Half-Hearted Humeanism

> *"The Many, if once irrevocably defined as real, and as essentially independent, can never again be linked by external ties. They indeed thenceforth remain strangers."* - Josiah Royce, *The World and the Individual*

1   Introduction

There are many concrete things, or so I shall suppose: substances such as teacups, mountains, and dogs; events such as wars, birthday parties, and elections; and maybe other sorts as well. Now here's a vague but suggestive question: what is holding all the concrete things together? What makes them "line up" the way they do? One answer to this question is, "Nothing at all. There's nothing whatsoever holding the pieces together. It's just one thing and then another." A fair number of contemporary metaphysicians accept something like this answer. They subscribe to a package of theses - four, by my count - that are Humean in spirit. What's common to all the theses is that they are elaborations of Hume's claim that the contents of the world "are entirely loose and separate". What's distinctive about each thesis is the *way* in which the world's contents are said to be loose and separate.

The first, core, thesis is simply about the way things could have been, period. "There is no object, which implies the existence of any other if we consider these objects in themselves," says Hume.[1] More generally, no object places any constraint on the way anything *else* is. This gives us a patchwork principle for possibilities: for any number of things, any ways each could be intrinsically, and any spatiotemporal arrangement, there is no impossibility in their each being those ways, in that very arrangement.

For example, I'm sitting here at my desk. But, claims the Humean, I, or at least some duplicate of me, could have been sitting here deskless and all alone, or at a desk of a different color or shape. There's nothing about me - other than my relational properties, like *being in front of a desk* - that absolutely guarantees that there be a desk here, or that the desk, if such there be, be a certain way. Or take two events, like my striking a match, followed by the match lighting. The Humean says that such a striking could have been followed by no lighting at all (even with the oxygen in the room as it actually was, etc.) or by a conflagration that consumed my house. Nothing with the force of logic makes them line up the way they do.

Of course, holding fixed the laws of nature as they are, some of those situations won't be possible. Presumably, given the laws of nature that are actually true - and the presence of oxygen in much the same quantity and distribution as was actually the case - my match striking had to cause a match lighting, in more or less the way it did. After noting this, we might be tempted to think that there are

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[1] Hume (1978), 86.

in fact *robust* causal or nomic connections "holding things together," even if there are no *absolutely* necessary connections. Indeed, causation and laws of nature are each alleged by some philosophers to genuinely hold the world's pieces together - at least those pieces that are events - much in the manner of glue. Enter the second Humean thesis, which denies that laws are glue-like, and the third Humean thesis, which denies that causation is glue-like.

The idea behind the glue imagery is this. To say that some law L is like glue is to say that for any sequence of events that instantiates L, it's *intrinsic* to that sequence *that* L is a law.[2] Consider the match striking and match lighting. There's probably no law that directly relates match strikings to match lightings, but pretend for the moment there is a law such as this: any match striking is followed by a match lighting. Call this law 'STRIKELIGHT'. Then my match striking and match lighting are related in the following way: they are such that STRIKELIGHT is a law. Of course, every other pair of things is also such that STRIKELIGHT is a law. But to say that STRIKELIGHT is like glue implies that the pair, {my match striking, match lighting}, has the property, *being such that STRIKELIGHT is a law*, not in virtue of my match striking or match lighting's relations (or lack thereof) to anything *else*, but solely in virtue of what those two events are like and the intrinsic relations they bear to one another. God can *inspect just those events* and "see" that STRIKELIGHT is a law. Or so goes the 'nomic glue' idea.

Similarly, to say that causation is like glue is to say that causation is an intrinsic relation; it is intrinsic to any pair of events that instantiates it. Take the match striking and lighting again. The striking caused the lighting. *That* the striking caused the lighting is not true in virtue of their relations (or lack thereof) to anything *else*, but solely in virtue of what those two events are like and the intrinsic relations they bear to one another. God can *inspect just those events* and "see" that the one caused the other. Or so goes the 'causal glue' idea.

One can see that Hume himself denied both of these ideas. On Hume's view, every law is just a universal generalization. But whether a certain non-trivial universal generalization is a law, and hence true, depends on what's going on *with everything there is* and on that's being *all* that's going on. So its being a law can hardly be intrinsic to a sequence of events. And the same holds, *mutatis mutandis*, for causation, since (according to at least one of Hume's accounts) to say that a certain event caused another *just is to say*, at least in part, that a certain non-trivial universal generalization is a lawful truth. And even on contemporary Hume-inspired views of laws and causation, which differ in important ways from Hume's own views, the denial of intrinsicness is preserved.[3] Thus the second and third Humean theses.

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[2] I am assuming that laws can have *instances*, and such instances are sequences of events. The idea is fairly intuitive, and I will not spend any time trying to make it more precise since my focus will be on the view that laws are *not* intrinsic to *any* events whatsoever.

[3] For qualifications of this claim, see §2.3.

Finally, adds the fourth thesis, there is no causal or nomic *straightjacket* to which the particular matters of fact must *conform*. Quite the opposite. The non-causal non-nomic truths wholly determine the causal and nomic truths, in at least this sense: the distribution of all properties and relations, causal and nomic ones included, globally supervenes on the distribution of non-causal, non-nomic properties and relations. So once God settles all the non-causal non-nomic questions, there's nothing more to settle.

These four theses constitute a tidy package. David Lewis (1986a, 1986b) was its foremost defender in recent years; others have followed suit in adopting it wholesale.[4] Indeed, there is a fairly natural chain of reasoning from the first, core, thesis, to the others. It goes like this[5]: if the first thesis is true, then there can't be any absolutely necessary connections between cause and effect or between whatever things are "connected" by a law of nature; that is, *causation* and *lawhood* can't be analyzed as a species of *entailment*. But then how are they to be reductively analyzed? At this point the philosopher thinks long and hard and sees no *local* facts in terms of which such analyses can be given; and as a matter of fact, it doesn't seem like widening her lens to encompass anything less than the whole of the concrete world is adequate to provide the materials for a reductive analysis of those concepts. But once she *does* widen her lens to that extent, the materials for a plausible analysis emerge: certain patterns in the particular matters of fact - perhaps the most simple and powerful ones - can serve as the laws, and then *causation* can be analyzed in terms of *lawhood*. And so it is that causation and laws are extrinsic; and since they are being *analyzed* in terms of the non-causal and non-nomic features of the world, they of course globally supervene on those features as well.

Despite how intuitive this chain of reasoning sounds, it contains several weak links; perhaps most importantly, it assumes without argument that *causation* and *lawhood* can be reductively analyzed in non-causal and non-nomic terms.[6] One could resist the whole chain of reasoning by simply denying that *there is* any reductive analysis of one, or both, of those concepts.[7] One who resists at that point

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[4]See Hawthorne (2006a), pp. 126-127, for a summary of the Lewisian package; the package discussed by Hawthorne includes several more theses than I will consider here.

[5]Assuming Hume himself accepted something like the whole package - and there has been a recent flurry of scholarly activity surrounding the question of whether Hume in fact endorsed the third thesis (no causal glue) or anything like it (see Strawson (1989, 2002) and Broackes (1993)) - his reasoning seems to at least have incorporated what follows in the text.

[6]Here is another place to balk: the version of the first thesis with which I will be working (see §2.2) is consistent with *causation* being a species of *entailment*, since the thesis requires only the possibility of an *intrinsic duplicate* of the cause not followed by an intrinsic duplicate of the effect; but it could very well be impossible – at least as far as the first thesis is concerned – for the cause itself (i.e., the event which is the cause) not to be followed by the effect (i.e., the event which is the effect).

[7]See Carroll (1994) and Maudlin (2007, ch. 1) for a defense of primitivism about laws; Armstrong's (1985) view about laws is not, strictly speaking, primitivist, but his analysis of lawhood is in terms of the notion of *nomic necessitation*, which is surely a nomic concept. And see Tooley

would appear to be free to accept only some parts of the package. So, one might reasonably think, for instance, that there are no *absolutely necessary* connections between distinct things (no 'superglue' we might say), but that there are nevertheless weaker connections, causal or nomic, that are intrinsic to the event pairs whose members are so related. And, even if one goes along with the Humean in denying such *intrinsic* connections, one could still reasonably hold that causal and nomic facts are *further* facts that don't supervene on the non-causal non-nomic facts, and which perhaps constrain the way the non-causal non-nomic facts turn out.

Indeed, some philosophers have endorsed the first thesis, but rejected the others. David Armstrong is a good example. While he has been a prominent defender of the first (no 'superglue') Humean thesis (1989, 1997), here is what he has to say about the second and third (no 'glue') theses:

> I now indicate briefly a consequence of combining the identification of singular causes with instantiations of a law (or laws) with my view, argued at length elsewhere, that laws are relations of universals...
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> Hence singular causation will be a completely intrinsic relation. The causal structure of a process will be determined solely by the intrinsic character of that process. This result was unsought, but I think it is a welcome consequence of my theory of laws. By contrast, any Hume-inspired theory of laws makes the lawlike nature of an instantiation of the law an extrinsic property of the instantiation. (2004)[8]

And, in much of his work (1985, 1989, 1997), he has denied the fourth, global supervenience thesis.[9] My impression is that he is far from being alone in his choosiness. The core Humean thesis commands a much more widespread allegiance among contemporary philosophers than the other Humean theses.[10]

Let's call any position which, like Armstrong's, accepts the first thesis but denies at least one of the others, a 'Half-Hearted Humean' position. I will argue that, contrary to appearances, any Half-Hearted Humean position is inconsistent. The only viable options are Wholehearted Humeanism and a denial of the core Humean thesis. The arguments will follow shortly, but first I have to state the theses more precisely.

(1988) and Menzies (1999) for a defense of anti-reductionism about causation.

[8] See also Tooley (1988) and Menzies (1999) about causation.

[9] See also Tooley (1977) and Carroll (1994).

[10] Although heterodoxy about the core Humean claim has seen a recent upsurge, coming from the ranks of so-called "new essentialists"; see, e.g., Bird (2007, §8.1.1.1), Molnar (2007, §11.3), and Wilson (2010a, 2010b).

2   Preliminaries

2.1   INTRINSICNESS

In expressing the first three theses, I have made use of notions such as *being intrinsic* and *being intrinsic to something*, so let me say a bit about what those amount to.

The intuitive idea is this: a property P is intrinsic to x if x has P solely in virtue of the way it is, and not (even partly) in virtue of its relations, or lack thereof, to things other than its parts. Otherwise, it is extrinsic to x. And P is an intrinsic property, simpliciter, if it is always intrinsic to anything that has it. Otherwise, it is an extrinsic property.

