

Thus the lowest grade of universe would be a world of mere withness, of which the parts were only strung together by the conjunction ‘and’.

Pragmatism, Lecture IV
WILLIAM JAMES [1907]

Imagine...a universe completely without structure, without topology. No space, no time; just a set of random events. I’d call them ‘isolated,’ but that’s not the right word; there’s simply *no such thing as distance*....Now, if the pattern that is *me* could pick itself out from the background noise of all the other events taking place on this planet...then why shouldn’t the pattern we think of as ‘the universe’ assemble itself, find itself, in exactly the same way?

“Dust”
GREG EGAN [1992]

1 Monism and Pluralism

A casual observer of recent metaphysical trends might reasonably conclude that William James’ pronouncement on the fates of Spinoza and Hume was premature:

The fate of Spinoza, with his barren union of all things in one substance, on the one hand; that of Hume, with his equally barren “looseness and separateness” of everything, on the other—neither philosopher owning any strict and systematic disciples today, each being to posterity a warning as well as a stimulus—show us that the only possible philosophy must be a compromise between an abstract monotony and a concrete heterogeneity. (James [1979])

Over the past decade or so, some philosophers have argued that there is just one fundamental concrete thing—one fundamental *being*, for short—and others have argued that there is just one being, period.¹ It would seem that at least in this regard Spinoza could claim them as strict and systematic disciples.

¹See, inter alia, Schaffer [2010a,b] for a defense of the former, moderate monism, and Horgan and Potrč [2000] for a defense of the latter, radical monism.

Likewise, over the past several decades, some philosophers have argued that there are no absolutely necessary connections and no fundamental nomic or causal or dispositional ties, that, in a nutshell, everything is entirely “loose and separate”.² It would seem that at least in this regard Hume could claim them as strict and systematic disciples.

Or could he? In asking that I do not intend to question James’ attribution of a “loose-and-separate” metaphysic to Hume. I am not sufficiently expert to weigh in on such historical controversies.³ I instead intend to question whether those who have recently defended a “loose-and-separate” metaphysic strictly adhere to a view as radically pluralist as the one James has in mind.⁴ Sure, David Lewis came to see in hindsight that he had campaigned on behalf of Humean Supervenience, according to which all there is at bottom is a “vast mosaic of local matters of fact”. Put less graphically, Humean Supervenience is the view that (a) there are a plurality of fundamental beings, (b) there are no inexplicable constraints on modal space, and hence the fundamental nature of each such being is independent of those of all the rest and of the fundamental relations in which it stands to the rest, (c) the fundamental beings stand in no fundamental (or intrinsic) causal or nomic relations, and hence (d) the distribution of any causal or nomic relations in which they do stand globally supervenes on their fundamental natures and the non-nomic, non-causal fundamental relations in which they stand.⁵ But while Humean Supervenience is pluralist all right, it isn’t quite as pluralist as the radical view James attributes to Hume. For as James notes, non-radical pluralists still recognize that fundamen-

²See, inter alia, [Lewis \[1986a, Introduction\]](#) and [Lewis \[1994\]](#).

³See [Strawson \[2013\]](#) and [Beebe \[2013\]](#) for an historically responsible discussion.

⁴Determining what exactly James had in mind in the quoted passage is non-trivial. But it can be ascertained, I think, by looking at his [\[1879\]](#), the article from whose reworking the quoted passage is drawn. There he describes the writers who succeeded Hume as being unwilling “to treat any abstractions whatever as if they are intelligible. Even to talk of space, time, feeling, power, &c., oppresses them with a strange sense of uneasiness. Anything to be real for them must be representable in the form of a *lump*.” (ibid., 323) And later (ibid., 326) he writes, “Hume’s followers are less bold in their utterances than their master, but throughout all recent British Nominalism we find the tendency to enthrone mere juxtaposition as lord of all and to make of the Universe what has well been styled a Nulliverse”: a ‘Nulliverse’ is what he elsewhere [\[1977, Lecture II\]](#) calls a world in which there are a plurality of beings each “cut off from all relation with its environment”.

⁵A ‘fundamental nature’ is a maximal consistent conjunction of fundamental properties/relations: it is a possibly instantiated conjunction of fundamental properties/relations, and the conjunction of it and any fundamental property/relation not already one of its conjuncts is not possibly instantiated. And a ‘nomic relation’ is a relation such that for some statement *L*, necessarily if the relation is instantiated then *L* is a law.

Humean Supervenience also includes the claim that causal and nomic relations are not just non-fundamental and extrinsic, but extrinsic to absolutely everything. (Where a property *P* is extrinsic to *x* iff *x* instantiates *P* and some possible intrinsic duplicate of *x* does not instantiate *P*.) See [Segal \[2015\]](#) for a discussion of this point, along with a discussion of the logical relations between the various prongs of Humean Supervenience.

tally, the world's pieces “hang together,” at least spatially and temporally.⁶ Lewis is no exception. While Humean Supervenience does not say one way or another, Lewis is explicit that the fundamental beings stand in fundamental spatiotemporal relations. There is still a mosaic at bottom.⁷

Radical Pluralism (as I shall call it), on the other hand, denies even this much.⁸ It is the view that (a) there are a plurality of fundamental beings, (b) there are no inexplicable constraints on modal space, and hence the fundamental nature of each such being is independent of those of all the rest and the fundamental relations in which it stands to the rest, (c) the fundamental beings stand in *no fundamental relations at all*—whether nomic, causal, or spatiotemporal—save for numerical identity and numerical diversity, and hence (d) the distribution of *any* relations in which they do stand globally supervenes on their fundamental natures. Thus, while it's the case that fundamentally there are many beings, it's not the case that fundamentally some beings are five feet apart (no fundamental metrical spatial relations), or that fundamentally some events are five minutes apart (no fundamental metrical temporal relations), or that fundamentally something is surrounded by something else (no fundamental topological spatial relations), or that fundamentally some event happens between other events (no fundamental topological temporal relations).⁹ If Radical Pluralism is true, then as James somewhat loosely but still aptly puts it, the only tie that binds things together is the conjunction ‘and’: not even “one damn thing after another,” just one damn thing

⁶See James [1907, Lecture IV]: “Space and time are thus vehicles of continuity by which the world's parts hang together.”

⁷Lewis, given his Modal Realism, could not but have accepted that things stand in some fundamental external relation, if he was to believe in a plurality of (actual) things at all. See his [1986b, §1.6].

⁸To forestall confusion, let me note that James [1977, Lecture II] uses the term ‘Radical Pluralism’ to refer to Pluralism *tout court*, to the view that there are a plurality of fundamental beings. (Its radicalism lies in its departure from what James takes to be the dominant view in the history of philosophy.) I, on the other hand, use it to refer to the radical version thereof, the view that James attributes to Hume, which he asserts has no modern-day adherents, and which he elsewhere [1907, Lecture IV] calls ‘Absolute Pluralism’. I apologize for any confusion, but I much prefer my terminology over his.

⁹Note that I assume here and throughout that if nothing stands in any fundamental spatiotemporal relations then nothing stands in any fundamental spatial or temporal relations either. Special Relativity makes this plausible enough. Cf. Barbour [1994a,b, 1999] for the claim that things do stand in fundamental spatial relations and a fundamental relation of simultaneity, but not in any other fundamental temporal relations and, I take it, not in any fundamental spatiotemporal relations. It would take me too far afield to make this case, but if the core of my argument in this paper succeeds in showing that conditional upon Humean Supervenience there is a likelihood of 1 that nothing stands in any fundamental spatiotemporal relations, I think it can also be shown that conditional upon Humean Supervenience there is a likelihood of 1 that Barbour's view is false.

and another damn thing.¹⁰

It should be emphasized just how radical Radical Pluralism is. It is stronger than the view, held by Leibniz and others, that there are a plurality of fundamental windowless monads, none of which stands in any fundamental relations—whether nomic, causal, or spatiotemporal—save numerical identity and numerical diversity. For Radical Pluralism insists that the fundamental natures of all the fundamental beings are independent of one another. Leibniz’s monads, on the other hand, are so intertwined that the fundamental nature of each entails the whole truth about all the others.¹¹ Likewise, it is stronger than the relationist view, also held by Leibniz (about the “phenomenal world”), that fundamentally there is no such thing as space or time or spacetime, just material things standing in certain spatial or temporal or spatiotemporal relations. For Radical Pluralism insists that fundamentally, nothing stands in any spatial or temporal or spatiotemporal relations either.

Perhaps the radical nature of Radical Pluralism explains the fact that while James’ claim about Spinoza has been falsified by contemporary adherence to Monism, the same cannot be said of his claim about Hume. To my knowledge, no other philosopher in the recent or distant past has endorsed Radical Pluralism.

I think it’s about time Radical Pluralism received a hearing. And not just because Monism has received one, but because Radical Pluralism deserves serious consideration by at least some philosophers, viz. those who are already pluralist enough to endorse Humean Supervenience. I think a good case can be made that *conditional upon* Humean Supervenience, it is overwhelmingly likely that Radical Pluralism is also true.

Two preliminary notes are in order before I turn to that case. First, as I’ve stated it, Humean Supervenience is silent on what the fundamental beings are. I shall assume going forward that if Humean Supervenience is true, then the fundamental beings are *points*, points that, whether fundamentally or not, make up a four-dimensional spacetime manifold. This assumption is in principle dispensable—at the cost of extra complexity in my formulations—and is in any case congenial to Humean Supervenience.¹² Thus, Lewis’s own view is that the fundamental beings

¹⁰A.J. Ayer reportedly liked to say of the universe that it was “just one damn thing after another”. See Rogers [1999, p. 300].

¹¹*Monadology* [1991], §56, 59–60. The same goes, albeit to a lesser extent, for contemporary views according to which no relations are fundamental: Simons [2016] and Lowe [2016] both endorse that view (or one that differs from it only with their preferred ideology substituting for fundamentality), but they also explicitly give up on the independence of the fundamental beings.

¹²The assumption is indeed dispensable, but not just any view on which plurality of beings are fundamental will permit my argument to proceed. In particular, any view according to which the fundamental beings are all and only enduring particles (particles wholly present at more than one time) will not allow my argument to go forward. But such a view is not consistent with Humean Supervenience, since (a) according to the latter, causation is extrinsic to everything (see nt. 5), and

are spacetime points, or at any rate point-sized things.

Second, although I have mentioned Lewis several times, I do not intend to compel *him*—or those living philosophers who hold all of his views—to embrace Radical Pluralism, on pain of irrationality. For one thing, I do not intend to compel at all. My aim is exploratory more than compulsory: I wish to explore one possible avenue to what I think is an unjustly neglected view. For another thing, I depart from Lewis’s own views at certain points. In particular, I assume the falsity of Lewis’s counterpart theory (nt. 23) and rely on a notion of intrinsic probability that Lewis will not countenance. But my assumptions are consistent with Humean Supervenience. I am exploring the consequences of *Humeanism*, not *Lewisianism*. The former is a separable piece of the latter.

2 Larger Argument

It might be helpful to chart out the larger argument and then take it premise by premise. The core of the argument establishes the claim that conditional upon Humean Supervenience, there is a likelihood of *one* that nothing stands in any fundamental spatiotemporal relations. (Let us call the claim that (some) things stand in fundamental spatiotemporal relations, ‘ST-F’, and that claim’s negation, ‘ST-NF’.) And given that fact, the argument goes on to establish that conditional upon Humean Supervenience, it is overwhelmingly likely that Radical Pluralism is true.

