of (say) 0.281 that they are in room R_1 , it seems like the only *non-arbitrary* answer is $1/2$.

The first goal of this paper is to defend a restricted version of **Naive Indifference**, which generalizes the intuition that one should assign a credence of $1/2$ in Two Rooms. After introducing and defending a principle inspired by Elga (2004) that is meant to accomplish this purpose (section 2), I argue that such a principle is ambiguous (section 3), and I defend a particular disambiguation (sections 4 and 5). My second goal will be to argue that resolving this ambiguity has far reaching consequences for a number of independently interesting epistemological questions, such as the epistemology of metaphysics (section 6), external world skepticism (section 7), and inductive skepticism (section 8).

2. Center Indifference

We begin with the familiar notion of an (epistemically) possible world, which is roughly a maximal way that reality might be that is compatible with your evidence.³ Following Lewis (1979), we will

¹ There is disagreement about whether ordinary cases like this are cases of “objective chance”, or whether the only objective chances are to be found in indeterministic quantum theories (e.g. see Schaffer (2007), Glynn (2010), and Emery (2017). Either way, the example could be modified to be one of indeterministic quantum mechanics.

² For different perspectives on the uses of simplicity in science and philosophy, see Huemer (2009b), Sober (2015), and Bradley (2018). For the case of explanation, see Hedden (2015) and Lange (forthcoming).

³ I only say “roughly” because we will be exploring exactly what is meant by a possible world in future sections.

also need the notion of a *centered* possible world, which is a possible world together with a designated individual and time.⁴ Lastly, let us say that two centered worlds are *similar* just in case they are associated with the same possible world.

We can now formulate the following principle, which is meant to generalize our verdict in Two Rooms:

Center Indifference: For any two similar centered worlds c_1 and c_2 , if both c_1 and c_2 are compatible with your evidence, then it is rationally required to set $\text{Cr}(c_1 \mid c_1 \text{ or } c_2) = 1/2$.⁵

The main intuition behind **Center Indifference** is supposed to be the same one that motivated the “1/2” verdict in Two Rooms. Conditional on c_1 or c_2 , you can know exactly which possible world you inhabit. The only ignorance you have left is about which of two locations you inhabit inside that world. In the case of Two Rooms, given that you inhabit either R_1 or R_2 , it seems like the only non-arbitrary option is to be indifferent between R_1 and R_2 . Similarly, given that you inhabit one of the locations described by c_1 or c_2 , it seems like the only non-arbitrary option is to be indifferent between c_1 and c_2 .

An important point in defense of **Center Indifference** is that it avoids both of the major criticisms faced by **Naive Indifference**. First, unlike **Naive Indifference**, it does not lead to any contradictions.⁶ **Naive Indifference** doesn’t specify a unique way one should partition the space of possibilities that one is indifferent over, but **Center Indifference** specifies that one should be indifferent between maximally specific similar centered worlds. Second, the usual reasons for why one might favor one possibility over another don’t seem to be present in **Center Indifference**. Given that c_1 and c_2 agree on all the non-indexical facts, it’s hard to see how either hypothesis can plausibly be regarded as more theoretically virtuous than the other, for example by being more simple or explanatory. Even if one could somehow make sense of the idea that one of the locations described by c_1 and c_2 is (say) “simpler” than the other, you already know that *someone* has to occupy each of the locations described by c_1 and c_2 . Call the individual that occupies the

⁴ Although Lewis’ distinction between possible worlds and centered worlds is popular, it has its detractors. For example, Lewis’ main motivation for introducing centered worlds was to accommodate the content of self-locating belief, but Stalnaker (2008) has argued that the content of self-locating beliefs can be accommodated by ordinary possible worlds propositions. For a critique of Stalnaker’s approach to self-locating belief, see Weber (2015). Even if Lewis’ overall framework is rejected, the kind of principles that I will go on to discuss should be able to be formulated in other frameworks as well.

⁵ This principle corresponds to Weatherson’s (2005) principle of “C-INDIFFERENCE”, which is a slight strengthening of Elga’s (2004) original principle. Weatherson also formulates a stronger principle to C-INDIFFERENCE, which he calls “P-INDIFFERENCE”, which allows the principle to be used in a much broader range of cases where it is unknown which possible world one is in. I will be focusing on C-INDIFFERENCE because the modifications that I will later be proposing to C-INDIFFERENCE straightforwardly generalize to Weatherson’s stronger P-INDIFFERENCE principle, and C-INDIFFERENCE is a more simple and intuitive principle to state.

⁶ Later in this section, I address a potential worry with applying **Center Indifference** in infinite situations.

perspective of the centered world that you *don't* occupy your “evidential twin”. Either you will occupy the simpler location or your evidential twin will. Why should the view that your evidential twin occupies the simpler location be an overall more complex theory than the view that you occupy the simpler location?

Another way to support **Center Indifference** is by noting that violations of **Center Indifference** require a strange kind of forced epistemic disagreement. Suppose you deviated from **Center Indifference** in some way, say by being more confident in c_1 . Then, so long as you are self-aware, it will be implied by your evidence that you are more confident in c_1 . This implies that your evidential twin will *also* think that they are more likely to be located in c_1 . We can dramatize this disagreement by imagining that being located at c_1 is tied up with something practically important: perhaps only the individual located at c_2 will soon be tortured. While you think that you are most likely safe, your evidential twin will think that you will most likely be tortured (since they will think that *they* are more likely to be safe)! Insofar as it is natural to think of you and your evidential twin as epistemic peers with the same evidence, this forced disagreement about who is about to be tortured can seem strange. In other contexts, some have argued that disagreements of this kind can never be rational.⁷ An interesting benefit of **Center Indifference** is that these kinds of forced epistemic disagreements never arise when the centers occupied by c_1 and c_2 contain rational agents. Both you and your evidential twin will agree that you are both equally likely to be tortured.

Before moving on, it is worth briefly addressing some important objections that Weatherson (2005) has raised to a related principle that Elga (2004) has defended. Elga (2004) formulates his own principle in terms of subjective indistinguishability: similar centered worlds that are centered on individuals undergoing indistinguishable subjective experiences should always be assigned the same credence. Weatherson criticizes Elga's principle on the grounds that it presupposes a controversial internalist conception of evidence.⁸ For example, according to Elga's principle, one should be indifferent between being a particular embodied human being and being a brain in a vat (BIV), so long as both the embodied being and the BIV occupy the same world and have indistinguishable experiences. However, on standard versions of externalism, it is part of your evidence that you have hands, so you shouldn't assign *any* credence to being a BIV.