To fix ideas, I propose to take 'x is an intrinsic duplicate of y' as primitive and define both 'P is intrinsic to x' and 'P is intrinsic' in terms of it:[11]

(D1) 'P **is intrinsic to** x' ('x **has** P **intrinsically**') $=_{df}$ Necessarily, for any z, if z is an intrinsic duplicate of x, then z has P (**all possible intrinsic duplicates of** x **have** P); otherwise, P is *extrinsic* to x (x has P *extrinsically*)

(D2) 'P **is an intrinsic property**' $=_{df}$ Necessarily, for any z, if z has P, P is intrinsic to z (P is necessarily intrinsic to whatever has it) $\equiv$ Necessarily, for any z, if z has P, then necessarily, for any z_1, if z_1 is an intrinsic duplicate of z, then z_1 has P (**no two possible intrinsic duplicates differ with respect to having** P)[12]; otherwise, P is *extrinsic*

The property *being spherical or one mile from a museum* is thus intrinsic to every sphere, since any duplicate of a sphere is also a sphere (let us suppose). But it is not intrinsic, period, since my car parked a mile from a museum is a duplicate of some other car that isn't (and surely isn't spherical).

And it will be helpful for precisely stating and discussing the first Humean thesis to have a way of talking about the *total way* a thing is intrinsically, or what we might call its 'intrinsic nature'. Conveniently, it is a straightforward matter

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[11]As is probably evident, my proposed definitions are supposed to be adequate even if actualism is true; that is why they are more tortured than Lewis's (1983). The trouble is that they aren't really (thanks to David Johnson for impressing this upon me). For example, my definitions seem to deliver the wrong result that *coexisting with Charlie* is intrinsic to Charlie (since necessarily, something is an intrinsic duplicate of Charlie only if Charlie exists). In order to address this, an actualism-adequate set of definitions must work with a more complicated four-place primitive: 'x in w_1 is an exact replica of y in w_2'. (I omit the required modifications because they make the definitions even more tortured.) I think we understand this primitive well enough, although see Dorr and Hawthorne (2014, nt. 27) for some skepticism about its intelligibility.

[12]According to this definition, every impossible property is intrinsic. Henceforth, whenever I say 'intrinsic property' I should be understood to mean '*possible* intrinsic property'.

to define 'P is an intrinsic nature of x' and 'P is an intrinsic nature' in terms of 'intrinsic duplicate':

(D3) '*P is an intrinsic nature of x*' $=_{\text{df}}$ Necessarily, for any z, z is an intrinsic duplicate of x iff z has P (**all and only possible intrinsic duplicates of x have P**)

(D4) '*P is an intrinsic nature*' $=_{\text{df}}$ Possibly there exists an x such that P is an intrinsic nature of x $\equiv$ Possibly there exists an x such that necessarily, for any z, z is an intrinsic duplicate of x iff z has P (**all and only possible intrinsic duplicates of some possible have P**)[13]

Now, in order to state the Humean theses, we will need to speak not only of monadic properties, but also of relations, such as *causation*, and take up the question whether they are intrinsic, or intrinsic to some things. The intuitive idea is the same as in the case of monadic properties. Thus, the relation *being an x and y such that x is a foot from y* is intrinsic to me and my briefcase, since it holds solely in virtue of the way the two of us are (or so we can suppose); on the other hand, the relation *being an x and y such that x and y are in the library* is extrinsic to us, since it holds partly in virtue of our relation to the library.[14]

Instead of changing the definitions I have given to accommodate this need, one should simply construe everything I apparently say about relations to be about monadic properties of multi-element *sequences*.[15] So, for example, contrary to appearances, I will not *really* be speaking about the relation, *being an x and y such that x caused y*, but about the monadic property, *being an x such that x is a sequence whose first element caused its second element.* But I will write *as though* I am referring to relations simply because it is less cumbersome and less distracting.[16] And I will indeed use the word 'relation'; you should just understand that to mean 'property of a multi-element sequence'. Given that I'm not really talking about relations, but about "relation-surrogates," I don't need to change the definitions of *intrinsic* or *intrinsic nature*. My definitions apply equally and without modification to the case of "relations" - and that's the last time I will put that word in scare

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[13]Some useful facts follow from definitions (D1) - (D4): (1) The negation of an intrinsic property is intrinsic; (2) For any intrinsic nature Q and any intrinsic property P, Q entails P or $\neg P$; and (3) Necessarily for any x and any property Q that is an intrinsic nature of x, Q entails any property that is intrinsic to x. (Facts (1) and (2) follow assuming that *intrinsic duplication* is an equivalence relation.)

[14]See Lewis (1986a).

[15]The reason I prefer this is not to avoid making the requisite change to the definitions, but to avoid speaking of polyadic relations altogether; and the reason I'd like to avoid *that* is that there appear to be deep and intractable problems with polyadic relations that are, as we might say, "permutation-sensitive". See Dorr (2004) and van Inwagen (2006). Those deep problems do not confront monadic properties of multi-element sequences. See van Inwagen (ibid.).

[16]In general, the locution 'being an $x_1...x_n$ such that $...x_i \Phi x_j...$' abbreviates 'being an x such that x is an n-termed sequence whose...and whose i-th element Φ-d its j-th element and...'.

quotes - since I was talking about them all along.[17]

That completes my brief remarks on *intrinsicness*. But I will add one final note to address a concern that some readers might have. I have not given a terribly informative *analysis* of 'P is intrinsic (to x)' or 'P is an intrinsic nature (of x)', as I have taken 'x is an intrinsic duplicate of y' as primitive. Indeed, giving a correct and informative analysis of 'intrinsic' is a formidable task, and I am unsure whether any such analysis *exists*.[18] But for the purposes of refuting any Half-Hearted Humean position, thankfully no such analysis is necessary. All that is needed is that (a) 'intrinsic' carries a consistent meaning throughout, and (b) our grasp of my primitive is firm enough so that whenever I make an assumption that involves the concept *intrinsicness*, we can understand it and see that it's true. I make only one such assumption and I will flag it explicitly; I trust it will be clear enough that my assumption is true. Now we can turn to the theses themselves.

2.2 Denial of Necessary Connections

Let's call the first thesis the 'Denial of Absolutely Necessary Connections', or 'DANC' for short. In my first pass at DANC, I offered this as a rough statement: "More generally, for any number of things, any ways each could be intrinsically, and any spatiotemporal arrangement, there is no impossibility in their each being those ways, in that very arrangement." The restriction to ways they could be *intrinsically* is needed for obvious reasons. There's no possible world in which one object has the property *coexisting with a dinosaur* and another object has the property *being such that there never was or ever will be a dinosaur*. The properties that an object has *extrinsically* place constraints on the way the rest of the world can be. The claim of the Humean is that none of those it has *intrinsically* do.

But the initial statement was a bit inaccurate in several respects. On the one hand, it was stronger than intended. To see why, consider a simple example: Bob and his mother Jane. Presumably, one way that Jane could be intrinsically is to have never produced any ova. But if Kripke (1980) is right about the necessity of one's origins, then there is no world in which Jane has never produced any ova and Bob *exists*, let alone be any which way intrinsically. Of course, Kripke might be wrong about the necessity of origins, but it is no part of DANC - that is, the thesis I've intended to discuss - to take issue with Kripke here. The intended thesis, applied to the case at hand, is that for each way_1 Bob could be intrinsically

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[17]However, this discussion does serve as a reminder that my initial statement of the intuitive gloss on 'P is intrinsic to x' should have taken sets and sequences into account; I should have said 'a property P is intrinsic to x if x has P solely in virtue of the way it is, and not (even partly) in virtue of its relations, or lack thereof, to things other than its parts *or parts of its members/elements*'.

[18]For some attempts, see Lewis (1983), Langton and Lewis (1998), Lewis (2001), Weatherson (2001), Sider (1996, 2001). Lewis (1983) and Sider (1996) both analyze 'intrinsic property' in terms of 'intrinsic duplicate,' and then further analyze 'intrinsic duplicate' in terms of 'perfectly natural property'. I am unsure whether their further analysis succeeds.

and each *way₂* Jane could be intrinsically, there is a possible world in which there is *something₁* that is *way₁* together with *something₂* that is *way₂*. So even if *Bob* couldn't co-exist with a Jane-who-produced-no-ova, someone very much like Bob - in fact, an intrinsic duplicate of Bob - could have co-existed with her (Lewis 1986a).

On the other hand, it was weaker than intended, in at least two respects: first, the thesis is not intended to be restricted to things in the actual world. In fact, it's not even supposed to be restricted to things in the *same* world, so merely prefixing the statement with a 'necessarily' operator won't be sufficient. A possibilist like Lewis has little trouble here; he can refer to and quantify over mere possibilia, and so he can just talk about duplicating and recombining *those.* For us actualists, things are a bit more complicated. What we want to say instead is this: if you take any total ways of being intrinsically, such that for each such way, possibly something is that way - here's where intrinsic natures come in handy - then there is no impossibility in *all* those ways being instantiated, and in any arrangement (and as many times for each way as you please).

Second, it is unduly restricted at least if 'thing' is understood, as it often is, to mean 'individual thing'. The thesis is not supposed to be restricted to the ways an *individual thing* can be intrinsically; remember, a *sequence of many things* instantiates an intrinsic nature - one that entails all the relations it instantiates intrinsically - and the thesis should allow for free recombination of those sorts of intrinsic natures.

Taking account of all this, here's a first pass at a more precise statement of the thesis.[19]

> DANC: For any sequence $\{Q_1,...,Q_N\}$ of non-equivalent intrinsic natures, and any sequence of positive cardinals $\{a_1,...,a_N\}$, and any disjoint spatiotemporal arrangement of a_1 instances of Q_1...and a_N instances of Q_N, which fits those intrinsic natures, there is a possible world in which there are exactly a_1 instances of Q_1...and exactly a_N instances of Q_N in that very arrangement, and no objects other than their parts and any sums of those parts (size and shape of spacetime permitting).

Some of the jargon here could use an explanation. First, what exactly is a spatiotemporal arrangement? In the way I am using that term, it is a function from sequences of objects to sequences of regions - where an individual will be considered a single-element sequence by courtesy - which, intuitively, are the respective spatiotemporal locations of objects in the sequence.[20] And a certain sequence is *in* a certain arrangement iff every element in the sequence exactly occupies the

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[19]See Darby and Watson (2010) for a very similar formulation.