The argument that ST-NF has a likelihood of 1, conditional upon Humean Supervenience, exploits a critical piece of our evidence, viz. the fact that the universe is highly ordered, *exquisitely ordered*. Indeed, it exploits just one way in which the universe is highly ordered. I will later say more about what that way is and why I take this to be a piece of our evidence. But to follow the larger argument one need not understand the details of this claim. So let us call the claim in question, ‘ORDER’, and proceed with the argument, which has just two premises: First, that the likelihood of ORDER conditional upon the conjunction of Humean Supervenience and ST-F is *zero*. And second, that the likelihood of ORDER conditional upon the conjunction of Humean Supervenience and ST-NF is greater than zero.

We can put this more succinctly and carefully. Let ‘HS’ abbreviate ‘Humean Supervenience’, ‘K’ represent our background knowledge, and ‘L(*)’ the *likelihood function*: it assigns to the propositions in its domain a real number between 0 and 1, equal to the credence that it is rationally permissible for an agent who is

(b) according to the former persisting is intrinsic to a (persisting) thing, and yet (c) persistence entails causation. (The inconsistency of this triad was pointed out by Ryan Wasserman in his [2005]: he argues that the Humean’s commitment to the extrinsicness of causation, together with the fact that persistence entails causation, commits the Humean to the extrinsicness of persistence, which he argues is problematic.)

ignorant of contingent matters to have in the proposition.¹³ I define the conditional likelihood $L(\alpha \mid \beta)$ in the usual way, as the quotient, $\frac{L(\alpha \& \beta)}{L(\beta)}$, and I assume the likelihood function obeys the axioms of the probability calculus.

Then the first two premises are as follows:

1. $L(\text{ORDER} \mid \text{HS} \& \text{ST-F} \& \text{K}) = 0$, and
2. $L(\text{ORDER} \mid \text{HS} \& \text{ST-NF} \& \text{K}) > 0$

From these premises it follows that¹⁴,

3. $L(\text{ST-F} \mid \text{HS} \& \text{ORDER} \& \text{K}) = 0$, and

And from premise (2) all by itself it follows that,

4. $L(\text{ST-NF} \mid \text{HS} \& \text{ORDER} \& \text{K}) > 0$

And since the sum of the two conditional likelihoods is 1¹⁵, it follows from (3) and (4) that

5. $L(\text{ST-NF} \mid \text{HS} \& \text{ORDER} \& \text{K}) = 1$

That is, conditional upon Humean Supervenience (and something else that we already assume or ought to assume), there is a likelihood of 1 that ST-NF is true.

But then it is just a short step to the final conclusion, involving not ST-NF, but Radical Pluralism itself. If conditional upon Humean Supervenience (and something else that we already assume or ought to assume), there is a likelihood of 1 that ST-NF is true, then it is overwhelmingly likely, conditional upon Humean Supervenience (and something else that we already assume or ought to assume), that Radical Pluralism is true. For the conjunction of Humean Supervenience and ST-NF entails that there are a plurality of fundamental beings, all of whose fundamental natures are logically independent of one another and none of which stands in any fundamental causal, nomic, or spatiotemporal relations. And there don't seem to be any good candidates for instantiated fundamental relations if there are

¹³If it is rationally permissible to have an *infinitesimal* credence, then the function will be real-or-infinitesimal valued. I ignore that complication in what follows, since it wouldn't affect the substance of the argument. Each claim of an equality with 0 can be replaced by one of an equality with either 0 or some infinitesimal, and each claim of an inequality with 0 can be replaced by one of an inequality with both 0 and every infinitesimal.

¹⁴From premise (2) it follows that $L(\text{ORDER} \& \text{HS} \& \text{ST-NF} \& \text{K}) > 0$, and hence that $L(\text{HS} \& \text{ORDER} \& \text{K}) > 0$. And from premise (1) it follows that $L(\text{ORDER} \& \text{HS} \& \text{ST-F} \& \text{K}) = 0$. So $\frac{L(\text{ORDER} \& \text{HS} \& \text{ST-F} \& \text{K})}{L(\text{HS} \& \text{ORDER} \& \text{K})} = 0$.

¹⁵As long as they are both defined, which, given (3) and (4), they are.

no instantiated causal, nomic, or spatiotemporal ones.¹⁶ That is, our final premise is this:

6. $L(\text{Radical Pluralism} \mid \text{ST-NF} \ \& \ \text{HS} \ \& \ \text{ORDER} \ \& \ \text{K}) \simeq 1$

And from (5) and (6) it follows that,

7. $L(\text{Radical Pluralism} \mid \text{HS} \ \& \ \text{ORDER} \ \& \ \text{K}) \simeq 1$

So concludes the sketch of the larger argument. I will say no more about premise (6). The remainder of the paper is devoted to a defense of premises (1) and (2).

3 Premise 1: Unlikelihood of ORDER

Premise (1) of the larger argument is that the likelihood of ORDER given the conjunction of Humean Supervenience and ST-F is *zero*. The sheer unlikelihood of the universe being highly ordered was expressed nicely by Archbishop Talliston when he asked:

How long might 20,000 blind men which should be sent out from the several remote parts of England, wander up and down before they would all meet upon Salisbury Plains, and fall into rank and file in the exact order of an army? And yet this is much more easy to be imagined than how the innumerable blind parts of matter should rendezvous themselves into a world.¹⁷

Indeed, supposing Humean Supervenience is true, the many fundamental beings, the points, really are “uncoordinated” by some other being (they’re fundamental)

¹⁶You might object that the quantum-mechanical relation of **being entangled** is fundamental. One possible reply is that **being entangled** is a nomic relation, and so would not be fundamental if Humean Supervenience is true.

But to my mind a more decisive reply is as follows: if nothing stands in any fundamental spatiotemporal relations, then any fundamental truth can be perspicuously expressed without any temporal or tensed vocabulary whatsoever: no time-indices, no primitive tense operators. And so any true sentence of the form $\phi(a_1 \dots a_n)$, where ϕ expresses a fundamental relation, expresses a truth that can in turn be perspicuously expressed without any temporal or tensed vocabulary whatsoever. But any such sentence either expresses a true proposition at all times or never expresses a true proposition at any time. But there are sentences of the form ‘entangled($a_1 \dots a_n$)’ that sometimes express a true proposition and sometimes a false one (where ‘entangled’ expresses the relation, **being entangled**). So if ST-NF is true, then **being entangled** is not a fundamental relation.

¹⁷Quoted in Peirce [1878]. Note that unlike the more famous passages from William Paley’s *Natural Theology* and Hume’s *Dialogues*, this passage makes no mention of the adaptation of means to ends. There is no assumption that anything serves any purpose or end or function at all. And that’s all to the good since I want to call our attention to the mere orderliness of it all, whether or not that orderliness is of any *use* to anyone or anything.

and “blind” to one another’s fundamental features and the fundamental relations in which they stand (no necessary connections). And so it’s exceedingly unlikely—supposing further that things *do* stand in fundamental spatiotemporal relations—that the spatiotemporal arrangement of the ones that are matter-filled would be as orderly as it is.¹⁸

To make this argument more precise, I must first elaborate on ORDER, Humean Supervenience, our background knowledge, and the relationship between likelihood and intrinsic probability.

3.1 WHAT IS ORDER?

It’s not that there is some *degree of orderliness* O such that ORDER is the claim that the spatiotemporal arrangement of the points that are matter-filled exhibits a *degree of orderliness* greater than or equal to O . This would require an explication of the notion of *degree of orderliness*, a daunting task in its own right. Moreover, it would be far from clear what degree of orderliness we should expect given the conjunction of Humean Supervenience and ST-F. Perhaps in the only sense of ‘degree of orderliness’ that that phrase can make we should expect a high degree of orderliness *no matter what*.¹⁹ And finally, the cognitive science cognoscenti will no doubt remind us that we tend to think the world is more orderly than it is and hence caution us against taking ORDER so understood to be part of our total evidence.²⁰

Rather, what is intended by ORDER is a claim about a *specific way* in which the spatiotemporal arrangement of the points that are matter-filled is orderly. Roughly, that the points are spatiotemporally arranged in such a way that every

¹⁸Galen Strawson [2014] exploits this point to argue against Humean Supervenience, period. Although, his seems not to be a probabilistic argument, but something like an inference to the only explanation of an extraordinarily surprising fact, and the extraordinarily surprising fact to which he points is more-or-less what I will shortly say is *not* what I mean by ‘ORDER’. See Beebe [2006, §3] for a response to *his* argument.

In any case, even if Strawson’s argument against Humean Supervenience were cast probabilistically and in terms of the ORDER I have in mind, it should be evident that I don’t think it succeeds, or at least not obviously so. For one thing, from the fact (for which I will argue) that $L(\text{ORDER} \mid \text{HS} \ \& \ \text{ST-NF} \ \& \ \text{K}) > 0$ it follows that $L(\text{ORDER} \ \& \ \text{HS} \ \& \ \text{ST-NF} \ \& \ \text{K}) > 0$, and hence that $L(\text{ORDER} \ \& \ \text{HS} \ \& \ \text{K}) > 0$. And from that fact, together with the assumption (that Strawson tacitly concedes) that $L(\text{HS} \ \& \ \text{K}) > 0$, it follows that $L(\text{ORDER} \mid \text{HS} \ \& \ \text{K}) > 0$. So we ought not accept the Strawsonian premise, analogous to premise (1) of my argument, that $L(\text{ORDER} \mid \text{HS} \ \& \ \text{K}) = 0$. For another thing, there is no non-question-begging analogous argument for his conclusion, $L(\neg\text{HS} \mid \text{ORDER} \ \& \ \text{K}) \simeq 1$, since there is no non-question-begging defense of the claim—the Strawsonian analogue of my premise (2)—that $L(\neg\text{HS} \mid \text{K}) > 0$. As we shall see, I think there is a non-question-begging defense of premise (2) of my argument.

¹⁹So claims C.S. Peirce in his reply [1878] to an argument very much like Strawson’s [2014].

²⁰For a seminal paper, see Gilovich et al. [1985]. The literature on the so-called clustering illusion, apophenia, and related phenomena, is of course enormous.

matter-filled point is “adjacent” to another matter-filled point. Somewhat more exactly: say a point x is *continuous* with some points, the N s, iff x is not one of the N s, and x and the N s together constitute a continuous curve. Then say a point is *friendly* iff there are matter-filled points with which it is continuous; otherwise, say it is *lonely*. Then ORDER is the claim that the points are spatiotemporally arranged in such a way that every matter-filled point is friendly. (Think of the fact that particle trajectories are continuous.) Most exactly: it is a claim about the friendliness of a vast number of points that are at some distance from each other. Say that some points, the D s, are *distant from each other* iff there are some neighborhoods, each surrounding one of the D s, that do not overlap one another. Let S be a countably infinite sequence of matter-filled points that are distant from each other.²¹ Then ORDER is the claim that S_1 is friendly, and S_2 is friendly, and so on.

3.2 WHAT IS HUMEAN SUPERVENIENCE?

If Humean Supervenience is true, then there are no inexplicable constraints on modal space. As Lewis puts it,

My main objection is that selection is not any ordinary external relation; it is a *modal* relation. I have been tolerant—maybe too much so—toward primitive modality; but here, the primitive modality is especially repugnant... It cannot be, for instance, that there is an absolutely necessary connection (as opposed to a contingent law of nature) whereby every charged particle must be exactly a certain distance from another particle. It’s one thing for the particle to be charged, another thing for two particles to be at a certain distance - the common involvement of the same particle is not enough to make the alleged connection intelligible [1986b, §3.4].

Any absolutely necessary connection must be *made intelligible*. I take that to mean that it cannot be inexplicable, that there must be some *explanation* for it.