My response to this objection is that the appeal to indistinguishable experiences was inessential to Elga's principle. **Center Indifference** is entirely neutral on the correct conception of evidence.

⁷ In particular, some have argued for the thesis of “Uniqueness” according to which any body of evidence rationalizes a unique doxastic attitude towards any proposition (e.g. White (2005a), Greco and Hedden (2016), Dogramaci and Horowitz (2016), and Horowitz (2019)). According to Uniqueness, if two agents share the very same evidence, then they cannot disagree over the likelihood of any proposition. The case here is related but somewhat different: it involves disagreement over *de se* matters rather than disagreement over an ordinary (uncentered) proposition.

⁸ For defenses of an externalist conception of evidence, see Williamson (2000) and Srinivasan (2015). For defenses of an internalist conception of evidence, see Fumerton (2009), Schoenfield (2015), Duncan (2018), and Smithies (2019).

For example, given an externalist conception of evidence, **Center Indifference** does *not* require you to assign any credence to being a BIV, since being a BIV is not compatible with your evidence.

A second criticism that Weatherson raises involves problems with infinity. Consider the following case:

Infinite Rooms: There are a countable infinity of indistinguishable rooms $R_1, R_2, \dots$, each of which is occupied by a single agent. All of the agents know exactly which possible world they are in, but they don't know which room they occupy, since they are all duplicates. How confident should any one of them be that they are in room R_1 ?

By **Center Indifference**, each agent is required to assign equal credence to being in any particular room. The only way to do this without violating the axiom of Finite Additivity is to assign a credence of 0 to being in any particular room. However, this violates the axiom of Countable Additivity.⁹ Weatherson recommends we should perform a *modus tollens*: since Countable Additivity should be upheld, **Center Indifference** should be rejected. It strikes me that the better thing to do is to perform the *modus ponens*, and conclude that there are violations of Countable Additivity. After all, there are already independent reasons to be skeptical of Countable Additivity, and it's unclear what other credence one should assign in Infinite Rooms.¹⁰ However, rather than making the case for **Center Indifference** presuppose the falsity of Countable Additivity, one can also simply restrict **Center Indifference** to only apply in finitary situations:

Finite Center Indifference: For any possible world w , if there are only finitely many similar centered worlds $c_1, c_2, \dots, c_n$ associated with w that are compatible with your evidence, then it is rationally required to set $\text{Cr}(c_1 \mid w) = 1/n$.

Finite Center Indifference is silent on Infinite Rooms and other infinitary cases, and so does not fall into trouble with Countable Additivity. For simplicity, I will mostly be focusing on **Center Indifference** in what follows, but it should be kept in mind that one can fall back to **Finite Center Indifference** to avoid getting entangled with puzzles about infinity.¹¹

⁹ The axiom of Finite Additivity states that, for two mutually exclusive hypotheses H_1 and H_2 , it is a rational requirement that $\text{Cr}(H_1 \text{ or } H_2) = \text{Cr}(H_1) + \text{Cr}(H_2)$. The axiom of Countable Additivity states that, for any mutually exclusive hypotheses $H_1, H_2, \dots$, it is a rational requirement that $\text{Cr}(H_1 \text{ or } H_2 \text{ or } \dots) = \text{Cr}(H_1) + \text{Cr}(H_2) + \dots$.

¹⁰ For other cases that make trouble for Countable Additivity, see the treatment of the infinitary puzzles in Arntzenius et al. (2004), Builes (2020a), and Dorr et al. (2020). Easwaran (2013) presents some arguments in favor of Countable Additivity, but see Stewart and Nielsen (2021) for a critical response.

¹¹ Singer (2014: 3170) raises another infinitary problem to a principle inspired by Elga (2004), which involves *continuum-many* different agents. While the case that Singer raises does pose a problem for the principle that he formulates, it does not pose any problem for **Center Indifference**, since **Center Indifference** is silent on what the right answer is to Singer's infinitary puzzle.

Lastly, Weatherson also objects to the background assumption that one should assign a precise credence to cases like Two Rooms. Instead, Weatherson suggests that one should assign an *imprecise* credence to the relevant self-locating proposition, where an imprecise credence is a doxastic state that is representable by a set of *multiple* probability functions. For example, instead of having a credence of 0.7 in some proposition P, one could instead have an imprecise credence of $[0.5, 0.7]$ in P, where this means that for every $r \in [0.5, 0.7]$, one of the many probability functions that collectively represents you assigns a credence of r to P.

The project of comparing the advantages and disadvantages of precise over imprecise credences is a large topic that I cannot fully address here. I will only provide a footnote to the sizeable literature of arguments against the rationality of imprecise credences (either that they are not rationally permissible or that they can never be rationally required).¹² One simple point that can be made is that it is unclear how imprecise credences help with giving a non-arbitrary answer to Two Rooms. Surely you shouldn't assign (say) a $[0.317, 0.753]$ credence that you are in R_1 . Why that rather than $[0.292, 0.819]$? Perhaps the least arbitrary option is to be maximally imprecise and assign a credence of $[0,1]$ to being in R_1 .¹³ Generalizing, we might formulate the following alternative to **Center Indifference**:

Center Imprecision: For any two similar centered worlds c_1 and c_2 , if both c_1 and c_2 are compatible with your evidence, then it is rationally required to set $\text{Cr}(c_1 \mid c_1 \text{ or } c_2) = [0,1]$.

Beyond the general arguments against the rationality of imprecise credences, I only have two points to make regarding **Center Imprecision**. First, it seems that in Two Rooms one should be more confident that $2+2=4$ than that one is in R_1 . However, on standard ways of interpreting imprecise credences, **Center Imprecision** contradicts this intuition.¹⁴ Second, all of the points that I will be making about **Center Indifference** in the next three sections equally apply to **Center Imprecision**. So, even if one is more sympathetic to **Center Imprecision** over **Center Indifference**, much of what I will say will still apply.¹⁵

¹² See, for example, White (2009), Elga (2010), Carr (2020), and Builes et al. (2020).

¹³ In fact, this is what Weatherson (2005: 626) himself recommends about a related case.

¹⁴ I am assuming here that rational agents should be certain that $2+2=4$. If one has a credence of 1 in P and an imprecise credence of $[0,1]$ in Q, then one is not strictly more confident in P than Q because there is a probability function in one's representor that is equally confident in P and Q.