[20]I assume throughout that there are spatiotemporal regions; but this assumption could be dispensed with at the expense of some added complexity.

region which that arrangement 'assigns' to it.[21]

Second, what is it for a spatiotemporal arrangement to *fit* certain intrinsic natures? It is easy to see what is meant by considering an example. Supposing that particular sizes, for example, are intrinsic properties, the principle shouldn't guarantee that an instance of an arbitrary intrinsic nature can exactly occupy *any which* spatiotemporal region: only those which are the same size as that entailed by the intrinsic nature. Now generalize: a spatiotemporal arrangement "fits intrinsic natures $Q_1...Q_N$" only if for any spatiotemporal property P that is *intrinsic*, and for any intrinsic natures among $Q_1...Q_N$ that entail P, it assigns to any instance of them a sequence of locations that has P.

Finally, what is a *disjoint* spatiotemporal arrangement? It is one that does not include overlapping spatiotemporal regions in two output sequences.

The restriction to disjoint spatiotemporal arrangements is seemingly needed for the following reason (the reason is of course more general, but I will illustrate it with an instance): there's probably no possible world in which a concrete object is red through-and-through and spatiotemporally overlaps a concrete object that is green through-and-through, because they can't mereologically overlap one another (there would have to be an entity that is both green through-and-through and red through-and-through), and it is probably not possible for two such concrete objects with no mereological overlap to spatiotemporally overlap. Since we don't want the principle to guarantee *that* possibility, it appears necessary to restrict the principle to disjoint arrangements.

But, as it turns out, restricting the principle in this way makes it too weak. For example, suppose I am identical to a human organism, *being conscious* is intrinsic to me, and my right arm is a duplicate of my left arm. Now, presumably the Humean would want to say this: there is a possible world in which there are two duplicates of me, and they spatiotemporally overlap in the region which one duplicate's left arm exactly occupies and the other duplicate's right arm exactly occupies. But that is not guaranteed by the thesis as I put it. Even assuming, as I do, that there are such things as my left arm, my right arm, and me-minus-both-arms, and hence intrinsic natures of each, the principle above still doesn't guarantee the possibility I mentioned. None of *those* body parts are conscious, and so none of them instantiates an intrinsic nature that entails *being conscious*. But the possibility I have described is one in which there are at least *two* things

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[21]Note well: a possible world in which there are " exactly a_1 instances of Q_1...and exactly a_N instances of Q_N *in that very arrangement*" need not be a world in which there are exactly a_1 instances of Q_1...and exactly a_N instances of Q_N, *period*. For instance, let Q_1 be the intrinsic nature of this chair and Q_2 be the intrinsic nature of an electron. There is obviously no possible world in which, say, there is exactly one instance of Q_1 and exactly one instance of Q_2; there are many more electrons in this chair than that! But there is some spatiotemporal arrangement of one instance of Q_1 and one instance of Q_2 such that there is a possible world in which there is exactly one instance of Q_1 and exactly one instance of Q_2 in that arrangement. Thus, the difficulties Efird and Stoneham (2008) raise about the use of 'exactly' do not arise, as far as I can tell, for the thesis I've formulated.

that are conscious.[22] Of course, we could "write in by hand" the truths about when some objects compose another one; maybe that wouldn't be so bad. But we'd also have to write in the conditions under which an object is conscious, and surely we'd prefer a very general principle over a hodge-podge amalgam of a general principle together with very specific "bridge principles".

The solution is to remove the restriction to disjoint spatiotemporal arrangements and address the 'red and green all over problem' less drastically. We can simply put in a manual override, which says that there can be overlap only if the two intrinsic natures "say the same thing" about what's going on in the region of overlap. Here's a way to make the override precise: 'provided that for any objects x and y and region R such that x and y each exactly occupy R, x and y have the same intrinsic nature'.[23]

And we ought to ensure one more thing. Take the example of my two doppelgangers. The Humean will say not only that there is a possible world in which they *spatiotemporally* overlap, but one in which they *mereologically* overlap as well, i.e. they will both have as a part the very same arm. Some Humeans might think, as I suggested above, that *every* case of spatiotemporal overlap will involve mereological overlap. I am inclined to agree. But even if it's not always the case, the Humean will say that nothing *precludes* it.

So how should DANC be reformulated so as to guarantee the possibility of two duplicates of me sharing an arm? The answer is this: *no* reformulation is needed so long as we broaden a 'spatiotemporal arrangement' to include a specification of which of the arranged objects and their parts are identical to which others. (If one thinks that co-location or multi-location is impossible, one should add an additional proviso to that effect; otherwise they'd both be guaranteed.) Thus, one of the spatiotemporal arrangements that is guaranteed possible by DANC is one

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[22]Nor would it help to point out that I could have lost my right arm, and so possibly, there is something that duplicates me-minus-right-arm *except that it's conscious.* Yes, that thing would have a certain intrinsic nature, and DANC would guarantee that it could be instantiated "next to" a duplicate of me, but that possible scenario is *still* not the one I have envisaged: *my* scenario involves two human beings who are both conscious *and two-armed.*

[23]Two things to note: first, the thesis thus amended will do the trick only if DAUP, or something near enough, is true (see van Inwagen 2001); otherwise, this formulation will count certain obvious impossibilities as possible. If DAUP, and everything near enough, is false, the override will have to be put another way.

Second, the proviso is really short for this: 'provided that *if* those intrinsic natures *were* in that spatiotemporal arrangements, it *would* be the case that for any objects x and y...'; clearly enough, if there is some impossible scenario that this proviso is to rule out, then there need to be false counterpossibles. And some philosophers think there aren't any. Now, as Cian Dorr (2005, §4.1) notes, there are plenty of examples of what seem to be non-trivial true counterpossibles, and by analogy, there are plenty of examples of what seem to be false counterpossibles. If, however, you are not convinced by these examples - perhaps because of your semantics for counterfactuals - then, following Dorr, read the proviso as follows: 'provided that according to the fiction that those intrinsic natures are in that spatiotemporal arrangement, it is the case that for any objects x and y...'; *I assume* you think some according-to-an-impossible-fiction claims are false.

in which the left arm of one duplicate is not only colocated with, but also identical to, the right arm of the other duplicate.[24]

So here's the final version:

> DANC: For any sequence $\{Q_1,...,Q_N\}$ of non-equivalent intrinsic natures, and any sequence of positive cardinals $\{a_1,...,a_N\}$, and *any* spatiotemporal arrangement of a_1 instances of Q_1...and a_N instances of Q_N, which fits those intrinsic natures, there is a possible world in which there are exactly a_1 instances of Q_1...and exactly a_N instances of Q_N in that very arrangement and no objects other than their parts and any sums of those parts (provided that (1) for any objects x and y and region R such that x and y each exactly occupy R, x and y have the same intrinsic nature and (2) size and shape of spacetime permits).

2.3 DELOCALIZATION OF LAWS

Let's call the second thesis the 'DELOCALIZATION OF LAWS'. It says that no matter how wide a glance we cast, we won't be able to see, just by inspecting the intrinsic properties and relations that are instantiated, what the laws are. In the best case - when we glance at *all* the goings-on throughout spacetime - we would still have to see that there is nothing *else* going on. Put less imagistically, we can say this: necessarily, for any sequence of events E, and any proposition L, any relation which, (a) entails that L is a law and (b) is instantiated by E, is extrinsic to E (and *a fortiori* to the subsequence that is an instance of L).[25]

Truth be told, there might be some exceptions to the thesis in its full generality, even according to a Wholehearted Humean. Suppose, for example, there is a maximum possible size of spacetime, and consider a possible world W_1 in which spacetime has that size and is "filled to the brim". Suppose further a Humean view of laws, according to which laws are simply patterns in the phenomena. (Lewis's (1994) Best-System Analysis is a good example. On this view a proposition is a law iff it is a theorem of the deductive system that strikes as good a balance as truth will allow between simplicity and strength.) It seems clear that any proposition L which is a law in W_1 is also a law in a world W_2 in which the global sequence of events in W_1 is duplicated; after all, there couldn't be anything else to "overturn" that law in W_2. So in W_1, any relation that for some L entails that L is a law and is instantiated by the global sequence of events, is intrinsic to that sequence.

But this case is, as we might say, "pathological": once you duplicate that sequence with respect to its *non-nomic* properties and relations, you've automatically duplicated it with respect to its *nomic* properties and relations as well. So the reason that sequence is intrinsically such that L is a law is not because law L is

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[24]I am assuming that there *is* such an object as my right arm. As I noted in nt. 23, I have already made substantively the same assumption in formulating the manual override.

[25]Where *R entails proposition p* $=_{df}$ Necessarily, for any x, x has R only if p is true.

like "glue"; it's because the truth (and lawhood) of *L* happens to track the intrinsic *non*-nomic features of that sequence, no matter the environment in which it is embedded.

This suggests that we can isolate the exceptions to the Delocalization of Laws in the following way. Say a *nomic property or relation* is one such that for some proposition *L*, it entails that *L* is a law. Every other property and relation is non-nomic. Then say that *x is a non-nomic duplicate of y* iff for any intrinsic non-nomic property or relation *R*, *x* has *R* iff y has *R*.[26] Finally, say that a sequence/relation pair is "nomologically innocent" iff necessarily, any non-nomic duplicate of that sequence instantiates that relation.

Here then is the official statement of the thesis:

> Delocalization of Laws: Necessarily, for any sequence of events *E* and any nomic relation *R* it instantiates (where the pair {*E*, *R*} is not nomologically innocent), *E* has *R* extrinsically.

2.4 Delocalization of Causation

Delocalization of Causation, which is what I'll call the third thesis, is a natural counterpart of the Delocalization of Laws. It says that no matter how wide a glance we cast, we won't be able to see, just by inspecting the intrinsic properties and relations that are instantiated, whether there is any causation going on between the events.

In order to make this precise, let us say a relation

> *being an $x_1,...,x_n$ such that $\Phi(x_1,...,x_n)$,*

is *causal* just in case it entails the relation,

> *being an $x_1,...,x_n$ such that for some i and j ($1 \leq i, j \leq n$), a part of x_i caused a part of x_j*

It's the sort of relation things bear to one another only if there is some causation involving only them and their parts.

Then a first pass at the thesis is this:

> Delocalization of Causation: Necessarily, for any sequence of events *E*, and any causal relation *CS* it instantiates, *E* has *CS* extrinsically.

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[26]Actually, for a reason I will discuss in §2.5, we need to be slightly more liberal about nomic duplication and restrict the required sharing to *perfectly natural* properties and relations (otherwise, pretty much every pair consisting of a sequence and a nomic relation it instantiates will come out nomologically innocent). So officially, *x is a non-nomic duplicate of y* iff for any intrinsic perfectly natural non-nomic property or relation *R*, *x* has *R* iff *y* has *R*.