As I have indicated, what follows from this denial of inexplicable constraints is that there are no absolutely necessary connections between distinct existents, in at least this sense: fundamental beings are independent of one another. And, what I have not yet indicated, independent both with regard to *possibility* and *probability*. Thus, with regard to possibility, how one fundamental being is fundamentally imposes no necessary constraints on how *another* fundamental being is fundamentally, or on the fundamental relations in which they stand. So, for instance:

²¹Is there such a sequence? Yes. Take some finite and continuous path C of matter-filled points (that doesn’t intersect itself), and label one end “the origin”. Let each point x along C be labelled by the length of the segment of C that runs from C ’s origin to x divided by the total length of C . Then let S be the countably infinite sequence of matter-filled points such that S_n is the point labelled by the number $\frac{1}{2^n}$.

- For any distinct fundamental beings x_1 and x_2 and any fundamental natures P_1 and P_2 and any fundamental relation R (other than identity), if possibly x_1 instantiates P_1 and possibly x_2 instantiates P_2 and possibly x_1 stands in R to something and possibly something stands in R to x_2 , then possibly x_1 instantiates P_1 and x_2 instantiates P_2 and x_1 stands in R to x_2

More generally, we have a Patchwork Principle for Possibilities²²:

- For any pairwise distinct fundamental beings $x_1 \dots x_N$ and any fundamental natures $P_1 \dots P_N$ and any pattern of instantiation PI among N things of some fundamental relation R (other than identity), if possibly x_1 instantiates P_1 ... and possibly x_N instantiates P_N , and possibly x_1 stands in pattern PI to some things, ... and possibly some things stand in pattern PI to x_N , then possibly x_1 instantiates P_1 and x_N instantiates P_N and x_1, \dots, x_N stand in pattern PI

Supposing, as Lewis does, that spatiotemporal relations are fundamental, it is to a truth of that form that Lewis refers in the passage cited above.

The Patchwork Principle for Possibilities follows from the denial of inexplicable constraints for the simple reason that every fundamental nature and every fundamental relation is *fundamental*, and so is never instantiated in virtue of *anything at all*. Thus nothing could explain an absolutely necessary connection that violated the Patchwork Principle for Possibilities: nothing could explain why the “choices of fundamental natures” among available alternatives made by some fundamental beings (and/or their “choices of fundamental relations”) would require certain “choices of fundamental natures” among available alternatives made by other fundamental beings, *since nothing explains those choices in the first place*.²³

Likewise with regard to probability: how one fundamental being is fundamentally ought not raise or lower the probability of whether *another* fundamental

²² ‘N’ can be replaced by any ordinal, finite or infinite.

²³For a fuller discussion of this argument, see Segal [2014].

Note: It is here that I tacitly assume the falsity of counterpart theory. As I’ve formulated it, the Patchwork Principle for Possibilities makes de re modal claims. According to counterpart theory, such de re modal claims are to be understood as claims about a thing’s counterparts. But similarity in extrinsic respects can be relevant to whether two things are counterparts (Lewis [1986b, pp. 88–9]). So if counterpart theory is true, there might well be some explanation of a violation of Patchwork Principle for Possibilities. The same goes, although not as straightforwardly, for the Patchwork Principle of Probabilities.

In truth, I could reformulate Patchwork Principle for Possibilities entirely in terms of fundamental (or intrinsic) natures, as I have done in Segal [2015], or in terms of *duplicates*, as Lewis (ibid.) does. The reformulated principle follows from the denial of inexplicable constraints whether or not counterpart theory is true, since the reformulated principle makes no de re modal claims at all. Unfortunately, I see no way to reformulate the Patchwork Principle of *Probabilities* in an analogous manner. So for the sake of consistency I formulate both of them as de re modal claims and simply assume the falsity of counterpart theory.

being is fundamentally such-and-such, nor should the fundamental relations in which it stands do so, at least so far as so-called intrinsic probability is concerned. By ‘intrinsic probability’ I mean that measure function that captures the objective and necessary facts about how much of modal space every proposition takes up.²⁴ Letting ‘P (*)’ represent intrinsic probability, we can put an instance of the claim this way²⁵:

- For any distinct fundamental beings x_1 and x_2 and any fundamental natures P_1 and P_2 and any fundamental relation R ,

$$\begin{aligned} &P(x_1 \text{ instantiates } P_1 \ \& \ x_2 \text{ instantiates } P_2 \ \& \ x_1 \text{ and } x_2 \text{ stand in } R \mid \\ &x_1 \text{ and } x_2 \text{ exist}) = \\ &P(x_1 \text{ instantiates } P_1 \mid x_1 \text{ and } x_2 \text{ exist}) * P(x_2 \text{ instantiates } P_2 \mid x_1 \\ &\text{and } x_2 \text{ exist}) * P(x_1 \text{ and } x_2 \text{ stand in } R \mid x_1 \text{ and } x_2 \text{ exist}) \end{aligned}$$

More generally, we have a Patchwork Principle for Probabilities²⁶:

- For any pairwise distinct fundamental beings $x_1 \dots x_M$ and any fundamental natures $P_1 \dots P_M$ and any pattern of instantiation PI among M things of some fundamental relation R ,

$$\begin{aligned} &P(x_1 \text{ instantiates } P_1 \ \& \dots \ x_N \text{ instantiates } P_N \ \& \ x_{N+1} \text{ instantiates } \\ &P_{N+1} \ \& \dots \ x_M \text{ instantiates } P_M \ \& \ x_1, \dots, x_M \text{ stand in } PI \mid x_1, \dots, x_M \\ &\text{exist}) = \\ &P(x_1 \text{ instantiates } P_1 \ \& \dots \ x_N \text{ instantiates } P_N \mid x_1, \dots, x_M \text{ exist}) * P \\ &(x_{N+1} \text{ instantiates } P_{N+1} \ \& \dots \ x_M \text{ instantiates } P_M \mid x_1, \dots, x_M \text{ exist}) * \\ &P(x_1, \dots, x_M \text{ stand in } PI \mid x_1, \dots, x_M \text{ exist}) \end{aligned}$$

The Patchwork Principle for Probabilities follows from the denial of inexplicable constraints for the same reason that its more well-known sibling does: every fundamental nature and every fundamental relation is *fundamental*, and so is never instantiated in virtue of *anything at all*. Thus nothing could explain an absolutely necessary connection that violated the Patchwork Principle for Probabilities: nothing could explain why the “choices of fundamental natures” among available alternatives made by some fundamental beings (and/or their “choices of fundamental relations”) would raise or lower the intrinsic probability of certain “choices of fundamental natures” among available alternatives made by other fundamental beings, *since nothing explains those choices in the first place*.

²⁴For a defense of the notion and its coherence, see §3.6.1.

²⁵I define the conditional intrinsic probability $P(\alpha \mid \beta)$ in the usual way, as the quotient, $\frac{P(\alpha \& \beta)}{P(\beta)}$

²⁶‘N’ and ‘M’ can be replaced by any ordinal, finite or infinite, the only constraint being that $N \leq M$.

3.3 WHAT IS OUR BACKGROUND KNOWLEDGE?

What relevant information is included in our background knowledge? It includes a fact about fundamentality, viz. the fact that **being matter-filled** is fundamental. It includes a fact about loneliness, viz. the fact that a substantial number of points—more than measure 0—are lonely. And it includes a number of facts about the points in S , viz. the fact that they exist, and the fact that they are all matter-filled, and the fact that they stand in such-and-such a spatiotemporal arrangement. But it does not include the fact that they (or even some of them) are friendly. Indeed, it includes no other facts about which other points are matter-filled (beyond the mere fact that a substantial number of points are lonely).

3.4 INTRINSIC PROBABILITY AND LIKELIHOOD

Finally, I assume a certain link between intrinsic probability and likelihood, viz.

(*) If $P(\alpha) = P(\beta)$, then $L(\alpha) = x$ iff $L(\beta) = x$ ²⁷

The defense of (*) is straightforward: if $P(\alpha) = P(\beta)$, then it is rationally permissible for a subject wholly ignorant of contingent matters to believe it is. And so if a particular, wholly ignorant subject is rationally permitted to have a credence of x in α , she is rationally permitted to reason her way to having a credence of x in β (and vice versa).²⁸ She is permitted to do so by having a credence of x in α and believing that $P(\alpha) = P(\beta)$, and so concluding that her credence in β ought to equal her credence in α . Note well: I do *not* assume that necessarily, if a wholly ignorant subject is rationally permitted to have a credence of x in the proposition that p , then the intrinsic probability of the proposition that p equals x . That is a much stronger claim, and one for which I have no need.

3.5 THE ARGUMENT FOR A LIKELIHOOD OF ZERO

With our elaborations in hand, we can now provide a more rigorous argument for Premise (1).²⁹ Let us suppose the truth of Humean Supervenience, ST-F, and K. Thus, we are supposing, the Patchwork Principle of Probabilities is true, **being continuous with** is a fundamental relation³⁰, and **being matter-filled** is fundamental.

²⁷Here ' α ' and ' β ' are to be replaced by expressions formed in the usual way from propositional variables, truth-functional connectives, and the conditionalization symbol.

²⁸If α or β is replaced by an expression that contains the conditionalization symbol, then what is intended is the ratio of her unconditional credences in the relevant propositions.

²⁹Note: I assume here that $L(\text{HS} \ \& \ \text{ST-F} \ \& \ \text{K}) > 0$. That is safe to assume in this context, since if it is false, (3) follows straightaway without going via premise (1).

³⁰Or, if that relation is not itself fundamental, there is some instantiated fundamental topological relation in virtue of which things stand in the relation **being continuous with** and that can serve the purposes of my argument equally well.

Conditional upon all that, whether the points with which a given point is *continuous* are matter-filled is probabilistically independent of whether *it* is matter-filled.³¹ That is, whether a given point is lonely or friendly is probabilistically independent of whether it is matter-filled.

What's more, for any *Ds* that are distant from each other, what's going on fundamentally in the *immediate vicinity* of any of the *Ds* is independent of what's going on fundamentally at any of the others and in the *immediate vicinity* of any of the others. (This is because, by definition of 'distant', there are neighborhoods, each surrounding one of the *Ds*, that do not overlap one another.) So whether one of the *Ds* is lonely or friendly is probabilistically independent of (a) whether any of the *other Ds* is lonely or friendly and (b) whether *any* of the *Ds* is matter-filled. Since the members of *S* are, by stipulation, distant from each other, whether some given member of *S* is lonely or friendly is probabilistically independent of (a) whether any of the *other* members of *S* is lonely or friendly and (b) whether *any* of the members of *S* is matter-filled.

Thus, let C_n be the proposition that S_n is friendly. Then, from (a) and (*),

$$L(\text{ORDER} \mid \text{HS} \ \& \ \text{ST-F} \ \& \ K) = \prod_{n=1}^{\infty} L(C_n \mid \text{HS} \ \& \ \text{ST-F} \ \& \ K)$$

Now, let K^- be our background knowledge "minus" the facts that S_1 is matter filled and that S_2 is matter-filled and so on. Then, from (b) and (*), for all n ,

$$L(C_n \mid \text{HS} \ \& \ \text{ST-F} \ \& \ K) = L(C_n \mid \text{HS} \ \& \ \text{ST-F} \ \& \ K^-)$$

So,

$$L(\text{ORDER} \mid \text{HS} \ \& \ \text{ST-F} \ \& \ K) = \prod_{n=1}^{\infty} L(C_n \mid \text{HS} \ \& \ \text{ST-F} \ \& \ K^-)$$

Now, what is the value of $L(C_n \mid \text{HS} \ \& \ \text{ST-F} \ \& \ K^-)$?³² How likely is it, conditional upon HS and ST-F and K^- , that an arbitrary point—perhaps matter-filled, perhaps not—is friendly? It's hard to say. I suspect it's vanishingly small, thanks to Humean Supervenience. But if I had a rigorous argument for that, I could have simplified my probabilistic argument considerably. So I will not assume that the probability is vanishingly small. But I will assume that it's less than 1. Condition-izing upon our background knowledge, which includes the fact that a substantial number of points—more than measure 0—are lonely, it has to be. But then it follows that $L(\text{ORDER} \mid \text{HS} \ \& \ \text{ST-F} \ \& \ K) = 0$.