¹⁵ A referee raises another worry to **Center Indifference**, namely that it seems to be in tension with the probabilities used in Everettian quantum mechanics given by the Born rule. I have two responses to this worry. First, Everettian quantum mechanics is highly controversial. According to the 2020 PhilPapers Survey conducted by Bourget and Chalmers (forthcoming), less than 20% of philosophers accept or lean towards such an interpretation. Second, it remains a matter of dispute how **Center Indifference** relates to the Everett Interpretation. For example, in their defense of the Everett interpretation, Carroll and Sebens (2018) write "We believe that the reasoning behind Elga's principle, when properly applied to Everettian quantum mechanics, actually leads to the Born rule—not branch-counting" (27). They then go on to defend a more general epistemic principle that delivers the Born rule and "is compatible with indifference in standard cases of classical self-locating uncertainty" (41).

3. Two Ambiguities

Having given a preliminary defense of **Center Indifference**, I now wish to point out some cases where it's unclear how **Center Indifference** applies, on the grounds that it is unclear how the operative notion of a “possible world” is supposed to apply.¹⁶

In the metaphysics of time, there is a debate between *Presentists* and *Eternalists*.¹⁷ Presentists hold that the whole of reality is three-dimensional: only present things exist. Nowhere in reality will you find any dinosaurs (although it is of course true that reality *did* once contain dinosaurs). Eternalists disagree. Eternalists hold that the whole of reality is four-dimensional: past, present, and future things all exist. In one portion of reality, there are dinosaurs, and in another portion of reality (perhaps) there are human outposts on Mars. For Eternalists, which time is the present time is merely an indexical fact, just as which place is “here” is merely an indexical fact. The present time is whichever time you happen to be located in. For Presentists, which time is present is not merely an indexical fact. The present time is the only time that exists!

Now, suppose you were somehow convinced that Presentism were true, and suppose you were informed that throughout the history of the universe, there will be three individuals that share your evidence. When time t_1 is present, one of those three individuals will exist. When a later time t_2 is present, two of those three individuals will exist. According to **Center Indifference**, are you rationally required to assign a credence of $1/3$ that you are any particular one of those individuals?

It depends what “possible world” is meant to refer to. On one understanding of “possible world”, possible worlds are three-dimensional objects for the Presentist, because the whole of reality is a three-dimensional object. On this understanding, **Center Indifference** does *not* imply that you are required to assign a credence of $1/3$ that you are any particular one of those individuals. Both individuals at t_2 occupy the same possible world, so you are required to be indifferent between them, but all three individuals do not occupy the same possible world. After all, there is no way that reality could be in which all three exist.

Alternatively, one could understand the notion of a “possible world” not to refer to everything that exists, but instead it might refer to everything that *did* exist, *does* exist, and *will* exist. In this second

¹⁶ The following material can be seen as an extending the discussion in Builes (2019, 2022b), where I also note the relevance of debates about the metaphysics of time to the epistemology of self-locating belief. However, in previous work, I did not connect the metaphysics of modality with the epistemology of self-locating belief, which is the purpose of this section. Furthermore, in previous work, I did not defend my own version of Elga's (2004) indifference principle over other possible versions, which will be the focus of the next two sections. The current paper can be read as defending the kind of reasoning that I have employed in earlier work, while at the same time extending its coverage to a wide range of other debates, concerning the metaphysics of modality (sections 3-6), external world skepticism (section 7) and inductive skepticism (section 8).

¹⁷ For defenses of Eternalism, see Sider (2001: ch. 2), Skow (2015), and Turner (2019). For defenses of Presentism, see Markosian (2004), Bourne (2007), Ingram (2019), and Builes and Impagnatiello (forthcoming).

sense, the three individuals do occupy the same world, even if Presentism is true. So, in this second sense, **Center Indifference** requires one to be indifferent between all three individuals.

Let us turn to a different case. Let a *universe* be a maximally interconnected spatiotemporal system. In other words, everything that lies inside a universe is spatiotemporally related to everything else in that universe, and everything that lies outside of a universe fails to be spatiotemporally related to anything inside that universe. Some philosophers have entertained the possibility that many universes exist. In fact, famously, Lewis (1986) argued that so many universes exist that there couldn't be any more of them.¹⁸ Suppose you were convinced that many universes exist (perhaps because you were convinced that Lewis' Modal Realism is true). Now consider three individuals that are located in two separate universes that share your same evidence, where one of them exists in universe u_1 and two of them exist in universe u_2 . Conditional on your being one of these three individuals, are you required to assign a $1/3$ credence that you are any particular one of them?

Again, it depends what "possible world" is meant to refer to. On one natural reading, a "world" is supposed to refer to the *entirety* of reality, whatever that might be. On this understanding, it is entirely unproblematic for a single possible world to contain multiple universes, just as it is unproblematic for a single possible world to contain multiple planets. Given this reading, **Center Indifference** tells you to be indifferent between the three relevant individuals, since they all live in the same world. However, for reasons having to do with his overall understanding of modality, Lewis (1986) argued that possible worlds cannot contain multiple universes. Instead, Lewis' notion of a "possible world" coincides exactly with the notion of a "possible universe". On this understanding, **Center Indifference** does *not* imply that you need to be indifferent between the three individuals located in two different universes, because those individuals do not inhabit the same possible world after all.

4. Four Ways To Be Indifferent Towards Others

Given these ambiguities, how should we make **Center Indifference** precise? In this section, I'll distinguish a few natural ways this might be done.

Let's start by regimenting some terminology. I will be stipulatively using the notion of a "world" to refer to the whole of reality, unrestrictedly speaking. So, if Presentism is true, possible worlds are three-dimensional objects. If Modal Realism is true, then the plurality of *all* universes are contained in a single world (the actual world). I will also be stipulatively using the notion of a "universe" to refer to maximal spatiotemporal system, as before. However, my stipulated notion of a universe is meant to apply in a way that is metaphysically neutral between Presentism and

¹⁸ Also see Bricker (2020) for further defense of a distinctive kind of modal realism. See Builes (2022c) for an argument against modal realism.

Eternalism. So, for example, both Presentists and Eternalists should agree that Abraham Lincoln and George Washington are contained in the same universe. For the Presentist, a universe is not just a maximally interconnected *spatial* system, but it also includes everything that *did* exist and *will* exist throughout the evolution of a maximal spatial system.

Let us say that two centered worlds are *3-D similar* if their associated centers occupy the same time and universe. Two centered worlds are *4-D similar* if their associated centers occupy the same universe. Any two centered worlds are *5-D similar*. Lastly, two centered worlds are *similar* if their associated centers occupy the same possible world.