I will make two comments here. First, beware of confusion. In the philosophical literature on causation, one will find a thesis that goes by the name 'INTRINSICNESS'. That thesis is roughly this: any duplicate of a certain causal process (suitably qualified), *in a world with the same laws of nature*, will also be a causal process.[27] But the italicized phrase makes all the difference. One who endorses the DELOCALIZATION OF CAUSATION is not thereby committed to denying INTRINSICNESS, because the latter is consistent with the claim that for every causal process, there is *some* duplicate of it - in a world with different laws - that is not a causal process. Lewis, at least at one time, accepted the DELOCALIZATION OF CAUSATION *and* INTRINSICNESS.[28] This was not a logical blunder.

Second, just as with respect to the DELOCALIZATION OF LAWS, an exception ought to be allowed for, and for pretty much the same reason. Suppose again a Humean view of laws, according to which laws are simply patterns in the phenomena. And suppose further that INTRINSICNESS - the thesis I just mentioned - is true. Then the global sequence of events in the "maximal" world W_1 I considered above - together with any causal relation it instantiates - is a counterexample to the unrestricted version of DELOCALIZATION OF CAUSATION. After all, any world W_2 in which that sequence is duplicated is one in which all and only the laws of W_1 are true. So then by INTRINSICNESS, all the same causal facts hold of the duplicate. So any causal relation it instantiates is intrinsic to it.

But here again we can easily isolate the exceptions, and in an analogous fashion. Say *x is a non-causal duplicate of y* iff for any intrinsic non-causal relation *R*, *x* has *R* iff *y* has *R*.[29] Then say that a sequence/relation pair is "causally innocent" iff necessarily any non-causal duplicate of that sequence instantiates that relation. So the thesis is really this:

> DELOCALIZATION OF CAUSATION: Necessarily, for any sequence of events *E*, and any causal relation *CS* it instantiates (where the pair {*E*, *CS*} is not causally innocent), *E* has *CS* extrinsically.

2.5 GLOBAL SUPERVENIENCE

The second and third theses each gives a *necessary* condition for determining whether a certain proposition is a law or that causation is happening between some events (respectively): inspect all the events there are and see *that* those are all the events. Any inspection less extensive than that will be inadequate to make those determinations.

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[27]See Hall (2004c).

[28]He came to reject INTRINSICNESS in his (2004) on independent grounds.

[29]Again, as in nt. 26, we actually need to be a bit more liberal about causal duplication (otherwise, pretty much every pair consisting of a sequence and a causal relation it instantiates will come out causally innocent). So officially, *x is a non-causal duplicate of y* iff for any intrinsic perfectly natural non-causal relation *R*, *x* has *R* iff *y* has *R*.

But what, if anything, *is* adequate? The fourth thesis, which I shall call 'GLOBAL SUPERVENIENCE,' adds that it is sufficient to examine the "matters of fact" in order to make those determinations. As I put it earlier, the distribution of causal and nomic properties and relations globally supervenes on the distribution over all concreta of non-causal, non-nomic properties and relations.

This thesis is slightly different from the global supervenience thesis endorsed by Lewis (1986b, 1994). That thesis is that all the facts about a world globally supervene on the distribution of local intrinsic qualities and spatiotemporal relations.[30] Lewis intends his claim to be a 'contingent supervenience claim,' by which is meant that there is a restriction on the possible worlds for which the supervenience is alleged to hold. His is not a claim that for *any* two possible worlds, if they are alike with respect to *X*, they are alike with respect to *Y*. It's that for any two possible worlds *like ours in some specified respect*, if they are alike with respect to *X*, they are alike with respect to *Y*. Not so the thesis I am considering. Mine is an unrestricted quantification over possible worlds. Thus, GLOBAL SUPERVENIENCE is slightly stronger than Lewis's thesis. On the other hand, it is also weaker in that it broadens the subvening set to include all non-causal non-nomic properties and relations, rather than just local intrinsic qualities and spatiotemporal relations.

That being said, GLOBAL SUPERVENIENCE seems to best capture Lewis's central contention. After all, he concedes that physics might teach us that there are irreducible external relations beyond the spatiotemporal ones or emergent intrinsic qualities that aren't local.[31] What he *really* wants to resist, he says, are *philosophical* arguments for the falsity of his supervenience claim. In particular, he wants to resist the claim that certain "commonplace features of the world," such as causation and laws of nature, fail to so supervene. That's where he puts his philosophical foot down. Whatever else physics teaches us, causation and laws of nature won't be irreducible features of any world. And that's just GLOBAL SUPERVENIENCE.

But stating GLOBAL SUPERVENIENCE carefully presents something of a challenge. The difficulty does not lie in spelling out what 'globally supervenes' means. That's been hashed out already a great deal, and I will simply follow others in defining it thus: where A is a set of properties and relations, let an *A-isomorphism* be a function f that is one-to-one and for any property or relation R in A, and any sequence X_1 of objects in f's domain, X_1 instantiates R iff the sequence of images (under f) of the elements of X_1 instantiates R.[32]

Then,

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[30] Where a local quality is one that needs nothing bigger than a point at which to be instantiated.

[31] Some philosophers have indeed claimed that quantum-theoretic "non-separability" teaches us just that. See Maudlin (2007, ch. 2). Frank Arntzenius (2012, ch. 2) claims that even classical physics teaches us the same.

[32] Where a sequence X_2 is 'a sequence of images of the elements of X_1' only if it is isomorphic to X_1 with respect to order in the sequence; that is, for any *a* and *b*, if *a* comes before *b* in X_1, then $f(a)$ comes before $f(b)$ in X_2.

'a set A of properties and relations globally supervenes on a set B of properties and relations' $=_{\text{df}}$ for any worlds w_1 and w_2, every B-isomorphism from w_1's domain onto w_2's domain is an A-isomorphism. (In our case, there will be a restriction to the *concrete* domain of the two worlds.)[33]

The difficulty, rather, lies in distinguishing between causal and non-causal relations and nomic and non-nomic relations.[34] My discussion of the Delocalization theses suggests a straightforward way to distinguish between them: say (as I have already done) that a *causal relation* is one that is causation-entailing, and otherwise it's non-causal; and a *nomic relation* is one such that for some proposition L, it entails that L is a law; otherwise it's non-nomic. But defining those terms that way and leaving GLOBAL SUPERVENIENCE as is would have the distinct disadvantage of trivializing the thesis. If you take any causation-entailing relation and disjoin it with a relation that is not a causation-entailing relation or law-entailing relation, like *being temporally prior to*, the resulting disjunctive relation is not a causation-entailing relation or a law-entailing relation. But then it is far too easy to see that the causation-entailing relations (and the same with the law-entailing relations) globally supervene on the distribution of relations that are neither causation-entailing nor law-entailing. Here's a simple recipe for cooking up, in any world, just a few non-causation-entailing non-law-entailing relations that will settle all the causal facts: take a maximally specific causation-entailing relation - one that specifies, down to the last detail, all the causation that is happening between events in that world - and disjoin it with some relation, **DECOY**, such that neither it nor its negation is causation-entailing or law-entailing, and which the events in that world do *not* instantiate. Then the resulting disjunctive relation and the negation of **DECOY** (which the events *do* instantiate) are non-causation-entailing and non-law-entailing relations instantiated by the events in that world, which will jointly sette the causal facts that obtain in the world. And it is fairly easy to see that for any world there will be such instantiated relations that are neither causation-entailing nor law-entailing and which trivially suffice to settle the causal and nomic facts.

But we can accept the suggested definition and skirt the problem, I think, if we stick closer to Lewis's own formulation of the supervenience thesis. Lewis, as is well known, distinguishes between relations which are *perfectly natural* and those which aren't.[35] The ones that are perfectly natural are ones that "carve the beast of nature at its joints." They make for genuine similarity between any two pairs (or sequences more generally) that instantiate them. And his global supervenience thesis is *really* a thesis about the supervenience of all properties and relations on

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[33]This is equivalent to what Sider (1999) calls 'strong global supervenience'; see his nt. 10.

[34]See Earman and Roberts (2005) for a survey of past attempts to address the difficulty - and analogous difficulties with related formulations - along with their own attempt. I address it differently from each of the ways they discuss.

[35]See, inter alia, Lewis (1983).

perfectly natural ones: perfectly natural local intrinsic qualities and spatiotemporal relations (which are themselves perfectly natural).

So by adopting an analogous modification to GLOBAL SUPERVENIENCE, we can indeed define 'causal relation' and 'nomic relation' as I have suggested. GLOBAL SUPERVENIENCE, then, is the following thesis: the distribution of all properties and relations globally supervenes on the distribution of perfectly natural non-causal non-nomic properties and relations over all concreta. This is a non-trivial thesis; or at least it cannot be shown trivial in virtue of including the "tricky disjunctions" in the supervenience base. Those disjunctions are surely not perfectly natural if there is anything to the natural/non-natural distinction at all.

3 From Denial to Delocalization

3.1 FROM DENIAL TO DELOCALIZATION OF LAWS

Now we are set to begin the arguments. The argument for the entailment from DANC to the DELOCALIZATION OF LAWS will be fairly simple: the guiding idea is that if laws are intrinsic, then there are intrinsic natures which entail propositions inconsistent with one another. But then DANC allows us to "patch" together those intrinsic natures, and thus entails that there is a possible world in which a contradiction is true.

Here's a more careful version. Suppose, for reductio, the following claim, a claim which is entailed by the denial of the DELOCALIZATION OF LAWS: possibly there is some sequence of events E_1, some proposition L_1 and some relation R which entails that L_1 is a law, such that R is intrinsic to E_1. For example, suppose that in the actual world, the relation, *being such that it is a law that all point masses attract with a force proportional to the product of their masses and inversely proportional to the square of the distance between them*, is intrinsic to some sequence of events.

Now I assume the following: necessarily, for any sequence of events E and proposition L, such that a relation which entails that L is a law is intrinsic to E, possibly there is a sequence of events E_2 and a proposition L_2 which is *inconsistent* with L, such that there is some relation which entails that L_2 is a law and is intrinsic to E_2. My assumption is only *slightly* stronger than the assumption that the laws of nature are contingent. It adds to that a parity assumption about the intrinsicality of conflicting laws: necessarily, if one law is intrinsic to some events, then possibly there is a law inconsistent with the first one which is *also* intrinsic to some events.[36]

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[36]One might object to this on grounds that have nothing to do with intrinsicality: given an Armstrongian account of laws, if some proposition p is a law, then nothing inconsistent with p could be a *law* (and, a fortiori, nothing inconsistent with p could be such that *its being a law* is intrinsic to some sequence) even if some such thing could be *true* (and hence p is indeed contingent). For laws express "necessitating relations" between universals and univerals are freely recombinable. If

So long as laws are contingent, that surely seems right. To continue with my example, if the Law of Universal Gravitation really is intrinsic in the way I have supposed, then it ought to be possible that the relation, *being such that it is a law that all point masses attract with a force proportional to the product of their masses and inversely proportional to the **cube** of the distance between them*, is intrinsic to some sequence of events. It would be peculiar, to put it mildly, if only the Law of Universal Gravitation had a special capability of being intrinsic that no possible law inconsistent with it possessed.