³¹I am appealing here to the following corollary of the Patchwork Principle for Probabilities: For any pairwise distinct fundamental beings $x_1 \dots x_M$ and any fundamental natures $P_1 \dots P_M$ and any pattern of instantiation *PI* among *M* things of some fundamental relation *R*, $P(x_1 \text{ instantiates } P_1 \ \& \ x_2 \text{ instantiates } P_2 \ \& \dots \ x_M \text{ instantiates } P_M \mid x_1, \dots, x_M \text{ stand in } PI) = P(x_1 \text{ instantiates } P_1 \mid x_1, \dots, x_M \text{ stand in } PI) * P(x_2 \text{ instantiates } P_2 \ \& \dots \ x_M \text{ instantiates } P_M \mid x_1, \dots, x_M \text{ stand in } PI)$.

³²I assume that the value of this probability is the same for all n .

3.6 OBJECTIONS

Before I move on to the next premise I consider several objections.

3.6.1 Are There Intrinsic Probabilities?

One might object that there is no such thing as intrinsic probability, no unique measure function that captures the objective and necessary facts about how much of modal space every proposition takes up.³³ What is the intrinsic probability of there being rice cakes? One might reasonably think there is no answer to that question. And if there is no such thing as intrinsic probability, then the Patchwork Principle of Probabilities is no part of Humean Supervenience: either there is no such principle in the first place or it is trivially false and in no way follows from the denial of inexplicable constraints.

But taking this route out of the argument is costlier than it might initially seem. For I do not need to assume that there is a *unique* measure function, which captures the objective and necessary facts about how much of modal space a given proposition takes up. I need only assume that there is a *family* of such measures, such that (i) what is true according to all of the measures in the family is just plain true (objectively and necessarily), and (ii) if Humean Supervenience is true, then the Patchwork Principle of Probabilities holds for all of the measures in the family. Thus, if Humean Supervenience is true, there are objective and necessary facts about the *arithmetic relationship* between the probabilities of different propositions—in particular, that certain propositions are probabilistically independent—even if there are no such facts about the probabilities of individual propositions.

And while it may not be terribly costly to deny that there are objective and necessary facts about the probabilities of individual propositions, it's much more costly to deny that there are any such facts about the arithmetic relationship between the probabilities of different propositions.³⁴ First, denying that there are any such facts robs one of the best, and perhaps only, explanation of corresponding *epistemic* claims. The only credence it is permissible for one to have in the proposition *that Abe favors Bernie Sanders*, conditional upon just the proposition

³³See F.P. Ramsey's "Truth and Probability" in Ramsey [1960] for a classic statement of this denial. It should be noted, however, that the central target of Ramsey's objection is the claim that we have *knowledge* in a wide range of cases of the particular values of a proposition's intrinsic probability, while I have nowhere in my argument assumed that we do.

³⁴See Keynes [1921, chs. 3, 15] for an endorsement of a partial real-valued intrinsic probability function. (See also Plantinga [1993, 150].) Keynes similarly allows that some (although not all) propositions that are not 'measurable' (in his sense) can be equally, or more, or less probable than other propositions that are not 'measurable'. Thus, some propositions might have a lower and upper bound for their probability, without taking on any definite value in the interval between the bounds. Given a family of measure functions, probability has enough structure to capture those facts. But it has more structure still, in order to make room for an arithmetic relationship between such non-'measurable' propositions.

that 75% of Democrats under the age of thirty favor Bernie Sanders and Abe is a Democrat under the age of thirty, is 0.75. But why? Why couldn't one rationally have some other credence? It would seem that the only available explanation is that it is an objective, *non-epistemic* fact that the *ratio* between the probability of the conjunction of those propositions and the probability of the latter proposition is 0.75.³⁵ And if there is such an objective, non-epistemic fact, then surely it is *necessary* as well. That *ratio* is preserved under any change in contingent reality.

Second, if there are so-called physical probabilities, as is widely assumed, then there are objective, non-epistemic facts about the degree to which certain propositions are physically determined. For example, it will be an objective, non-epistemic fact that it is physically determined to degree 0.8 that this radon atom will decay in the next six days. So let us use ' $O()$ ' to symbolize the function that captures *those* facts. Then as long as ' $O(\alpha \mid O(\alpha) = x)$ ' is well defined—and it is: let it be defined as the quotient of unconditional $O()$ probabilities, which are themselves well-defined—it would seem to equal x , *and necessarily* so.³⁶ So if, as is widely assumed, there are objective, non-epistemic facts about the degree to which certain propositions are physically determined, then there are objective, non-epistemic, and *necessary* facts about the *ratios* of certain probabilities.

So there is good reason to believe that there are objective and necessary facts about the ratios of certain probabilities. But if there are such facts, then there is the family of measure functions that agree on all those facts. And if Humean Supervenience is true, then the Patchwork Principles of Probabilities holds for each of the measures in that family, *for the same reason that we thought it held for the uniquely correct measure function*, viz. the denial of inexplicable constraints.³⁷

³⁵See van Inwagen [1998].

³⁶I assume that if ' $O(\alpha)$ ' is well-defined, then so is ' $O(O(\alpha) = x)$ ', and that if ' $O(\alpha)$ ' and ' $O(\beta)$ ' are well-defined, then so is ' $O(\alpha \& \beta)$ '. I further assume that if the physical probability of α is x , then the physical probability of the proposition *that* the physical probability of α is x , is 1. It is, after all, completely physically determined that those are the physical probabilities.

³⁷Objection: one (or more) of the functions in the family can exhibit necessary connections of the sort prohibited by the Patchwork Principle, provided that at least one other function in the family doesn't exhibit such necessary connections: it wouldn't then be true that there are necessary connections of the prohibited sort, since it wouldn't be true according to all functions in the family that there are. (Thanks to an anonymous reviewer for this journal for raising this objection.)

Reply: while it wouldn't be true that there *are* necessary connections of the prohibited sort, it also wouldn't be true that there *aren't* such necessary connections, since it wouldn't be true according to all functions in the family that there aren't. There would thus be no fact of the matter as to whether there are or aren't. But first, it is hard (for me anyway) to see how there could be *this* sort of truth-value gap, once it's granted that there are objective and necessary facts about the ratios of certain probabilities. And second, the denial of inexplicable constraints has a nearly equally plausible extension: if there needs to be an explanation for any "gap" in modal space, there would presumably need to be an explanation of there being no fact of the matter as to whether a particular "gap" in modal space is filled. So then that extended denial of inexplicable constraints would be reason for thinking it *true* that there *aren't* necessary connections of the sort prohibited

But then the rest of the argument goes through as before, with (**) in place of (*):

(**) If for all P_i , $P_i(\alpha) = P_i(\beta)$, then $L(\alpha) = x$ iff $L(\beta) = x$.³⁸

If (*) is plausible, but for the nonexistence of a unique intrinsic probability function, then we ought to accept (**) in its stead.

3.6.2 Does Quantum Mechanics Muck Things Up?

One might object that quantum mechanics mucks up the argument in some way. Or, more precisely, that *certain interpretations of the quantum mechanical formalism* do some mucking.

On some interpretations, the state of the universe at a time, including the positions of all the particles at that time, is entirely given by the wavefunction. And further, on some such interpretations, the wavefunction (at least much of the time) fails to specify determinate positions for the particles; rather it specifies for each particle and each position a *probability* of the particle's being at that position. Putting the point in terms of our working framework of spacetime, the wavefunction (at least much of the time for most of the points) fails to specify whether it is **matter-filled** or not; rather, it specifies a value (between 0 and 1) for each point in spacetime that represents (something like) the **degree to which it is matter-filled** or the **probability of its being matter-filled**. It specifies a quantity rather than a quality.

And this seems to muck up the foregoing discussion in rather important ways. For one thing, ORDER—which is formulated in terms of the quality, **being matter-filled** (and others “built up” from it)—is not true and should not be part of our total evidence. And while that's irrelevant to the truth or falsity of premise (1), it guts the significance of the argument's conclusion.

Moreover, it is not the case, as I claimed, that most of the points in spacetime are not matter-filled, at least not in the relevant sense. (That is, it might be true that most do not have the quality, **being matter-filled**. But it's also true that most of them are matter-filled to *some* positive degree or with *some* positive probability. They're not, as we might say, matter-empty.) And so my claim to the contrary is not, or ought not to be, part of our background knowledge.

Quantum mechanics has a way of mucking things up. But, contrary to appearances, I don't think this is one of those things. If some such interpretation of the formalism is correct, then some of the details of the argument will have to be modified, but not its essentials. Consider the state space (a Hilbert space) H in which each point represents a possible quantum-mechanical state of all the particles (that is, a possible wavefunction of the universe) at a single time. Say that a

by the Patchwork Principle.

³⁸The domain of quantification is the set of measure functions in the family.

point in that state space is *occupied*, full stop, if there is some time t such that the possible wavefunction represented by that point is the actual wavefunction of the universe at t . No matter what interpretation one gives to the quantum-mechanical formalism there is a countably infinite sequence S^* of occupied, friendly* points in H that are distant from each other.³⁹ If one of the “problematic” interpretations of the quantum mechanical formalism is right, then let ORDER* be the claim that S^*_1 is friendly*, and S^*_2 is friendly*, and so on.⁴⁰

I claim that, like with regard to ORDER, ORDER* has a likelihood of zero given the conjunction of Humean Supervenience and ST-F, and for the same reason. The same claims of probabilistic independence that held true of the elements of S hold true of the elements of S^* . (With the obvious adjustments: whether some given member of S^* is lonely* or friendly* is probabilistically independent of (a) whether any of the *other* members of S^* is lonely* or friendly* and (b) whether *any* of the members of S is occupied.) But not because **being continuous* with** is a fundamental relation. It probably isn’t. Metrical and topological relations between points in an abstract space such as H are probably internal (in the sense that they are settled by the intrinsic natures of the relata), and the points in that space are probably not even fundamental.⁴¹ In any case, their being so is contrary to the assumption we made at the outset as to the nature of the fundamental beings. Rather, it is because any failure of probabilistic independence of loneliness*/friendliness* and occupation with regard to *those points* entails a corresponding failure of probabilistic independence of the fundamental features and fundamental relations—including the spatiotemporal ones—with regard to the genuinely fundamental points. If spatiotemporal relations are fundamental—and Humean Supervenience is true—then the fact that a certain possible wavefunction is the actual wavefunction at a certain time won’t raise or lower the intrinsic probability that *other* possible wavefunctions (even ones that are continuous* with the first) are actual at *other* times: what goes on at one time is probabilistically independent of what goes on at different times.

³⁹Say a point x is *continuous** with some points, the N s, iff x is not one of the N s, and x and the N s together constitute a continuous curve in H . Then say a point is *friendly** iff there are occupied points in H with which it is continuous*; otherwise, say it is *lonely**.