Here is an example to illustrate these distinctions. Suppose I tell you that throughout the history of the universe there will be two individuals who share your evidence, and they will be located at different times. Presentists will think that those individuals do not occupy similar centered worlds, whereas Eternalists will think that those individuals do occupy similar centered worlds. However, whereas judgements of similarity are dependent on one's prior metaphysical commitments, judgements of 3-D similarity, 4-D similarity, and 5-D similarity are metaphysically neutral. Regardless of your metaphysical views, both of those individuals live in 4-D similar and 5-D similar worlds without living in 3-D similar worlds.

By using these stipulated distinctions, we can finally formulate different disambiguated variations of **Center Indifference**. Although I won't do so here, it's straightforward to note that exactly analogous variations can be formulated for **Center Imprecision**.

(X-D) Center Indifference: For any two (X-D) similar centered worlds c_1 and c_2 , if both c_1 and c_2 are compatible with your evidence, then it is rationally required to set $\text{Cr}(c_1 | c_1 \text{ or } c_2) = 1/2$.

Roughly speaking, **3-D Center Indifference** says to be indifferent across simultaneous individuals that share your evidence. **4-D Center Indifference** says to be indifferent across spatiotemporally related individuals that share your evidence. **5-D Center Indifference** says to be indifferent across any possible individuals that share your evidence. **Center Indifference** says to be indifferent across any individuals that live in the same world that share your evidence.

5. How To Be Indifferent

Which of these four principles should we endorse? While I don't have any decisive argument in favor of any one of these principles, I think we should endorse **Center Indifference**.

First, both **3-D Center Indifference** and **4-D Center Indifference** seem to be restricted in an *ad hoc* way. **3-D Center Indifference** says that *even Eternalists* should only be indifferent between simultaneous individuals. However, if individuals located at different times within the same

universe are all equally real, why shouldn't we be indifferent towards them? Similarly, **4-D Center Indifference** says that *even Modal Realists* should only be indifferent between individuals within the same universe. However, if individuals in different possible universes are all equally real, why shouldn't we be indifferent towards them? As a comparison, suppose someone posited a principle of **Planet Center Indifference**, where we are only required to be indifferent across individuals who inhabit the same *planet*. This principle strikes me as unacceptably arbitrary. What's so special about planets? Defenders of **3-D Center Indifference** and **4-D Center Indifference** need an account of why their principles are not just as ad hoc as **Planet Center Indifference**.

Second, both **3-D Center Indifference** and **4-D Center Indifference** are not well-defined in certain situations. According to Special Relativity, there can be situations where there are two individuals that are simultaneous with respect to one inertial reference frame, but they are not simultaneous with respect to other inertial reference frames.¹⁹ So, it's unclear whether we should be indifferent between them on **3-D Center Indifference**. With respect to **4-D Center Indifference**, many Presentists hold the view that the future is "open". This can be interpreted in a variety of ways, but the intuitive idea is that there are no determinate facts about how exactly the future will go.²⁰ According to these views, it's unclear how to apply **4-D Center Indifference**. **4-D Center Indifference** says to be indifferent over all individuals that *did*, *do*, and *will* exist, but how are we to make sense of this epistemic requirement when there's no fact of the matter about which individuals will exist in the future? Lastly, both **3-D Center Indifference** and **4-D Center Indifference** are formulated using spatiotemporal concepts. However, there are worlds where spatiotemporal concepts don't seem to easily apply. In fact, in contemporary research on Quantum Gravity, some have argued that space and time are emergent phenomenon that arise from a fundamentally non-spatiotemporal world, and others have even argued that space and time might not exist at all in the actual world!²¹ It seems to me that we should prefer fundamental principles of ideal rationality that are not hostage to empirical fortune in this kind of way.

Third, **4-D Center Indifference** seems unstable, because the recommendations it gives to Presentists and Modal Realists are "asymmetric" in a certain way. **4-D Center Indifference** recommends that Presentists should be indifferent towards individuals that exist across different times, even though only one of those times can possibly exist. In other words, it tells Presentists to be indifferent across a more *expansive* range of individuals that can possibly exist. However, **4-D Center Indifference** recommends that Modal Realists should only be indifferent towards individuals that live inside a particular universe, even though individuals in different universes are all equally real. In other words, it tells Modal Realists to be indifferent across a more *restricted*

¹⁹ For an introductory overview of inertial reference frames in Special Relativity, see Turner (2019).

²⁰ For an overview of different issues concerning the open future, see Torre (2011).

²¹ The recent collection of essays in Huggett et al. (2021) is concerned with how different approaches to quantum gravity might interact with the reality of spacetime. For an eliminativist approach to spacetime, see Baron (2021).

range of individuals than the range of all existing individuals. It's difficult to see how this asymmetric combination of views can be well-motivated.

None of these problems are faced by **5-D Center Indifference** and **Center Indifference**, and so I regard them as the two most plausible principles of the four that I've formulated. Still, however, I believe that **Center Indifference** is more plausible than **5-D Center Indifference**.

In Elga's (2004) discussion of his own version of **Center Indifference**, he considers an analogous principle to **5-D Center Indifference** (in terms of subjective indistinguishability), which he labels "ABSURD-CLAIM-THAT-I-DON'T-ENDORSE" (387). Here is what he says about that principle:

This stronger claim is absurd. For example, let *AT* be the actual world, centered on you, now. Let *VAT* be a world centered on a brain in a vat who is in a state subjectively indistinguishable from yours. ABSURD-CLAIM-THAT-I-DON'T-ENDORSE entails that you ought to assign *AT* and *VAT* equal credence. That's absurd. In contrast, [**Center Indifference**] entails nothing of the sort, since *AT* and *VAT* are *not* similar – they are associated with *different* possible worlds. (387-388)

Following Elga, one might worry that **5-D Center Indifference** has implausible skeptical consequences. However, it's also worth noting that many of the motivations for **Center Indifference** discussed in section 2 do not carry over to **5-D Center Indifference**. One argument in favor of **Center Indifference** was that, because any two *similar* centered worlds agree on all non-indexical facts, it's hard to see how standard theoretical virtues of (say) simplicity or explanatory power could favor one similar centered world over another. However, when one is considering centered worlds associated with entirely distinct possible worlds, there may well be reasons to favor one world over another. For example, consider two distinct possible worlds, each of which contains exactly one individual that is compatible with your evidence. Suppose that one of the worlds is elegant, simple, and law-governed, whereas the other one is horribly complex, chaotic, and random. **5-D Center Indifference** requires you to be indifferent between both possible worlds, whereas **Center Indifference** is a much more modest principle that is entirely silent on how you should compare those two worlds. Insofar as standard principles of theory choice tell us to assign more credence to the first world, **5-D Center Indifference** contradicts those principles. A second argument in favor of **Center Indifference** was that violations of **Center Indifference** resulted in forced disagreements with epistemic peers who share your same evidence. However, as long as you uphold **Center Indifference**, violations of **5-D Center Indifference** will not land you in any similar disagreements.