Returning to the general point, it follows from my assumption, together with our supposition, that possibly, there is some sequence of events E_1, some proposition L_1, and some relation R which entails that L_1 is a law, such that R is intrinsic to E_1, and possibly there is a sequence of events E_2 and a proposition L_2 which is *inconsistent* with L_1, such that there is some relation which entails that L_2 is a law and is intrinsic to E_2.[37] So there are two propositions, L_1 and L_2, which are inconsistent with one another, and (a) possibly there is some sequence of events, E_1, and some relation R that entails that L_1 is a law is intrinsic to E_1, and (b) possibly there is some sequence of events, E_2, and some relation R that entails that

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N(F,G) is a law, then how could there be a *law* inconsistent with that one unless there is a universal ¬G, or, more generally, some universal incompatible with G?

But this is a problem not so much for my claim as for Armstrong. He has to recognize the actual truth, and *a fortiori* the possible truth, of "exclusion laws," like Pauli's Exclusion Principle. He has several accounts of such laws (1997, 233), but whatever account he gives, he has to concede there could be such things. And, if there can be a law that universal F nomically excludes universal G, then it will be inconsistent with the possible law that universal F nomically necessitates universal G.

Moreover, he grants that *nomic necessitation* is a determinable with determinates, corresponding to different degrees of probabilifying. So there could be inconsistent possible laws in this way: one law is that univeral F probabilifies universal G with probability .46, and the other law is that it does so with probability .78. It can't very well be both!

Finally, laws involving magnitudes - whatever account he gives of them - will be ripe for incompatibilities.

[37]Technically, what follows without any special assumptions about iterated modalities is the proposition expressed by this sentence where the second occurence of 'possibly' is understood to occur within the scope of the first occurence. But I further assume that whatever is possibly possible is just plain possible (the axiom characteristic of **S4**, interpreted in the usual way). So we can go on to infer the claim expressed by the sentence that follows in the text. (Alternatively, one can avoid recourse to **S4** if one assumes (a) the validity of the inference of (the de re) "There is a proposition L_1 such that possibly there is some sequence of events E_1 and some relation R which entails that L_1 is a law, such that R is intrinsic to E_1" from (the de dicto) "Possibly there is some sequence of events E_1, some proposition L_1 and some relation R that entails that L_1 is a law, such that R is intrinsic to E_1," together with the following version of the Parity Premise: (b) For any proposition L_1, if possibly there is some sequence of events E_1 and some relation R which entails that L_1 is a law, such that R is intrinsic to E_1, then there is some proposition L_2 which is inconsistent with L_1 such that possibly there is some sequence of events E_2 and some relation R which entails that L_2 is a law, such that R is intrinsic to E_2. One could then infer from our supposition the claim expressed by the sentence that follows in the text without relying on **S4**.)

L_2 is a law is intrinsic to E_2. So then there are two intrinsic natures, Q_1 and Q_2, each of which entails that some proposition is a law, and those propositions are inconsistent with one another.[38]

Then assume DANC for conditonal proof. DANC allows us to patch together Q_1 and Q_2 into a single possible world – so long as size and shape permits – and so entails that there is a possible world in which two inconsistent propositions are both laws, and hence both true. And of course there is no such possible world. So by reductio, we can conclude that our initial supposition is false. That is, it's not possible that there is some sequence of events, E_1, some proposition L_1, and some relation R that entails that L_1 is a law, such that R is intrinsic to E_1. But since every relation that is instantiated by something is instantiated by it either intrinsically or extrinsically, it follows that necessarily, for any sequence of events E, and any proposition L, any relation that (a) entails that L is a law, and (b) is instantiated by E, is extrinsic to E. Then by conditional proof, conclude that DANC entails that necessary truth.

The careful reader will note that I have "overshot," since that necessary truth is stronger than the DELOCALIZATION OF LAWS, which allows an exception for nomologically innocent pairs, and is thus too strong even for the Wholehearted Humean. And there's at least one simple reason I overshot: my argument had to assume the satisfaction of the "size and shape permitting" proviso at the final step of the argument, and that *might not* always be satisfied. Whether it is depends of course on the "size and shape" of the two sequences that instantiate intrinsic natures Q_1 and Q_2. To address this, my argument ought to be modified slightly so that it proceeds in two stages: first, restrict our quantification over sequences to *manageable* sequences, where a sequence is manageable, let's say, if two duplicates of it could fit comfortably in a spacetime of maximal size; the conclusion of the first stage is that no nomic relation is ever intrinsic to a *manageable* sequence.[39] Second, generalize. Infer from the conclusion of the first stage that a proposition's being a law is a *wholly extrinsic matter*, which is to say this: a difference between two sequences with respect to whether some proposition is a law (or some propositions are laws) doesn't, all by itself, make for an intrinsic difference. Thus, any two sequences that are non-nomic duplicates are intrinsic duplicates, period.[40]

From which we can conclude this: necessarily, for any sequence of events E and any nomic relation R it instantiates (where the pair $\{E, R\}$ is not nomologically

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[38]This follows assuming that (1) necessarily, everything has an intrinsic nature, and (2) necessarily for any x and any property Q that is an intrinsic nature of x, Q entails any property that is intrinsic to x. See nt. 13.

[39]The argument does require a slightly different version of the 'Parity Premise', but it seems as obviously true as the original version.

[40]I am assuming here that the *perfectly natural* intrinsic non-nomic properties and relations settle *all* the intrinsic non-nomic properties and relations; this assumption is needed because 'non-nomic duplication' is defined in terms of the sharing of perfectly natural properties and relations (see nt. 26).

innocent), *E* has *R* extrinsically.[41] (For necessarily, for any sequence of events *E* and any nomic relation *R* it instantiates, if the pair {*E*, *R*} is not nomologically innocent, then *R* differs between non-nomic duplicates of *E*; and hence it differs between intrinsic duplicates of *E*; and hence it is extrinsic to *E*.) As should be apparent, the conclusion just is the DELOCALIZATION OF LAWS. By conditional proof, we can conclude that DANC entails the DELOCALIZATION OF LAWS.

3.1.1 Reply

I can see only one remotely plausible reply on the Half-Hearted Humean's behalf: deny that the laws are contingent.[42] This is a high price for anyone to pay. But the pricetag is much higher for the Half-Hearted Humean, at least with regard to non-probabilistic laws. She will be committed to the claim that all the properties that figure into those laws - such as *having a rest mass of XYZ* and *having a charge of XYZ* - are extrinsic to their bearers. If she assumes otherwise, then since those laws are necessary and non-probabilistic, there would surely be absolutely necessary connections between intrinsic natures.

For example, take the Law of Conservation of Linear Momentum. If that law is necessary, and, moreover, rest mass is intrinsic, then DANC is false. There would be no possible world in which, say, some lonely particle has a certain rest mass at t_1, it follows a trajectory in spacetime such that its velocity remains constant until t_2, but its rest mass is *different* at t_2. And that's a 'violation' of DANC.[43] So the proponent of DANC who concedes that the Law of Conservation of Linear Momentum is necessary would be forced to conclude that *having a rest mass of XYZ* is not intrinsic. That's not a happy thing to say.[44]

And it's not just the properties that figure directly into the laws. Pretty much all properties would have to be extrinsic to their bearers. Any proposition entailed by a necessary truth is necessary. So the proposition that bread always nourishes would be necessary. But then the property *being bread* and the property *being*

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[41]Of course, a Humean - one who accepts DANC - can't be too liberal about what pairs she holds are nomologically innocent, since in many cases my argument immediately establishes that a certain nomic relation is not intrinsic to a certain sequence. Thankfully for the Humean, the case of a maximal-sized spacetime filled to the brim (see. §2.3) is immune to such a direct argument, because the "size and shape" proviso cannot be satisfied, and hence my argument falters at the stage at which it employs DANC.

[42]The Half-Hearted Humean can distinguish between different laws if she wants: some laws, she'll say, are extrinsic and contingent, other laws are intrinsic and necessary. No laws are both contingent and intrinsic. If that's what she says, then simpy restrict the criticism that follows to whichever laws she claims are intrinsic, and hence necessary.

[43]That it's a violation of DANC follows straightforwardly assuming a perdurantist or stage-theoretic reading of the previous sentence. Assuming an endurantist reading, that it's a violation follows assuming there could be a *non*-lonely particle that met that description; and of course there could be.

[44]Although, see Field (1980) and the defense of a 'Comparativist' view about mass in Dasgupta (2014). For some critiques of Field, see Hawthorne (2006b).

nourished couldn't be intrinsic properties, since we would then have a violation of DANC: there would be no possible world in which I ingest bread and fail to be nourished. This is clearly an extremely hefty price.

3.2 FROM DENIAL TO DELOCALIZATION OF CAUSATION

Turning now to the DELOCALIZATION OF CAUSATION, the guiding idea is a bit different. I will give two arguments for the conclusion that DANC entails the DELOCALIZATION OF CAUSATION: they both rely only on some formal property or properties of causation; and they both exploit the fact that DANC guarantees the possibility of *any* spatiotemporal arrangement (of instances of any intrinsic natures), including ones in which the instances overlap (so long as the overlap is between things with the same intrinsic nature).

3.2.1 Argument from Causal Loops: First Version

My first argument - or at least the first version of it - relies only on the premise that there cannot be a "causal loop": that is, it is not possible for there to be a sequence of events, such that each event causes the next event in the sequence, and some event appears twice in the sequence. I will argue that the conjunction of DANC and the denial of the DELOCALIZATION OF CAUSATION entails that such things *are* possible. So that conjunction has to go; and so if we keep DANC, we have to accept the DELOCALIZATION OF CAUSATION.