According to a number of the “problematic” interpretations of the QM formalism—even one version of the “collapse theory” (the so-called CSL model)—*every* occupied point in that state space is friendly*. But it suffices for our purposes that there are infinitely many occupied, friendly* points in H , and there *are* even according to standard versions of the collapse theory, since even according to those versions the wavefunction doesn’t evolve in a way that is *everywhere* discontinuous.

⁴⁰And our background knowledge, K , includes the fact that S^*_1 and S^*_2 and so on are occupied. But it does not include the fact that S^*_1 is friendly*, or that S^*_2 is friendly*, and so on. Indeed, it includes no other facts about which points are occupied.

⁴¹To forestall confusion, the Hilbert space under discussion is not the same as the $3N$ -dimensional configuration space (N is the number of particles). Some have argued that the latter is the fundamental concrete space. For discussion, see the papers in [Albert and Ney \[2012\]](#).

3.6.3 Why HS?

Finally, one might object that if my argument for premise (1) succeeds, then an analogous argument will succeed in showing that ORDER has a likelihood of 0 conditional upon the *negation* of HS.⁴² That is, that,

$$1'. L(\text{ORDER} \mid \neg\text{HS} \ \& \ \text{ST-F} \ \& \ \text{K}) = 0$$

For even more “robust” views about laws make ORDER no more likely than their Humean counterpart does. Just insofar as those views go—and ignoring contingent matters—there might well be no laws at all, let alone laws that ensure that the matter-filled points are arranged so as to make ORDER true. Indeed, the *nature* of laws all by itself would seem to have no probabilistic bearing on what laws there *are* and whether they ensure an orderly world.

And then since a premise analogous to (2) would seem to be true if the original is, we can conclude,

$$5'. L(\text{ST-NF} \mid \neg\text{HS} \ \& \ \text{ORDER} \ \& \ \text{K}) = 1$$

Although we can't go on to infer anything about Radical Pluralism conditional upon $\neg\text{HS}$ —since there is no plausible analogue of (6)—we can still infer from (5) and (5') the following *very* striking conclusion:

$$5''. L(\text{ST-NF} \mid \text{ORDER} \ \& \ \text{K}) = 1$$

That is: conditional just upon the meager background knowledge we have specified and the orderliness we observe, there is a likelihood of 1 that spatiotemporal relations are not fundamental! If our argument leads to that conclusion, the objection goes, then something must be amiss with our argument.

If my argument were indeed to lead to that conclusion, I'd be prepared to follow it where it led. But I don't think it does. Set aside the interesting but wrongheaded reply that according to a necessitarian view of laws, the laws are necessary truths, and hence even an agent wholly ignorant of contingent truths, but knowledgeable about necessary matters, would know the laws and hence could rationally have a non-zero conditional credence in ORDER.⁴³

⁴²Thanks to an anonymous reviewer for this journal for helping me see the need to address this objection.

⁴³This reply is wrongheaded since even according to the necessitarian view, it is still a contingent matter that the properties and relations that figure into the actual laws are instantiated: we might have had schmass instead of mass and schmatiotemporal relations instead of spatiotemporal relations, or we might have had nothing at all like either of them. (On some versions of necessitarianism this contingency leads to a contingency in the laws themselves: what's necessary are the *conditionals*, that if such-and-such properties and relations are instantiated, then these-and-those laws (in which those properties and relations figure) are true. The issue of whether this further

And set aside the more promising but still controversial reply that certain non-Humean views on the nature of laws do in fact make it more probable that there are laws that ensure the world is orderly.⁴⁴

The correct and simpler reply, I think, is as follows. HS is a conjunction of theses (four, as I've parcelled them out). The denial of HS is thus a disjunction of denials; so there are several ways for HS to be false. One such way is for it to be false that: *there are no inexplicable constraints on modal space, and hence the fundamental nature of each fundamental being is independent of those of all the other fundamental beings and of the fundamental relations in which it stands to the rest of them*. It is *that* plank of HS—and not the plank that endorses a broadly Humean view of laws—that does the heavy lifting in our argument for premise (1). So there is no analogous argument for (1'), not because the “shift” to a non-Humean view of laws would matter for the argument, but because a “shift” to a non-Humean view on *absolutely necessary connections between distinct existents*—i.e. to a view according to which there *are* absolutely necessary connections between distinct existents—would very much matter for the argument. If there are such necessary connections, then whether a given member of *S* is friendly might well raise or lower the probability of whether another member of *S* is friendly or matter-filled.⁴⁵

4 Interlude: Proposed Analysis

Premise (2) of the larger argument is that the likelihood of ORDER given the conjunction of Humean Supervenience and ST-NF is greater than zero. The claim

contingency obtains doesn't matter for our purposes.) Thus, our agent who is omniscient with respect to necessary truths still won't be rational in having a non-zero conditional credence in ORDER, if our original argument for (1) succeeds. Thanks to the anonymous reviewer who raised the objection for noting the wrongheadedness of this reply.

⁴⁴See [Hildebrand \[2013\]](#).

⁴⁵One might now wonder whether my argument at the very least establishes:

5''. $L(ST-NF \mid HS(a-b) \ \& \ ORDER \ \& \ K) = 1$ (where $HS(a-b)$ is the conjunction of the first two planks of HS).

The answer, I believe, is yes. But not because we have equally good reason to believe,

1''. $L(ORDER \mid HS(a-b) \ \& \ \neg HS(c-d) \ \& \ ST-F \ \& \ K) = 0$, and

2''. $L(ORDER \mid HS(a-b) \ \& \ \neg HS(c-d) \ \& \ ST-NF \ \& \ K) > 0$

We don't, because we don't have equally good reason to believe that $L(HS(a-b) \ \& \ \neg HS(c-d) \ \& \ ST-NF \ \& \ K) > 0$: at several points in my argument (§5.2) for the claim that $L(HS \ \& \ BSA-ST \ \& \ K) > 0$ (and hence $L(HS \ \& \ ST-NF \ \& \ K) > 0$), I rely on the analogy between a Humean view of laws and a “Humean” view of spacetime.

Rather, it's because $HS(a-b)$ entails HS, as I've argued in [Segal \[2015\]](#). So $L(HS \ \& \ ORDER \ \& \ K \mid HS(a-b) \ \& \ ORDER \ \& \ K) = 1$. That, conjoined with (5), implies (5'').

that things do *not* stand in any fundamental spatiotemporal relations, which is part of what we are conditionalizing upon, is neutral on whether anything stands in any spatiotemporal relations at all, whether spatiotemporal relations can be finitely analyzed in terms of fundamental features, and if so, how. But while that's so, my *argument* for premise (2) goes by way of arguing for a corresponding premise regarding a particular analysis of spatiotemporal relations. (For reasons that will shortly become apparent, I shall call the analysis in question the 'Best System Analysis of (Lawhood and) Spacetime', or 'BSA-ST' for short.) That is, I will argue for this claim:

$$2^*. L(\text{ORDER} \mid \text{HS} \ \& \ \text{BSA-ST} \ \& \ \text{K}) > 0$$

Since BSA-ST entails ST-NF—the former is one way the latter could turn out to be true—(2*) entails (2).⁴⁶

But, of course, I need to spell out what BSA-ST *says* in order to argue for (2*). BSA-ST is inspired by Lewis's Best System Account of lawhood.⁴⁷ Indeed, it is an extension of it: it is a Best System Account of lawhood and spatioemporal relations taken together.⁴⁸ Hence the name, "Best System Analysis of (Lawhood and)

⁴⁶From (2*) it follows that both $L(\text{ORDER} \ \& \ \text{HS} \ \& \ \text{BSA-ST} \ \& \ \text{K})$ and $L(\text{HS} \ \& \ \text{BSA-ST} \ \& \ \text{K})$ are greater than zero. From which it follows that both $L(\text{ORDER} \ \& \ \text{HS} \ \& \ \text{ST-NF} \ \& \ \text{K})$ and $L(\text{HS} \ \& \ \text{ST-NF} \ \& \ \text{K})$ are greater than zero.

⁴⁷See, inter alia, [Lewis \[1983\]](#) and [Lewis \[1994\]](#).

⁴⁸[Lewis \[1994, §4\]](#) pursues a similar strategy regarding lawhood and chances. He gives a Best System Account of lawhood and chances taken together, so as to avoid either taking chances as fundamental or neglecting probabilistic laws.

Theodore Sider [\[2001, §6.5\]](#) likewise pursues a similar strategy regarding lawhood and genidentity. He gives a Best System Account of lawhood and genidentity taken together, so as to avoid analyzing lawhood in terms of genidentity (the laws only take account of, or apply to, things whose stages stand in the genidentity relation) and genidentity in terms of lawhood (genidentity is a matter of earlier stages standing in certain causal or nomic relations to later stages).

It is noteworthy that because BSA-ST implies that both spatiotemporal relations *and* lawhood are non-fundamental, what is perhaps the most serious objection to Julian Barbour's [\[1994a, 1994b, 1999\]](#) version of the view that temporal relations are not fundamental (although spatial relations and a relation of simultaneity are) has no application to BSA-ST. The objection I have in mind is that on his view the laws, which are fundamental, are either sensitive to facts that are not themselves fundamental or implausibly convoluted. If the laws are identical to what physicists typically take them to be—differential equations, whose terms are derivatives with respect to time—then they are sensitive to facts that are not themselves fundamental. But how could there be fundamental laws, and hence fundamental truths, that say how things evolve in time if fundamentally there is no time? To avoid that problem Barbour in fact maintains (if I have him right) that the real laws, the laws that are fundamental and fundamentally laws, are not exactly what physicists typically take them to be. Instead, the real laws are something like this: the hyperplanes of simultaneity *could be* ordered so that such-and-such differential equations hold of them. Or, alternatively, something like this: the hyperplanes of simultaneity are as if they are ordered so that such-and-such differential equations hold of them. But this introduces the problem of convolution. As Frank Arntzenius puts it:

Spacetime”. Roughly, the analysis is this: the correct spatiotemporal arrangement of such-and-such fundamental beings is the arrangement ST that permits the best axiomatization of the state of affairs, *such-and-such fundamental beings being ST-arranged*, and the correct laws are the axioms of the best axiomatization.⁴⁹

Here’s a more fleshed-out version. First, say that

‘ $\langle L, ST \rangle$ is a candidate assignment to U ’ =_{df}

1. U is the set of fundamental beings
2. ST is an arrangement of (i.e., a specification of a topology and a metric for) the members of U
3. L is a set of statements that (a) are consistent with the set of fundamental beings being isomorphic to U with respect to fundamental natures, and (b) jointly entail that if the set of fundamental beings is isomorphic to U with respect to fundamental natures, then the members of that set are in arrangement ST ⁵⁰

Now, this seems a strange kind of theory to me. Indeed, it seems to me that in the relevant sense of ‘simple’ or ‘plausible’ it is not a simple or plausible theory. One way to see this is to realize that if such a theory is counted as simple, then we can easily manufacture lots of ‘simple’ theories which get rid of just about any objects, quantities, or properties that one wishes to get rid of for whatever reason. For instance, we could get rid of the quantity ‘electrical charge’ by adopting a theory which says: ‘There is no such quantity as electrical charge, but there is a way of assigning (make-believe) electrical charge values to all the objects in the universe such that the usual laws (of electromagnetism) hold relative to that assignment’.

[2012, p. 32]

This strikes me as right. (Although, as Arntzenius notes, it’s hard to say precisely what’s non-simple about these theories. He refers the reader to [Dorr \[2010\]](#) for a probing attempt to say it more precisely.) Of course, there are truths that are not simple, and the true and complete theory of the world might be rather complex. But the point remains that complexity of this sort must count, and count strongly, against any theory that exhibits it.