6. The Epistemology of Metaphysics: Times and Universes

Now it's time to put **Center Indifference** to work. **Center Indifference** has the surprising consequence that different metaphysical views about the (non-)existence of other times and universes have concrete epistemological consequences. In this section, I'll consider two toy cases that illustrate this point. In the next two sections, I will consider the implications that these metaphysical views have for more realistic situations, involving classic skeptical problems in epistemology.

Consider the following case:

Presentism vs Eternalism: Suppose that at time t_1 , there will be one room with a single agent. At t_2 , there will be two rooms with two agents. The room at t_1 will have a label of "1" on the outside, and one of the rooms at t_2 will have a label of "1" on the outside while the other will have a label of "2". All three agents will be perfect duplicates of one another, and they will all be certain that they are in one of these three rooms.

How confident should each agent be that they are in a room labeled as "1" or "2"? According to **Center Indifference**, the answer depends on their views on Presentism and Eternalism. According to **Center Indifference**, they are required to have the following conditional credences:

$$\text{Cr}(\text{I am in a "1" room} \mid \text{Eternalism}) = 2/3$$

$$\text{Cr}(\text{I am in a "2" room} \mid \text{Eternalism}) = 1/3$$

Given Presentism, **Center Indifference** puts no constraints on what credences they may have that they are located at time t_1 or time t_2 . However, just to go through a particular example, a Presentist might rationally have a credence of $1/2$ that they are in time t_1 , on the grounds that there is no reason to be biased towards t_1 over t_2 .²² This would result in the following credences:

$$\text{Cr}(\text{I am in the "1" room} \mid \text{Presentism}) = 3/4$$

$$\text{Cr}(\text{I am in the "2" room} \mid \text{Presentism}) = 1/4$$

The fact that it is possible for Presentism and Eternalism to have different implications for what room each agent is likely located in can even be used to *empirically test* the truth of Presentism and Eternalism! For example, suppose one of them walks out of their room and sees a "2" on the

²² The only principles that entail that Presentists are always rationally required to be indifferent across agents at different times are **4-D Center Indifference** and **5-D Center Indifference**, which I've argued against in the previous section.

outside of their room. Then, since this was more expected on Eternalism, the agent can perform a standard instance of conditionalization and gain evidence for the truth of Eternalism!²³

An exactly similar kind of case can be run in the case of other universes. Consider the following:

Single Universe vs Modal Realism: Consider two possible universes u_1 and u_2 . In u_1 , there is a room with a single agent. In u_2 , there are two rooms with two agents. The room in u_1 has a label of “1” on the outside, and one of the rooms in u_2 has a label of “1” on the outside while the other has a label of “2”. All three possible agents are perfect duplicates of one another, and they are each certain that they are in one of the three rooms in u_1 or u_2 .

How confident should these possible agents in u_1 and u_2 be that they are in a room labeled as “1” or “2”? Insofar as they believe in Modal Realism, they will believe that both universes u_1 and u_2 exist, and so by **Center Indifference**, each agent is required to have the following conditional credences:

$$\text{Cr}(\text{I am in a “1” room} \mid \text{Modal Realism}) = 2/3$$

$$\text{Cr}(\text{I am in a “2” room} \mid \text{Modal Realism}) = 1/3$$

If they only believe that one universe exists (either u_1 or u_2), then **Center Indifference** puts no constraints on what credences they may have that u_1 or u_2 exist. If, following the previous example, they rationally assign a credence of $1/2$ that only universe u_1 exists, then this would result in the following credences:

$$\text{Cr}(\text{I am in the “1” room} \mid \text{Single Universe}) = 3/4$$

$$\text{Cr}(\text{I am in the “2” room} \mid \text{Single Universe}) = 1/4$$

Just as before, these agents can put the metaphysical question about whether all possible universes exist to an empirical test. Suppose one of them walks out of their room and observes a “2”. Since this was more expected on Modal Realism, applying standard Conditionalization should give a boost to their credence in Modal Realism!

²³ Some philosophers have questioned this instance of conditionalization in the case of updating on self-locating information (e.g. see Meacham 2008, Cozic 2011, and Builes 2020b) by endorsing the so-called ‘Relevance-Limiting Thesis’, which states that one should only update one’s credences in non-indexical hypotheses upon learning non-indexical information. However, even on this kind of view, one still gains evidence about the metaphysics of time upon finding a “2” on one’s door. This is because one rules out the (non-indexical) Presentist hypothesis that reality corresponds to the three-dimensional slice which is t_1 , however one does not rule out any non-indexical Eternalist hypothesis. Therefore, even on the Relevance-Limiting Thesis, seeing a “2” provides evidence for Eternalism. See Titelbaum (2008) for an argument against the Relevance-Limiting Thesis.

7. Time and External World Skepticism

Next, I'll explore some connections that **Center Indifference** may have for traditional concerns about skepticism.

Start with external world skepticism. For all we know (so the skeptic says), we might be dreaming or hallucinating right now. This suggests that, for all we know, our immediate external environment might be radically different than it appears. Doesn't this show that we can't know anything about the external world?

There are several standard responses to this kind of argument. Perhaps some version of externalism about evidence is right and facts about our immediate environment are part of our evidence. Perhaps the best explanation for the regularities in our experience involves the hypothesis that the external world is roughly as it appears. Perhaps we are rationally entitled to believe that things are as they appear in the absence of defeaters.

My purpose here isn't to argue for or against these other responses to external world skepticism, but rather to see how **Center Indifference** interacts with the problem. To this end, consider the following two cases:

Modal BIVs: You discover that throughout modal space, there are countless brains in vats (BIVs) that are having indistinguishable experiences to your own. How do you know you're not one of them?

Temporal BIVs: You discover that throughout the history of the universe, there will be countless BIVs that will have indistinguishable experiences to your own. How do you know you're not one of them?

If you're an externalist about evidence, and you take the fact that you have hands to be part of your evidence, then none of these skeptical cases will be compelling. For the moment, then, let us assume an internalist conception of evidence.