Here's the argument in greater detail. Assume DANC is true. Now, it is surely possible for an event to cause a duplicate of itself. Just think of an idealized case of falling dominoes. Consider such a possible pair of events, (E_1, E_2), and call the intrinsic nature each one instantiates, '**Falling Domino**'. Since E_1 caused E_2, naturally enough the pair instantiates the causal relation,

> *being an x and y such that x caused y,*

otherwise known as *causation*. And now suppose, for reductio, that the pair instantiates *causation* intrinsically. Then (E_1, E_2) has an intrinsic nature - call it '**Domino Pair**' - which entails the following relation:

> *being an x and y such that x's intrinsic nature is **Falling Domino** and y's intrinsic nature is **Falling Domino** and x caused y*

But DANC allows us to 'take' as many instances of an intrinsic nature as we wish, and 'put them' in any spatiotemporal arrangement, so long any spatiotemporal coincidence happens between things that have the same intrinsic nature. So we can 'take' two instances of **Domino Pair** and arrange them so that the event that is the effect in the one pair *is the very same event* as the cause in the other pair. After all, those 'two' events have the same intrinsic nature, i.e., **Falling Domino**. And we need not stop there: we can 'string along' such instances until we have

a sequence of events, each with intrinsic nature **Falling Domino**, each of which causes the next member of the sequence, and such that the sequence *eventually cycles back on itself*.[45] Putting the conclusion less picturesquely, if DANC is true, then *there is some possible world in which* there is a sequence of events, each with intrinsic nature **Falling Domino**, each of which causes the next element of the sequence, and such that some element appears twice in the sequence. But there can't be any such causal loops. By reductio, we can conclude that the pair (E_1, E_2) instantiates causation extrinsically.

Of course, there was nothing special about the pair (E_1, E_2) beyond their being duplicates of one another; any such pair would do. As a matter of fact, I didn't really need to 'start' with such a pair. For example, consider the following three possible pairs of (non-duplicate) events: (E_1, E_2), (E_3, E_4), and (E_5, E_6), where E_1 caused E_2, E_3 caused E_4, and E_5 caused E_6, and where E_2 and E_3 are duplicates, E_4 and E_5 are duplicates, and E_6 and E_1 are duplicates.

Then assume DANC. By an analogous argument (assume causation is intrinsic to all of them, string them along until the sequence cycles, invoke premise that there are no causal loops) I can show that it's not the case that causation is intrinsic to *all three* pairs. And there's nothing *at all special* about those pairs.

Moreover, we need not confine our attention to causal relations of *pairs* of events. You can take a vast sequence of events, which are perhaps intricately and systematically interconnected. So long as two of them are duplicates - one of which causes the other - and the whole lot can be duplicated and arranged in spacetime so that the the duplicating events overlap in such a way as to cycle, an analogous argument to the one I just gave will show that the vast sequence of events will have certain causal relations extrinsically. And again, it's not really necessary to 'start' with two duplicates related by causation.

So this argument immediately establishes that certain sequences instantiate some causal relations extrinsically (if at all). But there are certain sequence/relation pairs such that my argument cannot immediately establish that the relation is instantiated by the sequence extrinsically (if at all), at the very least because of the "size and shape" proviso in DANC. However, as with the argument from DANC

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[45]Here's a more formal argument. It follows from DANC that if {**Domino Pair**} is a sequence of intrinsic natures, {3} is a sequence of positive cardinals, and ϕ is a spatiotemporal arrangement that maps one instance of **Domino Pair** to the sequence of regions {R_1, R_2}, another instance to the sequence {R_2, R_3}, and a third instance to the sequence {R_3, R_1} (where that arrangement "fits"), and the element in the first instance, which was mapped to R_2, is identical to that element of the second instance which was mapped to R_2, etc., then there is a possible world in which there are exactly three instances of **Domino Pair** in that arrangement - provided that for any objects x and y and region R such that x and y each exactly occupy R, x and y have the same intrinsic nature (and size and shape permit). Let 'ϕ' name the arrangement described. The antecedent seems to be true and the proviso is met, so it follows that there is a possible world in which there are exactly three instances of **Domino Pair** in ϕ. From which it follows that there *is* a possible world in which an event E that exactly occupies R_1 caused an event that exactly occupies R_2 which caused an event that exactly occupies R_3, which in turn caused E.

to the Delocalization of Laws, the second stage is to generalize. Infer from the conclusion of the first stage that the instantiation of any causal relation is a *wholly extrinsic matter*, which is to say this: a difference between two sequences with respect to whether there is any causation going on between (the parts of) the elements of the sequence doesn't, all by itself, make for an intrinsic difference. Thus, any two sequences that are non-causal duplicates are intrinsic duplicates period.[46]

From which we can conclude this: necessarily, for any sequence of events E, and any causal relation CS it instantiates (where the pair $\{E, CS\}$ is not causally innocent), E has CS extrinsically. (For necessarily, for any sequence of events E, and any causal relation CS it instantiates, if the pair $\{E, CS\}$ is not causally innocent, then CS differs between non-causal duplicates of E; and hence it differs between intrinsic duplicates of E; and hence it is extrinsic to E.) As should be apparent, the conclusion just is the Delocalization of Causation. By conditional proof, we can conclude that DANC entails the Delocalization of Causation.

The only premise of my argument - aside from the "generalizing maneuver" - is that causal loops are impossible. I assume that causal loops are impossible because I think they are conceptually impossible. But I recognize that not everyone will agree with me on the latter point.[47] Perhaps some of those who disagree have been persuaded that such things are conceptually possible by reading apparently coherent science fiction stories, such as Robert Heinlein's "All you Zombies" or Robert Silverberg's "Absolutely Inflexible," which seem to involve just such things. I am persuaded by these stories of the conceptual possibility of causal loops to about the same extent that I am persuaded by Jorge Luis Borges' "Aleph" of the conceptual possibility of proper parthood loops (see Sanford 1993); which is to say, not at all.[48] Whatever appearance of conceptual possibility there is in such cases seems to derive from the fact that we don't grasp the whole situation "all at once".[49] But that's just a piece of psychological autobiography. And in any case, others may simply not see any conceptual impossibility in causal loops to begin with. So I will offer a justification for the claim that a certain *sort* of causal loop is indeed impossible, and then point out that a version of my Argument from Causal Loops relies only on that weaker premise.

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[46]As in nt. 40, I am assuming that the *perfectly natural* intrinsic non-causal properties and relations settle *all* the intrinsic non-causal properties and relations; this assumption is needed because 'non-causal duplication' is defined in terms of the sharing of perfectly natural properties and relations (see nt. 29).

[47]See, e.g., Lewis (1986b, ch. 18) and Hanley (2004).

[48]Here is one of the things Borges wrote: "I saw the Aleph from every point and angle, and in the Aleph I saw the earth and in the earth the Aleph and in the Aleph the earth". This too is, in some sense, *apparently* coherent, especially if you take frequent breaks when reading it.

[49]See also van Inwagen (1993).

3.2.2 Argument from Causal Loops: Second Version

It is a conceptual truth, I take it, that causation is irreflexive. Nothing can cause itself. So *if* it were a conceptual truth that causation is transitive, then it would be a conceptual truth that there are no causal loops. And indeed, some philosophers think it a conceptual truth that causation is transitive. As Ned Hall (2004a) puts it, "That causation is, necessarily, a transitive relation on events seems to many a bedrock datum, one of the few indisputable a priori insights we have into the workings of the concept." But as Hall goes on to say, that position has come under attack from philosophers armed with a variety of counterexamples.[50] Here is such an example (from Hartry Field): John doesn't like Joe, so he puts a bomb in front of his house (he *really* doesn't like him). Joe smells the fuse burning and so runs and defuses it, and so survives. So John's placing the bomb caused Joe to smell the bomb; and Joe's smelling of the bomb caused the bomb to be defused; and the bomb's defusal caused Joe's survival. But it doesn't *seem* like John's placing the bomb caused Joe's survival.[51]

There are philosophers who have dug in their heels and insisted that even in such putative counterexamples, transitivity holds; although we would not usually *say* "John's placing the bomb caused Joe's survival," it is nonetheless strictly speaking true.[52] And I think they're *right*. But I need not insist on that here. The reason is that my argument only needs the assumption that a *certain sort* of causal loop is impossible. And that can be justified in turn by the assumption that causation is transitive in *certain cases*. One can capture such restricted versions of transitivity with any instance of the following schema (where 'Φ' is replaced by a predicate that involves no causal vocabulary and is "wholly qualitative"): necessarily, for any events E_1, E_2, and E_3, if E_1 caused E_2, E_2 caused E_3, and $\Phi(\{E_1, E_2, E_3\})$, then E_1 caused E_3. And any such instance (so long as what is substituted for 'Φ' isn't trivially satisfied) may of course be consistent with there being counterexamples to the claim that causation is transitive *everywhere and always*. Importantly, the cases in which transitivity seems to fail are *unusual* in some way: as a matter of fact, many of them are unusual in the very same way.[53]

Now, I do not claim that I know what to substitue for 'Φ'. But I do claim that the existence of counterexamples to a fully general claim of transitivity shouldn't shake our confidence that causation is *usually* transitive, that transitivity holds in general *provided* that a highly unusual condition (which is perhaps very difficult

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[50]See also McDermott (1995) and Ehring (1997).

[51]Cited in, among others, Lewis (2004).

[52]See Lewis (2004, §2.3) and Hall (2004a, 2004b).

[53]See Lewis (2004, §2.3). Here's how we might characterize the structure of most of the counterexamples: some event threatens to do something, but also does something that contributes to the undoing of that very threat. (It is put roughly this way by Collins, Hall, and Paul (2004), p. 40.) Thus, the placement of the bomb threatens to kill Joe, but it also alerts Joe to the threat and thus contributes to the undoing of that threat.

to specify) does not obtain. And, moreover, that in many cases we can simply see that the condition does not obtain.

To take the simple example with which my argument began, if we know that domino$_1$ fell, causing (duplicate) domino$_2$ to fall in just the same way, which in turn caused (duplicate) domino$_3$ to fall in just the same way, then it seems we can validly infer that domino$_1$'s falling caused domino$_3$'s falling. No failure of transitivity seems in the offing once we fix the intrinsic natures of the events in the sequence in that way.[54] But the fact that the transitivity of causation holds in any such case, together with the assumption that causation is irreflexive, implies that causal loops consisting solely of such falling dominoes are impossible.