According to BSA-ST, on the other hand, no law is fundamentally a law, and some (perhaps all) laws might not be fundamental at all. So there is nothing objectionable about the laws being identical to what physicists typically take them to be: differential equations, whose terms are derivatives with respect to time. The problem of convolution does not arise, of course. But neither does the problem of sensitivity to facts that are not themselves fundamental. Non-fundamental facts—which is what the laws are, or could well be—can be sensitive to facts that are not themselves fundamental. So even though spatiotemporal relations are not fundamental, the laws can say how things evolve in time.

⁴⁹My proposal should not be confused with the one Nick Huggett [[2006](#)] puts forward, although his is also billed as a Best System Account of spacetime. His is a Best System Account of the metric structure of spacetime, assuming that at least some spatiotemporal relation, such as distance, is fundamental.

⁵⁰Two sets A and B are isomorphic with respect to fundamental natures iff there is a one-to-one mapping f from A to B such that for any fundamental nature N and any $x \in A$, $f(x)$ instantiates

Notice that the third condition guarantees that for any given set of all the fundamental beings, no set of statements can be paired with more than one arrangement to generate different candidate assignments to that set. This allows us to simply compare the strength and simplicity of candidate sets of sentences, in order to determine which is the right candidate: the winning candidate set of sentences automatically brings with it the winning arrangement. That is, we can say that,

‘ $\langle L, ST \rangle$ is the correct assignment to U ’ =_{df}

1. $\langle L, ST \rangle$ is a candidate assignment to U
2. For any L^* and ST^* such that (a) the conjunction of L ’s members is not equivalent to the conjunction of L^* ’s members and (b) $\langle L^*, ST^* \rangle$ is a candidate assignment to U , L strikes a better balance of strength and simplicity than L^*

The laws are the members of the first element of the correct assignment to the set of all fundamental beings, and all the fundamental beings are *spatiotemporally arranged* according to the second element of that correct assignment. That’s just what it is to be a law and just what it is for the fundamental beings to be spatiotemporally arranged suchwise. And spatiotemporal relations more generally—ones that hold among non-fundamental beings if such there be—are to be analyzed in terms of the spatiotemporal arrangement of the fundamental beings, perhaps along with other relations such as **parthood** or **set-membership**.

So goes the fleshed-out version of BSA-ST. Or *almost*. It needs just one tweak. As it stands it certainly delivers the wrong results as to how the actual fundamental beings—the points—are spatiotemporally arranged. For there is some spatiotemporal arrangement ST of the points according to which all the continuous time-like curves of matter-filled points are inertial ones (“straight” lines). (As we’d ordinarily put it: nothing accelerates.) But then consider the pair, $\langle L, ST \rangle$, where L is the singleton set whose sole member is the statement that all the continuous time-like curves of matter-filled points are inertial ones. That pair is a candidate assignment to the set of points. And it would seem to be the *correct* assignment, since it’s hard to imagine another set of “candidate statements” that is as simple and powerful as L .⁵¹ But then the points are arranged in such a way that all the continuous time-like curves of matter-filled points are inertial ones. And that is evidently not so.

N iff x instantiates N. For the definition of ‘fundamental nature’, see nt. 5.

The need for condition (a) is to avoid trivial satisfaction of condition (b).

⁵¹In any case, even if there is, the members of that set are certainly inconsistent with the points being spatiotemporally arranged the way they actually are. Then we can use *that* set to make the same point.

So let us modify the analysis by adding another feature of an axiomatization that is to be balanced alongside power and simplicity (and perhaps fit) in determining which is the best axiomatization of the fundamental facts. The catalogue of virtues that contribute to being the best such axiomatization of course includes power and simplicity, but should also include what I will call *sensitivity*: sensitivity is a matter of being appropriately sensitive to the fundamental properties. Things with *different* masses ought to behave *differently*, and likewise for things with different charge, spin, or whatnot. Or at least the more some axiomatization says they do, the more sensitive that axiomatization is. And an axiomatization of the fundamental facts needs to strike the best balance between power, simplicity, *and* sensitivity.⁵² The “candidate statement” that says that all the continuous time-like curves of matter-filled points are inertial ones may be simpler and more powerful than the actual laws, but the latter are *far* more sensitive than the former.

That sensitivity is indeed a desideratum of the laws, just as much power and simplicity are, is reflected in scientific practice. Physicists go about discovering the fundamental properties and laws of nature together: they wouldn’t claim to have *discovered* a fundamental property unless they also claimed to have uncovered laws *in which those properties figure*.⁵³

5 Premise 2: Likelihood of ORDER

Now we are in a position to argue for (2*), the claim that $L(\text{ORDER} \mid \text{HS} \ \& \ \text{BSA-ST} \ \& \ \text{K}) > 0$. Since the conditional likelihood is defined as the quotient, $\frac{L(\text{ORDER} \ \& \ \text{HS} \ \& \ \text{BSA-ST} \ \& \ \text{K})}{L(\text{HS} \ \& \ \text{BSA-ST} \ \& \ \text{K})}$, premise (2*) is true if and only if both the numerator

⁵²Note well that a set of statements might be quite sensitive—perhaps maximally sensitive—and still entail that in certain circumstances particular things with different masses will behave just the same; what’s more, they might entail that in certain *kinds* of circumstances *all* things with different masses will behave just the same. Indeed, that’s how things actually are. Newton’s second law says that the acceleration a body undergoes is proportional to the force exerted on it and inversely proportional to its own mass. And the law of universal gravitation says (in part) that the gravitational force exerted on a body is proportional to its mass. Each is sensitive to a thing’s own mass. But the conjunction of those two laws entails what Galileo had already noted: that two bodies subject only to their mutual gravitational force will experience the same acceleration regardless of their masses.

⁵³See Lewis [1983]: “Of course, the discovery of natural properties is inseparable from the discovery of laws. For an excellent reason to think that some hitherto unsuspected natural properties are instantiated—properties deserving of recognition by physics, the quark colours as they might be—is that without them, no satisfactory system of laws can be found...Thus my account explains...why the scientific investigation of laws and of natural properties is a package deal; why physicists posit natural properties such as the quark colours *in order to posit* the laws in which those properties figure, so that laws and natural properties get discovered together.” (emphasis mine)

and denominator are greater than zero. I will first argue that *supposing* the denominator, $L(\text{HS} \ \& \ \text{BSA-ST} \ \& \ K)$, is greater than zero, the numerator, $L(\text{ORDER} \ \& \ \text{HS} \ \& \ \text{BSA-ST} \ \& \ K)$, is also greater than zero. And then I will argue that the denominator is indeed greater than zero.

5.1 HOW LIKELY IS ORDER (GIVEN BSA-ST)?

We are tentatively supposing that $L(\text{HS} \ \& \ \text{BSA-ST} \ \& \ K)$ is greater than zero. So that conjunction, $\text{HS} \ \& \ \text{BSA-ST} \ \& \ K$, “takes up” a positive amount of likelihood space. And the question before us is: does its conjunction with ORDER likewise “take up” a positive amount of likelihood space? Equivalently, what proportion of the space “taken up” by $\text{HS} \ \& \ \text{BSA-ST} \ \& \ K$ is “taken up” by $\text{ORDER} \ \& \ \text{HS} \ \& \ \text{BSA-ST} \ \& \ K$: is it zero or positive?

In addressing this question, the first thing to note is that there is no argument analogous to the one in §3 that will establish an answer of *zero*. As we’ve noted, BSA-ST entails that spatiotemporal relations are not fundamental. So there’s no good reason to think that conditional upon the conjunction of Humean Supervenience and BSA-ST (and K), whether a given member of S is friendly is probabilistically independent of whether *it* is matter-filled: **being continuous with** won’t be a fundamental relation (and nor will any other topological relation). And thus the fact that a given point is matter-filled might well raise the probability that it is friendly.

But we can say more. Not only do we have no argument for a conditional likelihood of zero, given what BSA-ST says we have good reason to think that it’s *non-zero*. Our background knowledge K is somewhat meager, but it still says much about the points in S , viz. that they exist, that they are matter-filled, and that they are in the particular spatiotemporal arrangement that they are—which implies that there is in fact spatiotemporal structure. Conditional upon all of this—and upon the conjunction of BSA-ST and HS (and the rest of K)—how likely is ORDER?

I grant that it’s hard to give an exact or even approximate answer here. But I think it would be irrational to be absolutely certain that ORDER is false, or even to fail to have some non-zero credence in ORDER. For given what our background knowledge says, the truth of ORDER permits a vast simplification of the system of laws, as compared to those “embeddings” of the points in S according to which ORDER is false. And being a very simple system contributes to a significant extent to being the best system. But BSA-ST says (roughly) that things are spatiotemporally arranged in exactly that arrangement that permits the best system of laws. So taking BSA-ST (and K and HS) for granted, it seems rational to have at least *some* non-zero degree of confidence that the points in S do indeed lie on continuous matter-filled curves.⁵⁴

⁵⁴For those still skeptical, I should note that K can be enriched further in ways that don’t threaten the argument for premise (1). In particular, it can include a specification of the full-

5.2 HOW LIKELY IS BSA-ST?

The next and final order of business is to defend the claim that $L(HS \& BSA-ST \& K)$ is non-zero. My aim here is modest. I merely seek to show that there is no decisive objection against the conjunction of BSA-ST and Humean Supervenience. Or, at least that there is no decisive objection against the conjunction that isn't an equally decisive objection against Humean Supervenience all by itself. If I succeed in showing that, then assuming, as we are, that $L(HS \& K)$ is non-zero, it seems that I will have succeeded in showing that $L(HS \& BSA-ST \& K)$ is likewise non-zero. An adherent of Humean Supervenience ought not to be so confident in the falsity of BSA-ST that she gives it *no* (positive) credence at all.

I will consider two objections to BSA-ST (and hence to its conjunction with Humean Supervenience). In both cases, I argue that if the objection is decisive, then one very much like it with the same force can be levelled at Humean Supervenience itself. Of course, this response does nothing to show that the objections are misguided, when targeting BSA-ST or Humean Supervenience or their conjunction. But the response does show that the objections are misguided, when targeting premise (2) of my argument. And of course, there might be *other* decisive objections to the conjunction of BSA-ST and Humean Supervenience that are not objections to Humean Supervenience. But I am not aware of any.⁵⁵

blown fundamental natures of each of the points in S . And if the fundamental natures are chosen judiciously—and the spatiotemporal arrangement of the points in S is further specified in a judicious way—then the conditional likelihood of ORDER will be even more evidently non-zero. For example, we might specify that all of the points in S have the very same fundamental nature, and that they are arranged in such a way that they would lie on a single, continuous, *inertial* path if they were to be connected one to the other via continuous, inertial paths. (In the construction of S in nt.21 we could have started with a finite, continuous, and *inertial* path.) These further specifications and concomitant enrichments of K would not affect my argument for premise (1), since even conditionalizing upon that enriched K (together with $HS \& ST-F$), the friendliness of a given point is probabilistically independent both of its own fundamental nature and of the friendliness of the other points in S .

But I acknowledge that I have not given any *argument* for a nonzero likelihood, conditional upon BSA-ST and HS and (even the enriched) K : I have provided nothing more than what I take to be a *good reason*—and which I think many readers will also take to be a good reason—to think it's nonzero. Recall, however, that my aim is to explore one possible avenue to Radical Pluralism, not to compel everyone to believe it.

⁵⁵Some philosophers have objected to theories in quantum cosmology according to which “spacetime is emergent” on the grounds that such views are empirically incoherent: if the theory is true, goes the objection, then we can have no empirical evidence for it. (See Maudlin [2007a] and Barrett [1999].)