There are two reasons why Modal BIVs isn't a compelling skeptical problem. First, so long as Modal Realism is false, **Center Indifference** doesn't get any purchase in Modal BIVs. Second, in the absence of some precise sense in which there are "more" BIVs than normal embodied agents throughout modal space, it's hard to see how **Center Indifference** could have any direct implications even if Modal Realism were true.

On the other hand, **Center Indifference** implies that Temporal BIV should be very worrying for Eternalists. According to Eternalism, all of the countless BIVs throughout the history of the universe actually exist, and so **Center Indifference** requires one to be indifferent between them. However, it is important to note that **Center Indifference** does *not* require you to believe that you're a BIV if you're a Presentist. In fact, **Center Indifference** is *entirely silent* on what

credences one should assign to observers at other times if one is a Presentist. In the relevant sense of “possible world” that is used in **Center Indifference**, hypotheses about what happens at other times are really hypotheses about what happens in other possible worlds (i.e. other maximal ways that reality could be). A common attitude in contemporary epistemology is that raising the *mere possibility* of a skeptical scenario should not undermine one’s non-skeptical convictions. Such mere possibilities don’t imply anything about how reality actually is. Just as the “Actualist” can take this dismissive attitude towards non-actual skeptical situations, the Presentist can take this very same dismissive attitude towards non-present skeptical situations. Even if a Presentist was convinced that thousands of years from now the world will be dominated by BIVs, that doesn’t imply that any of those BIVs exist. For all **Center Indifference** says, the Presentist can stand firm in thinking that the whole of reality is a three-dimensional object that contains no BIVs at all.

What makes these thought experiments especially pressing is that our best physics seems to suggest that something like Temporal BIV might actually describe the real world. This is the “Boltzmann Brain” problem, which Carroll (2019) introduces as follows:

The Boltzmann Brain (BB) problem is a puzzle facing certain kinds of long-lived universes...In brief, the BB problem arises if our universe (1.1) lasts forever (or at least an extraordinarily long time, much longer than 10^{1066} years), and (1.2) undergoes random fluctuations that could potentially create conscious observers. If the rate of fluctuations times the lifetime of the universe is sufficiently large, we would expect a “typical” observer to be such a fluctuation, rather than one of the ordinary observers (OOs) that arise through traditional thermodynamic evolution in the wake of a low-entropy Big Bang. We humans here on Earth have a strong belief that we are OOs, not BBs, so there is apparently something fishy about a cosmological model that predicts that almost all observers are BBs.

This mildly diverting observation becomes more pressing if we notice that the current best-fit model for cosmology – denoted Λ CDM, where Λ stands for the cosmological constant (vacuum energy) and CDM for “cold dark matter” – is arguably a theory that satisfies both conditions (1.1) and (1.2). (Many eternally inflating cosmologies potentially do so as well.)...[W]e need to face the prospect that our leading cosmological model, carefully constructed to fit a multitude of astronomical observations and our current understanding of the laws of physics, actually predicts nonsense. (7)

There are two kinds of perspectives that one can take in such a situation. First, one might argue that, even if a physical theory implies that almost all observers who share our experiences are BBs, that is not bad news for such a physical theory, because we can still rationally believe that we are not BBs in such a situation. One might think that such an option would be easily available to an externalist about evidence, but standard versions of externalism do not completely avoid the skeptical problem raised by BBs. Just as there can be “Boltzmann Brains”, there can also be “Boltzmann Planets” and even “Boltzmann Galaxies” that can spontaneously arise from such

random fluctuations. So, even if one grants that (say) facts about our immediate environment are part of our evidence, for all we know we might be living in a Boltzmann Planet or a Boltzmann Galaxy. There are other, more subtle, ways that one might argue that we should believe that we are OOs instead of BBs. For example, Dogramaci (2020) has argued that, once one gets clear about certain relevant facts concerning “basing and epistemic dependence”, one can see that *even if* our evidence is shared by all of our BB subjective duplicates, our total evidence supports the fact that we are OOs (and so our BB subjective duplicates should also think they are OOs). Dogramaci’s suggestion is an interesting one that deserves further exploration, but because it contradicts **Center Indifference**, I will be setting it to one side.

A second perspective one can take, which is the one that Carroll (2019) takes, is that physical theories which imply that the universe is filled with BB should be rejected in favor of physical theories that do not have this implication. On Carroll’s view, the BB problem therefore becomes a novel constraint on our physical theorizing, alongside empirical adequacy, simplicity, and other theoretical virtues.

The main point I wish to make here is that, at least given how Carroll sets up the problem, the Boltzmann Brain problem is only a problem for the combination of **Center Indifference** and *Eternalism*.²⁴ If one is a Presentist, the mere fact that there will be countless BBs throughout the history of the universe is just like Temporal BIVs. It has no skeptical implications whatsoever so far as **Center Indifference** is concerned. The crucial question for the Presentist is whether our best physical theories give us good reason to believe that *at this very precise moment* there are countless BBs who are having our very same conscious experiences. Insofar as they do, then we have a skeptical problem. Insofar as they don’t, we don’t have a problem.

From the perspective of the Presentist, the project of coming up with a cosmological history without BBs in order to avoid skepticism is in some ways analogous to the project of coming up with a *modal space* without BBs in order to avoid skepticism. In the modal case, no epistemologist is encouraging modal metaphysicians to come up with a view of modal space that doesn’t include BBs. In the absence of some consideration that goes *beyond Center Indifference*, the scientific project of coming up with a cosmological history without BBs in order to avoid skepticism is just as badly motivated.

²⁴ Strictly speaking, **Center Indifference** doesn’t generate a skeptical problem if the history of the universe has both a countable infinity of OOs and BBs. It is only when **Center Indifference** is generalized in some way to capture the intuitive fact that the “proportion” of BBs outnumber OOs (e.g. according to some limiting process) that **Center Indifference** has skeptical implications. However, I suspect that anyone sympathetic with **Center Indifference** will be sympathetic to such infinitary generalizations. Furthermore, **Center Indifference** will also have to be generalized so that one can apply the principle in situations where one is uncertain about exactly which possible world one inhabits. As discussed in note 5, Weatherson (2005) develops one such generalization in his “P-INDIFFERENCE”.