And of course, it's not the case that causation is transitive only when it comes to duplicate falling-domino-events. As I've suggested, it's transitive in a large class of cases. And that fact, together with the assumption that causation is irreflexive, implies more generally that many sorts of causal loops are impossible.[55] So to anyone who is sceptical of the premise that *every sort* of causal loop is impossible, I can offer a version of the Argument from Causal Loops that relies not on that fully general premise, but only on instances of it. Of course, the relevant instances are the sorts of causal loops which are (a) guaranteed possible by the conjunction of DANC and the claim that causation (or some causal relation) is intrinsic, and (b) demonstrably impossible, assuming certain true restricted transitivity claims.[56]

3.2.3 Argument from Transitivity Violation

Alas, almost nothing is uncontroversial in philosophy: not only are there philosophers who deny that causal loops are all impossible, there are also those who deny that causation is irreflexive.[57] To those philosophers I offer another argument, which exploits the point I made in the previous section about a true restricted transitivity claim, and relies neither on the premise that causation is irreflexive nor on the premise that causal loops are impossible. The basic idea of this argu-

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[54]If you think that other *external* conditions need to be satisfied for transitivity to hold - like there being nothing *else* going on in the vicinity other than falling dominoes - that will present no special difficulty for my argument; after all, DANC guarantees the possibility of the causal loop of falling dominoes *and nothing else.*

[55]Where to say that a particular sort of causal loop is impossible is to assert some instance of the following schema: necessarily, there is no sequence of events $\{E_1,..., E_N\}$, such that (1) each event causes the succeeding event in the sequence, (2) some event appears twice in the sequence, and (3) $\Phi(\{E_1,..., E_N\})$. Any such instance could be derived from a restricted claim of transitivity (together with the assumption of irreflexivity) if the fact that $\{E_1,..., E_N\}$ satisfies the predicate that substitutes for Φ implies that any three-membered subsequence of $\{E_1,..., E_N\}$ satisfies a condition sufficent for transitivity.

[56]I should note that this version of the argument requires a bit more generalizing at the second stage of the argument - to cover the cases in which the transitivity of causation fails - but that seems to make the generalizing maneuver no less plausible.

[57]Lewis (1986b) denies it (Postscripts to "Causation," §F); he does concede that causal dependence is irreflexive, but that is of no use for the argument in the previous section.

ment is simple: the conjunction of DANC and the assumption that causation is intrinsic entails the possibility of violations of transitivity in the sorts of cases in which causation is necessarily transitive. So DANC entails that causation is not intrinsic. Then another application of the "generalizing maneuver" delivers the result that DANC entails the DELOCALIZATION OF CAUSATION.[58]

The details are as follows: consider again a possible pair of domino-falling-events, (E_1, E_2), where E_1 caused E_2. Again, call the intrinsic nature of each event, '**Falling Domino**'. Now suppose, for reductio, that causation is intrinsic. Then (E_1, E_2) has an intrinsic nature - again, call it '**Domino Pair**' - which entails the following relation:

> *being an x and y such that x's intrinsic nature is* **Falling Domino** *and y's intrinsic nature is* **Falling Domino** *and x caused y*

And it surely seems that there is another possible pair of domino-falling-events, (E_3, E_4), where that pair is a duplicate of (E_1, E_2) but for the fact that it *does not instantiate causation* (or any causal relation).[59] But since (as we have supposed) causation is intrinsic, then so is its negation.[60] So then (E_3, E_4) has an intrinsic nature - call it '**Domino Pair**$_{\text{NoCause}}$' - which entails the following relation:

> *being an x and y such that x's intrinsic nature is* **Falling Domino** *and y's intrinsic nature is* **Falling Domino** *and x does not cause y*

DANC then allows us to patch together two instances of **Domino Pair** and one instance of **Domino Pair**$_{\text{NoCause}}$, in such a way that - assuming a restricted transitivity claim for which I argued in the previous section - there are two events, x and y, where it's both the case that x caused y and it's *not the case* that x caused y.[61] And there can be no such thing. So by reductio, we can conlude that DANC entails that causation is extrinsic.

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[58] Thanks to John Hawthorne for suggesting this alternative argument.

[59] To put this in terms of the jargon I used to formulate the DELOCALIZATION OF CAUSATION, my assumption amounts to the claim that the sequence/relation pair $\{(E_1, E_2)/causation\}$ is not causally innocent.

[60] See nt. 13.

[61] Here's a more formal argument. It follows from DANC that if {**Domino Pair**, **Domino Pair**$_{\text{NoCause}}$} is a sequence of intrinsic natures, {2,1} is a sequence of positive cardinals, and ϕ is a spatiotemporal arrangement that maps one instance of **Domino Pair** to the sequence of regions $\{R_1, R_2\}$, another instance to the sequence $\{R_2, R_3\}$, an instance of **Domino Pair**$_{\text{NoCause}}$ to the sequence $\{R_1, R_3\}$ (where that arrangement "fits"), and the element in the first instance, which was mapped to R_2, is identical to that element of the second instance which was mapped to R_2, etc., then there is a possible world in which there are exactly two instances of **Domino Pair** and one instance of **Domino Pair**$_{\text{NoCause}}$ in that arrangement - provided that for any objects x and y and region R such that x and y each exactly occupy R, x and y have the same intrinsic nature (and size and shape permit). Let 'ϕ' name the arrangement described. The antecedent seems true and the proviso is met, so it follows that there *is* a possible world in which there are exactly two instances of **Domino Pair** and one instance of **Domino Pair**$_{\text{NoCause}}$ in ϕ. From which it follows that there *is* a possible world in which an event x that exactly occupies R_1 caused an event y that exactly

The second stage of the argument is the same as in the previous argument: infer from the conclusion of the first stage that the instantiation of any causal relation is a *wholly extrinsic matter*...which entails the DELOCALIZATION OF CAUSATION. By conditional proof, we can conclude that DANC entails the DELOCALIZATION OF CAUSATION.

3.2.4 Objection: Temporal Direction is Intrinsic

Objection: The central objection I anticipate is directed at my Argument from Causal Loops and rests on two assumptions:

1. *Temporal direction is an intrinsic relation.*

   So if my match striking came before its lighting, then it is *intrinsic* to the pair (my match striking, the match lighting) that the match striking *is earlier than* the match lighting.

2. *One event can cause another only if the one occurs before the other.*

   Thus, backward and simultaneous causation are both impossible.

If both of these assumptions are true, then none of the problematic situations which I claimed are guaranteed possible - assuming DANC is true and causation is intrinsic to certain sequences - are really guaranteed possible. For instance, consider the simple example involving the intrinsic nature **Domino Pair**. That intrinsic nature entails the relation:

> *being an x and y such that x's intrinsic nature is **Falling Domino** and y's intrinsic nature is **Falling Domino** and x caused y*

Then assumption (2) implies that it also entails the relation:

> *being an x and y such that x is earlier than y*

But then since that relation is intrinsic (per assumption (1)), there is no spatiotemporal arrangement of three instances of **Domino Pair** that satisfies the description I gave in my argument (in §3.2.1) *and* which *fits*. The spatiotemporal arrangement I considered assigns one instance of the intrinsic nature to $\{R_1, R_2\}$, another to $\{R_2, R_3\}$, and a third one to $\{R_3, R_1\}$.[62] That's how we get a causal loop. But then it doesn't *fit* **Domino Pair**, an intrinsic nature every one of whose instances instantiates the *earlier than* relation. In order to fit, it would have to be the case that R_1 is earlier than R_2, and R_2 is earlier than R_3, and R_3 is earlier than R_1. And there is no

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occupies R_2 which caused an event z that exactly occupies R_3 - and, I am assuming, the triple $\{x, y, z\}$ satisfies a condition sufficient for causal transitivity, so x caused z - but where x did *not* cause z. Impossible!

[62]See nt. 45.

such set of spacetime regions. (The objection assumes that there can't be "*earlier than* loops".)

Reply: Before I get to my main reply, I will note two things. First, the objection is only directed at my Argument from Causal Loops; even if its two assumptions are true, no part of my Argument from Transitivity Violation is affected. That's not a reply to the objection, of course, as much as a reminder that even if my reply is unsuccessful, the Half-Hearted Humean is not out of the woods. Second, the assumptions upon which the objection rests are hefty and far from obvious. Perhaps (2) is a natural companion to the assumption (of my argument) that causal loops are impossible, in that they both reflect a conservative view about when causation can occur.[63] But (1) involves a hefty add-on, and one that seems very unHumean at that.[64] Of course, my argument is directed against a Half-Hearted Humean, and she might be *very* faint-hearted about her Humeanism. But it is still noteworthy that she has to take on a seemingly independent hefty commitment.

Now for my main reply: she *can't* take on that hefty commitment, not so long as she is commited to DANC. The reason is that a very natural extension of DANC - one which I don't think any proponent of DANC could reasonably deny - makes precisely the same sort of trouble for the view that temporal direction is intrinsic as DANC makes for the view that causation is intrinsic. In essence, the objection has merely shifted the problem from one allegedly intrinsic relation to another.

The natural extension of DANC I have in mind, which we can call 'DANC*', is something of an abstraction from DANC. DANC* doesn't guarantee the possibility of *spatiotemporal* arrangements at all, or at least not directly. Rather, it guarantees the possibility of any mereological arrangement of instances of any intrinsic natures, where a mereological arrangement is a specification of which objects overlap (in the mereological sense of 'overlap') which others, and on what parts; such an arrangement remains silent on the spatiotemporal locations of objects. Of course, an analogous proviso to the one in DANC applies here as well: the mereological arrangement can specify overlap only between parts that share the same intrinsic nature. It couldn't very well be the case that you and I overlap on my head and your arm.

Now, it's a fairly straightforward matter to show that DANC* entails that temporal direction is not intrinsic. All we need is the possibility of a pair of duplicate events - like two beats of a metronome - one of which occured before the other. (Our falling dominoes would do, but I'll leave them aside so that issues involving *causation* don't confuse the reader.) Let us call each beat's intrinsic nature "**Metro**

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[63]Thanks to an anonymous referee here.

[64]Note that if a proponent of DANC accepts (2) but denies (1), then there is yet a third - and even quicker - argument that she is committed to the DELOCALIZATION OF CAUSATION. If (1) is false, then DANC guarantees the possibility of, for example, two instances of **Domino Pair** that are temporal inverts of one another; and that's clearly impossible if causation is intrinsic, (2) is true, and no pair can instantiate both *earlier than* and *later than*.

Beat," and the pair's "**Beat Pair**". Suppose temporal direction is intrinsic; then **Beat Pair** entails the following relation:

> *being an x and y such that x's intrinsic nature is **Metro Beat** and y's intrinsic nature is **Metro Beat** and x is earlier than y*

But then there are two arguments - perfectly analogous to the Argument from Causal Loops and the Argument from Transitivity Violation - which show that DANC* entails the possibility of an impossible situation. (And remember, the objection requires the assumption that there can't be "earlier than" loops; and so I can safely assume that as well in replying.) By reductio, conclude that temporal direction is not intrinsic.

I suppose the Half-Heared Humean might endorse DANC but not DANC*. That would leave her in an unenviable position, and perhaps an unstable one as well. DANC* seems to be nothing but a more abstract version of DANC, and the central motivation for DANC - that any "violation" of it would constitute a deeply mysterious necessary connection - seems equally a motivation for DANC*.