To the extent that I understand the objection, I believe it targets theories that *eliminate* spacetime and spatiotemporal relations, or at the very least fail to imply either the existence of spacetime or the instantiation of spatiotemporal relations. In J.S. Bell's [2004] terminology, the theories either fail to imply or explicitly deny that spacetime regions and spatiotemporal things are *beables*. But BSA-ST does no such thing. BSA-ST implies that if there are some fundamental beings, then they

5.2.1 Scientifically Revisionary

One might object to BSA-ST on the grounds that it has implications that are scientifically revisionary. For if BSA-ST is true, then the actual laws jointly entail that if the set of fundamental beings is isomorphic under duplication to the actual points, then the members of that set are in the spatiotemporal arrangement they are actually in. But then the actual laws say more, and less is nomologically possible, than scientific practice suggests. For scientists take to be *models of the laws* scenarios in which the spatiotemporal distribution of matter-filled points (propertied just as the actual matter-filled points) differs from the actual distribution. (Consider models in which the initial conditions differ from actuality, but only in spatiotemporal respects.) And if scientists take these scenarios to be models of the laws, then, the objection concludes, we ought to take them to be nomologically possible, contrary to BSA-ST. Call this *the Objection from Scientific Revision*.

Here I say that the Objection from Scientific Revision is a decisive objection against BSA-ST only if there is an objection very much like it that is equally decisive against Humean Supervenience. But showing this requires some care.

Let's first introduce a distinction between two senses in which a scenario might be said to be nomologically possible (relative to a possible world):

- 'S is a nomologically possible₁ scenario in w' =_{df} S is compossible with the *truth* of those claims that are laws in w, i.e. there is a world w' such that S obtains in w' and the propositions that are laws in w are *true* in w'
- 'S is a nomologically possible₂ scenario in w' =_{df} S is compossible with the *lawhood* of those claims that are laws in w, i.e. there is a world w' such that S obtains in w' and the propositions that are laws in w are *laws* in w'

A scenario might be nomologically possible₁ in w while not being nomologically possible₂ in w, but not vice versa.⁵⁶

The Objection from Scientific Revision requires a premise employing only nomological possibility₁, since my proposed analysis has as a consequence that any scenario in which the spatiotemporal distribution of matter-filled points (propertied

are spatiotemporally arranged in some way or other; and if BSA-ST is right, then it of course implies that if there are some fundamental beings, then they are spatiotemporally arranged *in such-and-such a way*, where that is the way they actually are arranged. So BSA-ST is not empirically incoherent, even if the quantum cosmological theories in question are.

I should acknowledge that Lewis's Modal Realism gives rise to a decisive objection to the conjunction of Humean Supervenience and BSA-ST that isn't a decisive objection to Humean Supervenience all by itself (see nt. 7). So I should make explicit that the denial of Modal Realism is part of our background knowledge: it is an unfortunate consequence of this that my argument would not move the greatest latter-day denier of necessary connections.

⁵⁶As long as lawhood entails truth and what is a law in one world could be true but not a law in another world.

just as the actual matter-filled points) differs from the actual distribution is not even nomologically possible₁. That is, the Objection from Scientific Revision requires only this premise:

- SCIENTIFIC MODELING₁: If scientists take a certain scenario to be a model of the laws, then we ought to take that scenario to be nomologically possible₁,

not its stronger counterpart that employs nomological possibility₂:

- SCIENTIFIC MODELING₂: If scientists take a certain scenario to be a model of the laws, then we ought to take that scenario to be nomologically possible₂

And SCIENTIFIC MODELING₁ isn't inconsistent with Humean Supervenience, nor does it *obviously* commit one to the falsity of Humean Supervenience.

But it seems to me that we have reason to believe SCIENTIFIC MODELING₁ only if we have equally good reason to believe SCIENTIFIC MODELING₂. For presumably our reason to believe the former goes something like this: If scientists take a certain scenario to be a model of the laws, then they are taking that scenario to be one of the ways the world could have *unfolded in accordance with the laws*. But then they are taking the scenario to be nomologically possible₂. And so we too ought to take it to be nomologically possible₂. And if we ought to take it to be nomologically possible₂, then we ought to take it to be nomologically possible₁. And so we ought to take it to be nomologically possible₁. As is manifest, if this provides us with good reason to believe SCIENTIFIC MODELING₁ then it provides us equally good reason to believe SCIENTIFIC MODELING₂.

And if SCIENTIFIC MODELING₂ is true, then we ought to deny Humean Supervenience. For scientists take an empty world (a possible world in which no spacetime point is matter-filled), for example, as a model of the actual laws, *as well as of other rival sets of laws*; that is, of other possible laws whose lawhood entails counterfactuals incompatible with those entailed by the lawhood of the actual laws. And so if SCIENTIFIC MODELING₂ is true, then we ought to think there's a possible empty world in which the actual laws are the laws and a possible empty world in which a rival set of laws are the laws.⁵⁷ But they can't very well be laws in the same world since the lawhood of the one entails counterfactuals incompatible with those entailed by the lawhood of the others. So we ought to think there are two possible empty worlds. And yet if Humean Supervenience is true, there is only one empty world. So if SCIENTIFIC MODELING₂ is true, then we ought to deny Humean Supervenience.⁵⁸

To summarize: the Objection from Scientific Reasoning is decisive only if we have a decisive reason to believe SCIENTIFIC MODELING₁. And we have a decisive reason to believe SCIENTIFIC MODELING₁ only if we have a decisive reason

⁵⁷I assume that if SCIENTIFIC MODELING₂ is true, then so is a generalized version thereof that applies not only to the actual laws but to merely possible laws.

⁵⁸See Maudlin [2007b, p. 67-8] for a version of this argument.

to believe SCIENTIFIC MODELING₂. And we have a decisive reason to believe SCIENTIFIC MODELING₂ only if we have a decisive reason to believe something such that if *that* thing is true, then we ought to deny Humean Supervenience. So the Objection from Scientific Revision is a decisive objection against BSA-ST only if there is an objection very much like it that is equally decisive against Humean Supervenience itself.

But wait: one might point out an objection in the vicinity of the Objection from Scientific Revision—it's a truncated version of that objection—that has no parallel objection to Humean Supervenience itself. Instead of going on to note that BSA-ST forecloses certain *nomological possibilities* that are countenanced by scientific practice, which is something we can say about Humean Supervenience itself, the truncated objection stops after noting that if BSA-ST is true, then the actual laws say more—there are, in effect, *more laws*—than those of which scientists speak. And one might think that that all by itself is objectionable, and objectionable in a way that Humean Supervenience isn't. Humean Supervenience does not imply that there are more laws than those of which scientists speak, even if it forecloses certain nomological possibilities₂ that are countenanced by scientific practice. Call this the Truncated Objection from Scientific Revision.

There is, I acknowledge, an added cost here to BSA-ST over bare Humean Supervenience.⁵⁹ And perhaps the cost is high. But is it so high that the Truncated Objection from Scientific Revision constitutes a *decisive* objection to BSA-ST? It seem to me that it doesn't, if the original Objection from Scientific Revision does not itself constitute such an objection. It's not as though the actual laws would be

⁵⁹One might think that the cost can be avoided entirely by modifying BSA-ST. In particular, we can let BSA-ST go silent on *lawhood* and explicit on *nomological possibility*. That is, instead of the analysis concluding that “the laws are the members of the first element of the correct assignment to the set of all fundamental beings...that's just what it *is* to be a law...,” it'll conclude as follows: “the nomologically possible scenarios/propositions are the scenarios/propositions that are compossible with the truth of all the members of the first element of the correct assignment to the set of all fundamental beings...that's just what it *is* to be nomologically possible.” (And the nomologically necessary scenarios/propositions are those whose negations are not nomologically possible.) So stated, BSA-ST itself says nothing about what the *laws* are, just about what's nomologically possible (where that latter notion is not to be defined in the manner of *either* nomological possibility₁ or nomological possibility₂). In particular, it doesn't say that all the members of the first element of the correct assignment are laws, and so isn't subject to the Truncated Objection.

But we can ask what the conceptual relationship between *lawhood* and *nomological possibility/necessity* is supposed to be: is it the case that the laws entail every nomologically necessary truth or not? Well, either they do or they don't. If they do, then the Truncated Objection rears its head again, since the laws of which the scientists speak don't entail every nomologically necessary truth; the laws of which they speak are strictly weaker than the conjunction of all nomologically necessary truths. So the actual laws must be stronger, must say more, than the laws of which the scientists speak. If, on the other hand, it's not the case that the laws entail every nomologically necessary truth, then that's a cost in its own right. It would mean that there are truths that are nomologically necessary but not required by the laws. But what could that mean? I would have thought that would be a conceptual falsehood.

inconsistent with or independent of the laws of which scientists speak, supposing BSA-ST is correct: the actual laws would *properly include*—in the sense of strictly entailing—the scientists’ laws. They would just add some extra content. And the stick-to-her-guns adherent of Humean Supervenience has already conceded that on her view, there are scenarios that scientists take to be models of the laws but which *could not have unfolded in accordance with the laws*, i.e. that the scientists have not fully grasped what the laws demand. It seems to me then that a Humean ought not be so antecedently confident that the content of the actual laws is exhausted by what scientists speak of that she gives BSA-ST no (positive) credence at all before considering the evidence of ORDER.

5.2.2 Perceptual Judgment

One might object to BSA-ST on the grounds that it is inconsistent with the rationality of our ordinary perceptual judgments. For according to BSA-ST, spatiotemporal relations are extrinsic. Indeed, they are *global*, in that they are extrinsic to absolutely everything. In order to ascertain whether some things stand in a certain spatiotemporal relation, God would have to survey the whole universe, and, moreover, see that there wasn’t anything *else* in the universe. But then either we can perceive some things standing in a global relation, or we can’t perceive the cat’s being on the mat. And if we can’t *perceive* the cat’s being on the mat—and spatiotemporal relations are global, and hence have implications for how the world is beyond the region we can perceive—then we can’t even *rationally believe* that the cat is on the mat. So if BSA-ST is true, then either we can perceive some things standing in a global relation or we can’t rationally believe that the cat is on the mat. And both disjuncts are false. So BSA-ST is false. Call this *the Objection from Perceptual Judgments*.

Here again I say that the Objection from Perceptual Judgments is a decisive objection against BSA-ST only if there is an objection very much like it that is equally decisive against Humean Supervenience. For according to Humean Supervenience, causal relations, nomic properties, and dispositions are all extrinsic. Indeed, they are *global*, in that they are extrinsic to absolutely everything. In order to ascertain whether some things stand in a certain causal relation, or instantiate some nomic property or disposition, God would have to survey the whole universe, and, moreover, see that there wasn’t anything *else* in the universe. But then either we can perceive some things standing in a global relation, or we can’t perceive any of the following: (a) the cat’s being on the mat now being caused by the cat’s being on the mat a second ago, (b) the glass’s unmanifested disposition to break, and (c) mass’s nomically necessitating attraction to other massive objects. And if we can’t perceive any of those things—and causal relations, nomic properties, and dispositions are all global, and hence have implications for how the world is beyond the region we can perceive—then we can’t even rationally believe any of the

following: (a') that the cat's being on the mat now was caused by the cat's being on the mat a second ago—and hence, since persistence entails causation, that the cat on the mat now *is the same cat* as the cat on the mat a second ago, (b') that this glass is disposed to break (although it never will), and (c') that it is a law of nature that massive objects attract one another. So if Humean Supervenience is true, then either we can perceive some things standing in a global relation, or we can't rationally believe any of (a'), (b'), and (c'). And both disjuncts are false. So Humean Supervenience is false.