Let us consider one last reason why something like Temporal BIV might describe the actual world, which has to do with the possibility of simulated minds. Bostrom (2003) introduces the “simulation argument” as follows:

Many works of science fiction as well as some forecasts by serious technologists and futurologists predict that enormous amounts of computing power will be available in the future. Let us suppose for a moment that these predictions are correct. One thing that later generations might do with their super-powerful computers is run detailed simulations of their forebears or of people like their forebears. Because their computers would be so powerful, they could run a great many such simulations. Suppose that these simulated people are conscious (as they would be if the simulations were sufficiently fine-grained and if a certain quite widely accepted position in the philosophy of mind is correct). Then it could be the case that the vast majority of minds like ours do not belong to the original race but rather to people simulated by the advanced descendants of an original race. It is then possible to argue that, if this were the case, we would be rational to think that we are likely among the simulated minds rather than among the original biological ones. (243)

Many things can be (and have been) said about whether this kind of argument is persuasive, but the relevant point to make here is that the inference from *the vast majority of minds like ours throughout history are simulated* to *we are likely simulated* implicitly relies on an indifference principle across agents throughout time. According to **Center Indifference**, such an indifference principle is valid given Eternalism, but it is not valid given Presentism. Therefore, just like in the Boltzmann Brain case, the Presentist has resources to avoid this argument that are not available to the Eternalist.²⁵

8. Modality and Inductive Skepticism

Let us now turn to consider inductive skepticism. There are countless possible universes that contain agents like me, yet the inductive inferences of those agents go badly wrong. For example, there are countless possible universes that contain agents like me in which the sun will not rise

²⁵ There are two caveats to make about the simulation argument in this dialectical context. First, it is unclear whether living in a simulation counts as a “skeptical hypothesis”. For example, Chalmers (2022) has argued that, so long as the simulation is sufficiently rich and “structurally” similar to the world that we believe that we inhabit, then most of our ordinary beliefs would still be true. Second, Bostrom (2003) defends the simulation argument both on the assumption that minds qualitatively exactly like ours will exist in the future and on the assumption that minds “similar” (but not qualitatively identical) to ours will exist in the future. In the latter case, **Center Indifference** might not directly apply, but the same reasons for thinking that **Center Indifference** is sensitive to one’s underlying metaphysics of time equally apply to the kind of indifference reasoning that Bostrom appeals to.

tomorrow. Given all of these possible agents in similar evidential situations to mine, how can I be sure that *my* inductive inferences will not go badly wrong?

This is the classic problem of induction, and there is no agreed upon solution. Perhaps it is simply a brute fact about rationality that rational people ought to (defeasibly) believe that they are in inductively friendly worlds, or perhaps there is some deeper story to be told.²⁶ However, at first glance, it seems like this problem has little to do with **Center Indifference**. **Center Indifference** only tells you to be indifferent over *existing* agents who share your same evidence, but as long as we are talking about *merely possible* agents who share your same evidence, **Center Indifference** does not apply.

It is correct that **Center Indifference** is irrelevant to this skeptical argument so long as we think that these other possible universes don't exist. However, according to Modal Realism, every possible universe is just as real as the universe that we actually inhabit. There *are* countless people out there, in a similar evidential situation to mine, whose inductive inferences go badly wrong. By **Center Indifference**, I'm required to be indifferent across all such people. Doesn't that show that Modal Realism lands us in inductive skepticism?

Lewis (1986) was aware of this problem to Modal Realism, because a similar problem had been raised by Forrest (1982).²⁷ Lewis had two replies. First, he replied that the problem mistakenly assumes that Modal Realism implies that the *actual world* contains countless people who are inductively mistaken. However, as we saw before, Lewis argued that "worlds" should be identified with "universes". So, for Lewis, the actual "world" was just the actual *universe* that we find ourselves in, rather than the collection of all existing universes. In effect, one could interpret this reply as Lewis advocating for **4-D Center Indifference** rather than **Center Indifference**. According to Lewis, perhaps we should be indifferent across individuals who are spatiotemporally related to us, but we should not be indifferent across all individuals who exist (unrestrictedly speaking). In section 5, I argued that this is mistaken. We should accept **Center Indifference** rather than **4-D Center Indifference**, and so I believe that this first reply fails.

Lewis' second reply was to question the technical details of such an argument. After all, although there are infinitely many individuals throughout modal space whose inductive inferences fail, there are also infinitely many individuals throughout modal space whose inductive inferences succeed. It's therefore unclear whether **Center Indifference** has any unwelcome epistemological implications, even if Modal Realism is true. In what follows, I will try to fill in the technical details of an argument that *does* show that **Center Indifference** has unwelcome inductive consequences for Modal Realism.

²⁶ For attempts at a deeper story, see White (2005b), Huemer (2009a), and Builes (2022a).

²⁷ Forrest's objection to Modal Realism was not targeted directly at inductive reasoning. Instead, Forrest argued that Modal Realism was in tension with Occam's Razor. However, the problems are structurally analogous.

My target will be our knowledge of the fundamental laws of nature. Many of our best guesses of the fundamental laws of nature have been *deterministic*, where a law L is deterministic just in case it satisfies the following property:

Determinism: For all metaphysical possible universes u and u^* where L is true, if there is a time t at both u and u^* such that t has the same intrinsic properties at both u and u^* , then $u = u^*$.²⁸

Before the advent of quantum mechanics, all of our best guesses of the fundamental laws of nature were deterministic.²⁹ In the case of quantum mechanics, the issue is more subtle. Certain interpretations of quantum mechanics imply that the world is deterministic (such as Everettian quantum mechanics and Bohmian quantum mechanics), whereas other interpretations are indeterministic (such as objective collapse theories).³⁰ Still, the history of physics suggests that we should regard it as a live epistemic possibility that we actually live in a deterministic universe.

The question I want to focus on is the following: can it ever be rationally *permissible* for an agent to assign a *non-zero* credence that some particular deterministic law of physics holds? It seems to me that the answer is clearly “yes”. For example, consider a world governed by deterministic Newtonian Laws. Suppose the scientists in that world come up with Newton’s Laws, and for trillions of years Newton’s Laws are experimentally verified to arbitrary levels of precision, with no experimental anomalies. Surely it should at least be *permissible* to assign a *non-zero* credence in Newton’s Laws in such a situation! My worry, however, is that **Center Indifference** implies that it is never rationally permissible for any agent who believes in Modal Realism to assign non-zero credence in any deterministic law.

Let’s first assume that in the relevant sense of “agent”, agents can only have evidence about the past and present state of the world. Perhaps there could be “agents” that can know the laws of physics by simply “seeing” the whole history of the universe through magical powers of clairvoyance, but we will be setting such agents to the side. Our question will be whether an agent

²⁸ This definition follows the definition of “Full Determinism” in Teitel (2019: 353).