3.3   From Denial to Joint Delocalization

That concludes my argument for the claim that DANC entails both Delocalization theses. I'd *like* to argue straightaway that DANC entails Global Supervenience by arguing that the conjunction of the Delocalization theses entails Global Supervenience. And I could do so if those theses didn't make an exception for "nomologically/causally innocent pairs". But because they *do* make such an exception, matters aren't as straightforward. (I'll presently explain why they make matters less straightforward.) Instead, I have to first argue that DANC entails *another* thesis - which I shall call 'Joint Delocalization' - a thesis that is, at least on the face of it, slightly stronger than the conjunction of the two Delocalization theses, and which *does* straightforwardly entail Global Supervenience.

In the course of arguing for the Delocalization of Laws, I arrived at the (interim) conclusion that,

> (1) A difference between two sequences with respect to whether some proposition is a law (or some propositions are laws) doesn't, all by itself, make for an intrinsic difference. So any two sequences that are non-nomic duplicates are intrinsic duplicates, period.

And in the course of both arguments for the Delocalization of Causation, I arrived at the (interim) conclusion that,

> (2) A difference between two sequences with respect to whether there is any causation going on between (the parts of) the elements of the

sequence doesn't, all by itself, make for an intrinsic difference. So any two sequences that are non-causal duplicates are intrinsic duplicates, period.

But what I need in order to argue for GLOBAL SUPERVENIENCE is this thesis:

> JOINT DELOCALIZATION: A difference between two sequences with respect to both whether some proposition is a law (or some propositions are laws) *and* whether there is any causation going on between (the parts of) the elements of the sequence doesn't, all by itself, make for an intrinsic difference. **So any two sequences that are non-causal, non-nomic duplicates are intrinsic duplicates, period.**[65]

And JOINT DELOCALIZATION doesn't *straightforwardly follow* from the conjunction of (1) and (2): perhaps a departure in just the nomic facts makes no intrinsic difference, and a departure in just the causal facts makes no intrinsic difference, but a departure in *both* respects does make for an intrinsic difference. Call this suggestion 'Hairsplit' (not to be tendentious). Now, I'm not sure Hairsplit is a genuine epistemic possibility; and I am unaware of any account of causation and laws which would have it as a result. But so as not to leave room for such accounts, I will show that the Argument from Causal Loops can be extended to deliver the result that DANC entails JOINT DELOCALIZATION.[66] (Note that if the Delocalization theses didn't make an exception for "nomologically/causally innocent pairs," then they would imply that all causal and all nomic properties are, without exception, extrinsic; which would then imply that any non-causal, non-nomic duplicates are intrinsic duplicates, since they share all intrinsic properties and relations.[67])

Assume DANC is true. Now, consider again, if you are not too tired of them, a possible pair of duplicate domino falling events, (E_1, E_2), which are such that E_1 caused E_2 *and* the Law of Universal Gravitation is a law. Call its intrinsic nature '**Domino Pair$_{+\text{Gravity}}$**'. Now, according to Hairsplit, the relation,

> *being an x and y such that x caused y or the Law of Universal Gravitation is a law*,

is intrinsic to (E_1, E_2). After all, any pair that lacked that relation would fail to be an intrinsic duplicate of (E_1, E_2). So that relation is entailed by **Domino Pair$_{+\text{Gravity}}$**.

And there is, presumably, another possible pair of duplicate domino falling events, (E_3, E_4), which are such that E_3 caused E_4 *and* the Law of Universal Schmav-

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[65]Where *x is a non-causal, non-nomic duplicate of y* iff for any intrinsic perfectly natural non-causal, non-nomic relation *R*, *x* has *R* iff *y* has *R*.

[66]One could likewise extend the Argument from Transitivity Violation to deliver the same result.

[67]I am assuming that the perfectly natural (non-causal, non-nomic) properties and relations settle all the less-than-perfectly natural (non-causal, non-nomic) ones.

itation is a law. (Where the Law of Universal Schmavitation is some proposition inconsistent with the Law of Universal Gravitation.) Call its intrinsic nature 'Domino Pair$_{+\text{Schmavity}}$'. Then, according to Hairsplit, the relation,

> *being an x and y such that x caused y or the Law of Universal Schmavitation is a law,*

is intrinsic to (E_3, E_4). After all, any pair that lacked that relation would fail to be an intrinsic duplicate of (E_3, E_4). So that relation is entailed by Domino Pair$_{+\text{Schmavity}}$.

Now, DANC guarantees that it is possible that there are *two* event loops – a million miles apart, say – one of which is "constructed" solely from instances of Domino Pair$_{+\text{Gravity}}$ and the other of which is "constructed" solely from instances of Domino Pair$_{+\text{Schmavity}}$. But that's not in fact possible, since it would involve *either* an impossible sort of causal loop or the truth of two inconsistent propositions. So Hairsplit is false. By conditional proof, conclude that DANC entails that Hairsplit is false. And since DANC entails (1) and (2), it entails JOINT DELOCALIZATION.

4   From Delocalization to Global Supervenience

Now I can move to GLOBAL SUPERVENIENCE, the final thesis in the Wholehearted Humean's package. There are several extant arguments for GLOBAL SUPERVENIENCE; none of them seems compelling to me.[68]   But granting the core Humean idea that there are no absolutely necessary connections between distinct things, there is indeed a refreshing and compelling argument for GLOBAL SUPERVENIENCE. Its first premise is that DANC entails JOINT DELOCALIZATION. Its second premise is that JOINT DELOCALIZATION in turn entails GLOBAL SUPERVENIENCE. As is hopefully clear, I have argued for the first premise in §3.3; now I will argue for the second premise.

4.1   THE ARGUMENT

The argument is quite simple. Its only "moving part" is this assumption:

> INTRINSIC SETTLES ALL: Any two possible sequences of concreta which are intrinsic duplicates, and such that each one *exhausts* the concreta - that is, each sequence instantiates the relation *being all the concreta there are* - instantiate all the same qualitative properties/relations, period.

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[68]See Schaffer (2007) for a survey of the arguments; he and I differ, it seems, with respect to the force of his so-called arguments from *methodology* and *science.*

Think of a simple case: I tell you that in W_1 there is a monkey, and nothing else concrete (other than its parts); and in W_2 there is a monkey, and nothing else concrete (other than its parts); and I further tell you that the monkeys are intrinsic duplicates. Isn't it obvious that the monkeys don't differ at all, except perhaps in a non-qualitative way? To use my initial and intuitive characterization of intrinsicality as a guide, if you know how a certain monkey is in itself, and you know that it is not related to *any other* mereologically disjoint concrete object (since you know there is no other), don't you know everything you need to know to determine the properties it has *ex*trinsically, i.e. the properties it has in virtue of the way it is (intrinsically) and the relations it stands or fails to stand in to other things? It would certainly seem so. (I told you I'd flag where it is that I am leaning on our grasp of the concept *intrinsicness*. Here it is. And as I said, I trust it is clear enough that my assumption is true.) Now extend the thought to multi-element sequences of concreta: it still seems just as obviously true.

Now assume JOINT DELOCALIZATION for conditional proof. Then any two possible sequences of concreta that are non-causal, non-nomic duplicates are intrinsic duplicates, period. But then, assuming INTRINSIC SETTLES ALL, any two possible sequences of concreta that are non-causal, non-nomic duplicates, and such that each one exhausts the concreta, instantiate all the same qualitative properties/relations, period. And that implies GLOBAL SUPERVENIENCE.[69] Thus, JOINT DELOCALIZATION entails GLOBAL SUPERVENIENCE. And as I argued in §3.3, DANC entails JOINT DELOCALIZATION. So DANC entails GLOBAL SUPERVENIENCE.

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[69]I assume that necessarily, if there are concreta, then there is a sequence of all concreta. (I also assume that *being all the concreta* is a perfectly natural, non-causal, non-nomic relation; but that plays no substantive role. If you think that relation is not perfectly natural, then simply reformulate GLOBAL SUPERVENIENCE to accommodate that.) Let B be the set of all perfectly natural non-causal, non-nomic properties/relations, and let A be the set of all qualitative properties/relations. For any worlds w_1 and w_2, any function f that is a B-isomorphism from the concrete domain of w_1 to the concrete domain of w_2 is such that for any sequence X_1 of all the concreta in w_1, the sequence X_2 of images (under f) of the elements of X_1 instantiates the relation *being all the concreta there are*, and for any (other) perfectly natural non-causal, non-nomic property/relation R, X_1 instantiates R iff X_2 instantiates R; and so they instantiate all the same qualitiative properties/relations. But since I assume that necessarily, if there are concreta, then there is a sequence of all concreta, it follows that for any worlds w_1 and w_2, such that there are concreta in w_1, any function f that is a B-isomorphism from the concrete domain of w_1 to the concrete domain of w_2 is such that *there is* some sequence X_1 of all the concreta in w_1, and the sequence X_2 of images (under f) of the elements of X_1 instantiates all the same qualitative properties/relations as X_1; and hence is such that for any qualitative property/relation R, and *any* sequence of concreta in w_1, that sequence instantiates R iff the sequence of images (under f) of the elements of that sequence instantiates R; that is, it is an A-isomorphism. (And for any worlds w_1 and w_2, such that there are *no* concreta in w_1, it is trivial that any B-isomorphism from the concrete domain of w_1 to the concrete domain of w_2 is an A-isomorphism.)

5 Conclusion

I have argued that DANC quite plausibly entails three other Humean theses. The final turn of the screw is to note that it is extremely unattractive, if not demonstrably inconsistent, to hold GLOBAL SUPERVENIENCE together with a governing conception of either *causation* or *lawhood*.[70] If causal facts or laws really *do* govern or constrain the particular matters of fact, then why couldn't the particular matters of fact underdetermine the causal or nomic facts? Why couldn't different causal or nomic facts underlie the same patterns in the phenomena? Those questions are especially pressing given what *appear* to be distinct scenarios that exhibit that very sort of underdetermination (see Tooley (1988) and Carroll (1994)). Someone with a Humean account of laws and causation can, in a principled way, drive a wedge between appearance and reality. They have an *explanation* of the fact, if it is a fact, that those scenarios are not really distinct after all.[71] But, absent such an account, it would seem that no such explanation could be given. GLOBAL SUPERVENIENCE would be an inexplicable constriction of what appears to be modal space.

The upshot then is that we face a stark choice: either there are *absolutely* necessary connections between distinct existents or it really is "just one damn thing after another." If she accepts my arguments, the Half-Hearted Humean could of course do one of two things: accept the whole Humean package or reject DANC and give up Humeanism entirely. My arguments are silent on which course to take. But either way she goes, she needs to get off the fence.[72]

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[70]On the distinction between governing and non-governing conceptions of *lawhood*, see Beebee (2000).

[71]They do owe an explanation of why we *think* they are. See §5 in Collins, Hall, and Paul (2004, ch. 1).

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