I claim that the parallel objection to Humean Supervenience is as decisive as the original Objection from Perceptual Judgments. Each has two premises, and the analogues are just as plausible as the originals.

However obvious it is that we can rationally believe that the cat is on the mat, it's equally obvious, or nearly so, that we can rationally believe at least one of the following: that the cat on the mat now *is the same cat* as the cat on the mat a second ago, or that this glass is disposed to break (although it never will), or that it is a law of nature that massive objects attract one another.

And if we can, consistently with Humean Supervenience, *reason* our way to rational judgments about causation, dispositions, and laws of nature—despite our inability to *perceive* causal relations, dispositions, and nomic relations—then we can, consistently with BSA-ST (and with its conjunction with Humean Supervenience), reason our way (and in the very same manner) to rational judgments about spatiotemporal relations.

How, consistently with the conjunction of Humean Supervenience and \neg BSA-ST, would we reason our way to rational judgments about laws of nature, say? We would start with what we have observed, viz. such-and-such things standing in thus-and-such spatiotemporal relations. We would then determine the simplest systematization of those facts. This systematization comprises what the laws of nature *would be* if the observed things (and their parts) were all the things there were. Then we'd tentatively assume that the observed things are representative of all the things, in this sense: the laws of nature, the laws that hold for *all* things, are the same as what the laws of nature would be if the observed things (and their parts) were all the things there were. So we'd go on to infer that those claims of which said systematization are comprised are indeed the laws of nature. The assumption of the "Uniformity of Nature" was tentative, of course, and so we could learn that our rational judgments about laws of nature were in fact wrong. But that doesn't stop those judgments from being rational.

If *that's* right, then if we ask how, consistently with BSA-ST (and with its conjunction with Humean Supervenience), we would reason our way to rational judgment about spatiotemporal relations, the right answer to *that* question is this. We would start with what we have observed, viz. such-and-such things. Then we'd tentatively assume that the observed things are representative of all the things, in this sense: the laws of nature, the laws that hold for *all* things, are the same

as what the laws of nature would be if the observed things (and their parts) were all the things there were. So we'd go on to infer *both* the laws of nature and the spatiotemporal arrangement of the observed things. We simply *pretend* the observed things (and their parts) are all the things there are, and determine which spatiotemporal arrangement *ST* would permit the best systematization of (the fundamental parts of) such-and-such things being in arrangement *ST* and what that systematization would be. The pretense is harmless, since we've already assumed that the laws of nature are the same as what the laws of nature would be if the observed things (and their parts) were all the things there were. The assumption of the "Uniformity of Nature" was tentative, of course, and so we could learn that our rational judgments about the spatiotemporal arrangement of the observed things and the laws of nature were in fact wrong. But that doesn't stop those judgments from being rational.

So, I conclude, the parallel objection to Humean Supervenience is as decisive as the original Objection from Perceptual Judgments. And thus the Objection from Perceptual Judgment is a decisive objection against BSA-ST only if there is an objection very much like it that is equally decisive against Humean Supervenience itself.

But wait: one might point out an objection in the vicinity of the Objection from Perceptual Judgment—it's a truncated version of that objection—that has no parallel objection to Humean Supervenience itself. Instead of going on to note that BSA-ST implies a disjunction of an obvious falsehood and the claim that we can't *rationally believe* some commonplace truths, which is something we can say about Humean Supervenience itself, the truncated objection stops after noting that BSA-ST implies a disjunction of an obvious falsehood and the claim that we can't *perceive* things standing in any spatiotemporal relations. And one might think that that all by itself is objectionable, and objectionable in a way that Humean Supervenience isn't. Humean Supervenience might well imply a disjunction of an obvious falsehood and the claim that we can't perceive things possessing (unmanifested) dispositions or standing in any causal or nomic relations. But it is supposed to be more obvious that we can perceive things standing in a spatiotemporal relation than that we can perceive things possessing (unmanifested) dispositions or standing in causal or nomic relations. Call this the Objection from Perception.

There is, I acknowledge, an added cost here to BSA-ST over bare Humean Supervenience. And perhaps the cost is high. But is it so high that the Objection from Perception constitutes a *decisive* objection to BSA-ST? It seems to me that it doesn't, if the original Objection from Perceptual Judgment does not itself constitute such an objection. It's not as though BSA-ST implies a disjunction of an obvious falsehood and the claim that we can't *perceptually represent* a state of affairs in which some things stand in some spatiotemporal relation: as best as I can tell, BSA-ST is consistent with both the falsehood of that obvious falsehood *and* our ability to perceptually represent a state of affairs in which some things stand in

some spatiotemporal relation. And the stick-to-her-guns adherent of Humean Supervenience must in any case hold either that our perceptual judgments of things standing in some spatiotemporal relations can be rational even if BSA-ST is right, or that we can't rationally believe much at all. What's at issue then is a rather subtle matter: not whether we can perceptually represent things standing in a spatiotemporal relation, and not whether the beliefs about things standing in spatiotemporal relations formed (at least partly) on the basis of those perceptual representations can be rational, but whether what goes on in such cases constitutes genuine perception. It seems to me then that a Humean—who is already committed to the claim that many cases which we took to involve genuine perception don't in fact do so—ought not be *so* antecedently confident that what's going on in the spatiotemporal case is genuine perception that she gives BSA-ST no (positive) credence at all before considering the evidence of ORDER.

6 Conclusion

Once a Humean opens up even a sliver of likelihood space for BSA-ST, she ought to see that the likelihood of ORDER conditional upon BSA-ST, and hence conditional upon ST-NF, is greater than zero. And since the likelihood of ORDER conditional upon ST-F is zero, the likelihood of ST-NF, and hence Radical Pluralism, conditional upon her evidence, is overwhelmingly high. Supposing there is nothing *more* to the universe than a mosaic, a good case can be made that it is overwhelmingly likely that there isn't *even* a mosaic.⁶⁰

References

- David Z. Albert and Alyssa Ney, editors. *The Wavefunction: Essays in the Metaphysics of Quantum Mechanics*. Oxford University Press, Oxford, 2012. Forthcoming.
- Frank Arntzenius. *Space, Time, & Stuff*. Oxford University Press, 2012.
- Julian Barbour. *The End of Time: The Next Revolution in Physics*. Weidenfeld & Nicholson, 1999.
- Julian B. Barbour. The timelessness of quantum gravity: I. the evidence from the classical theory. *Classical and Quantum Gravity*, 11:2853–73, 1994a.

⁶⁰A version of this paper was presented at Tel Hai College. I would like to thank the audience, and especially Eli Pitcovsky, for their helpful feedback. The paper also benefitted from conversations I had with Bar Luzon, Jonathan Fiat, and Tyron Goldschmidt. Finally, an anonymous reviewer for this journal provided very perceptive comments, for which I am most appreciative.

- Julian B. Barbour. The timelessness of quantum gravity: Ii. the appearance of dynamics in static configurations. *Classical and Quantum Gravity*, 11:2875–97, 1994b.
- Jeffrey Alan Barrett. *The Quantum Mechanics of Minds and Worlds*. Oxford University Press, 1999.
- Helen Beebe. Does anything hold the universe together? *Synthese*, 149(3):509–533, 2006.
- Helen Beebe. Reply to Strawson: “David Hume: Objects and power”. In Stewart Duncan and Antonia LoLordo, editors, *Debates in Modern Philosophy: Essential Readings and Contemporary Responses*. Routledge, 2013.
- J. S. Bell. *Speakable and Unspeakable in Quantum Mechanics: Collected Papers on Quantum Philosophy*. Cambridge University Press, 2004.
- Cian Dorr. Of numbers and electrons. *Proceedings of the Aristotelian Society*, 110(2):133–181, 2010.
- Greg Egan. Dust. *Isaac Asimov’s Science Fiction Magazine*, July 1992.
- Thomas Gilovich, Robert Vallone, and Amos Tversky. The hot hand in basketball: On the misperception of random sequences. *Cognitive Psychology*, (17):295–314, 1985.
- Tyler Hildebrand. Can primitive laws explain? *Philosophers’ Imprint*, 13:1–15, 2013.
- Terence Horgan and Matjaž Potrč. Blobjectivism and Indirect Correspondence. *Facta Philosophica*, 2:249–70, 2000.
- Nick Huggett. The regularity account of relational spacetime. *Mind*, 115(457):41–73, 2006.
- William James. The sentiment of rationality. *Mind*, 4(15):317–346, 1879.
- William James. *Pragmatism*. Dover Publications, 1907.
- William James. *A Pluralistic Universe*. Harvard University Press, 1977.
- William James. *The Will to Believe and Other Essays in Popular Philosophy*. Harvard University Press, 1979.
- John Maynard Keynes. *A Treatise on Probability*. Dover Publications, 1921.
- Gottfried Wilhelm Leibniz. *Discourse on Metaphysics and Other Essays*. Hackett Publishing Company: Indianapolis, Indiana, 1991.

- David Lewis. New work for a theory of universals. *Australasian Journal of Philosophy*, 61(December):343–377, 1983.
- David Lewis. *Philosophical Papers, Volume 2*. Oxford University Press, Oxford, 1986a.
- David Lewis. *On the Plurality of Worlds*. Blackwell, Oxford, 1986b.
- David Lewis. Humean supervenience debugged. *Mind*, 103:473–90, 1994.
- E. Jonathan Lowe. There Are (Probably) No Relations. In *Metaphysics of Relations*, pages 100–112. Oxford University Press, UK, 2016.
- Tim Maudlin. Completeness, supervenience, and ontology. *Journal of Physics A: Practical and Theoretical*, 40:3151–71, 2007a.
- Tim Maudlin. *The Metaphysics Within Physics*. Oxford University Press, New York, 2007b.
- C.S. Peirce. Fifth paper: The order of nature. *Popular Science Monthly*, 12:203–17, 1878.
- Alvin Plantinga. *Warrant and Proper Function*. Oxford University Press, 1993.
- Frank P. Ramsey. *The Foundations of Mathematics and Other Logical Essays*. Littlefield, Adams, and co., 1960.
- Ben Rogers. *A.J. Ayer: A Life*. Grove Press, 1999.
- Jonathan Schaffer. The Internal Relatedness of All Things. *Mind*, 119:341–76, 2010a.
- Jonathan Schaffer. Monism: The Priority of the Whole. *Philosophical Review*, 119: 31–76, 2010b.
- Aaron Segal. Causal essentialism and mereological monism. *Philosophical Studies*, 169(2):227–255, 2014.
- Aaron Segal. Half-hearted humeanism. *Oxford Studies in Metaphysics*, 9:262–305, 2015.
- Theodore Sider. *Four-Dimensionalism*. Clarendon Press, Oxford, 2001.
- Peter Simons. External Relations, Causal Coincidence, and Contingency. In *Metaphysics of Relations*, pages 113–26. Oxford University Press, UK, 2016.
- Galen Strawson. David Hume: Objects and power. In Stewart Duncan and Antonia LoLordo, editors, *Debates in Modern Philosophy: Essential Readings and Contemporary Responses*. Routledge, 2013.

Galen Strawson. *The Secret Connexion: Causation, Realism, and David Hume: Revised Edition*. Oxford University Press: Oxford, 2014.

Peter van Inwagen. Probability and Evil. In *The Possibility of Resurrection and Other Essays in Christian Apologetics*. Westview Press, Boulder, Colorado, 1998.

Ryan J. Wasserman. Humean supervenience and personal identity. *Philosophical Quarterly*, 55(221):582–593, 2005.