²⁹ There are several subtleties though. First, classical theories are only deterministic if the values of certain vector quantities (like velocity or momentum) are specified, which may require the intrinsic state of an arbitrarily small temporal interval, rather than a mere instant of time (e.g. see Arntzenius 2000 and Builes and Teitel 2020). Second, there are some exotic situations (e.g. “space invaders”, “Norton’s dome”, and certain situations involving supertasks) where classical mechanics might not be deterministic, depending on exactly what assumptions are built into “classical mechanics” (e.g. see Fletcher 2012). Third, whether determinism is true in General Relativity depends on certain “physically reasonable” assumptions such as global hyperbolicity (e.g. see Smeenk and Wüthrich 2022). Lastly, some have argued that determinism should be restricted to merely “qualitative” facts, but see Builes and Teitel (2022) for arguments against this restriction.

³⁰ See Maudlin (2019) for an introduction to these three different approaches to quantum mechanics.

who only has access to the past and present (i.e. an agent like us) can permissibly assign a non-zero credence in some deterministic law.

Let's consider the best case scenario for such an agent, where we let the agent have access to the *entire* history of the universe up until the present time. We can formulate the hypothesis that such an agent can permissibly have non-zero credence in some deterministic law as follows:

The Viability of Determinism: There is some possible universe u , with some initial segment of history H up to time t , and some agent a in u at t , such that it is rationally permissible for a at t to set $\text{Cr}(L \mid H) > 0$, for some deterministic law L .

A surprising fact is that, given **Center Indifference**, **The Viability of Determinism** fails for any agent a that believes in Modal Realism.

The reasoning behind this claim is a bit technical. It starts with the observation that there is only a *single* universe u_{LH} where L and H are true, since L is deterministic. So, since the agent knows that L and H are true if and only if they live in u_{LH} , the agent is rationally required to assign $\text{Cr}(L \mid H) = \text{Cr}(u_{LH} \mid H)$. However, according to Lewis' version Modal Realism, there are uncountably many different universes where H holds. For example, for every positive real number r , there is a universe whose last moment of time is r seconds after t . Each of these uncountably many universes will contain an agent at t whose evidence is compatible with a 's evidence (i.e. *an evidential twin*), since each of these uncountably many universes share an initial history up to t . Therefore, given Modal Realism, there will be uncountably many evidential twins of a who live in universes distinct from u_{LH} . So, as long as there are only countably many evidential twins of a that live in u_{LH} , **Center Indifference** will entail that, if a is a Modal Realist, a is rationally required to set $\text{Cr}(u_{LH} \mid H) = 0$. I will leave the proof of this claim to a footnote.³¹ Although there is a caveat here that there are only countably many evidential twins of a that live in u_{LH} , this assumption is certainly satisfied in our universe.³² Insofar as we ultimately care about drawing conclusions about our own epistemic predicament, this caveat is no caveat at all.

Center Indifference therefore implies that there can be no Modal Realist for which any hypothesis about the deterministic laws of nature is a viable hypothesis. Even if such a law was breathtakingly

³¹ Let $a_1, a_2, a_3, \dots$ be the (finitely many or countably many) agents located in u_{LH} compatible with a 's evidence. Since a lives in u_{LH} if and only if a is one of $a_1, a_2, \dots$, a is rationally required to set $\text{Cr}(u_{LH} \mid H) = \text{Cr}(a_1 \text{ or } a_2 \text{ or } \dots \mid H)$. Using an instance of Finite Additivity or Countable Additivity, $\text{Cr}(a_1 \text{ or } a_2 \text{ or } \dots \mid H) = \text{Cr}(a_1 \mid H) + \text{Cr}(a_2 \mid H) + \dots$. So, it suffices to show $\text{Cr}(a_i \mid H) = 0$ for all i . This is true because H is true in uncountably many epistemically possible centered worlds, and by **Center Indifference** each pair of such epistemically possible centered worlds must be assigned equal credence by a (since a 's evidence is exhausted by H). This can only be true if a assigns $\text{Cr}(c \mid H) = 0$, for all centered worlds c compatible with H , as desired.

³² From the fact that there is a countable dense subset of space-time points in our space-time manifold, it follows that, so long as "agents" need to occupy some finite volume of space-time, uncountably many agents cannot fit inside our space-time manifold.

elegant and simple, and even if could be conclusively verified that such a law had been perfectly followed for trillions of years, and even if the entire scientific community unanimously agreed that such a law must be true, the Modal Realist is rationally required to assign a credence of *zero* that the law is true.³³ Therefore, given **Center Indifference**, Modal Realism seems highly implausible.

9. Conclusion

Principles of indifference are powerful principles. Left unchecked, they can easily lapse into contradiction, just as **Naive Indifference** clearly does. However, if a suitably restricted principle of indifference can be defended, it can potentially lead us to a wide variety of interesting epistemological consequences.

I have tried to defend a restricted principle of indifference here, namely **Center Indifference**, and I have explored some of its surprising consequences. In particular, I have argued that **Center Indifference** implies that both Eternalists and Modal Realists face distinctive skeptical challenges that are not faced by Presentists and Actualists.³⁴ One might have thought that debates in the metaphysics of time and modality would be insensitive to debates in epistemology, but if I'm right, then perhaps another way we could make progress on these metaphysical debates is by looking at their epistemological consequences.

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³³ Is there space to think that a Modal Realist can assign positive credence to some deterministic law *L* with only *partial* information about the past? Such a Modal Realist would have to be certain that *every* epistemically possible history *H* that perfectly conforms to *L* is decisive evidence against *L*. In other words, for all histories *H* which conform to *L*, $Cr(L \mid H) = 0$, because of the failure of **The Viability of Determinism**. This strikes me as obviously bad reasoning. If you have positive credence in *L*, learning that *L* has been perfectly followed for billions of years should not count as decisive evidence against *L*. There should at least be *some* way that history could have gone that isn't decisive evidence against *L*.

³⁴ As a referee points out, Eternalists and Modal Realists might want to “modus tollens” this argument to reject **Center Indifference** in favor of another principle discussed in sections 4-5 (or they might reject all forms of indifference reasoning). However, although this might forestall the threat of skepticism, it would still involve controversial epistemic commitments (e.g. by rejecting the arguments in section 5 against alternative indifference principles, or by entirely rejecting intuitive indifference reasoning in cases like Two Rooms).

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