Two Concepts of Intrinsicality*

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Draft

1 Introduction

Intrinsic properties are those which a thing has in virtue of how it is itself. There are no uncontroversial examples, though determinates of shape (being spherical), of size (having a volume of 1 litre), and of quantity of matter (having a mass of 2 kg) are probably as good candidates as any. Extrinsic properties are had by a thing partly in virtue of how other things are, or of what relations it bears to other things. Being an uncle and being the poorest person are examples.

The distinction is fairly intuitive, and we might choose to help ourselves to it while simply relying on our pre-theoretical understanding. Nonetheless, there are reasons not to do that, and instead aim to give a philosophical account of what the distinction consists in. One reason is that there are skeptics, who deny the intelligibility or coherence of the distinction. Another reason is that our pre-theoretical grasp, while allowing us to identify clear cases of extrinsic properties, does not allow us to decide which, if any, properties are intrinsic.

'Intrinsic' and 'extrinsic' are definitely contraries: they can never be predicated of

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one and the same entity. I leave it open here whether on the domain of properties, they are indeed contradictories. Arguably, disjunctions of intrinsic and extrinsic properties are neither intrinsic nor extrinsic.[1] Partly to avoid such complications, I focus here on 'intrinsic', and will say little about 'extrinsic'.

Intrinsic properties are an interesting topic in its own right in the metaphysics of properties. But they are also invoked in other philosophical debates. Humean supervenience, a much-discussed metaphysical thesis, is the view that everything globally supervenes on intrinsic properties of point-sized entities and spatiotemporal relations.[2] Debates between internalism and externalism, which loom large in various sub-disciplines of philosophy, are often usefully explicated by appeal to the distinction between intrinsic and extrinsic properties.[3]

There have been various attempts at providing an analysis of 'intrinsic'. One strategy is to take off from the informal gloss above, and help onself to the concept of one fact obtaining in virtue of another one. One might be worried that we have only a tenuous grasp of that concept, and that it will itself prove recalcitrant to philosophical elucidation. Still, I acknowledge that this strategy may have promise. However, I am not pursuing it here.[4] Instead, I discuss two other *prima facie* promising answers to the question what intrinsic properties are. These answers appeal to the notions of duplication and of recombination, respectively. They are both prominent in the literature, in one manifestation or another. I will suggest that they both capture an important concept, but not the same one.

[1] Lewis [1983a] takes extrinsicness to be a matter of degree; and the theory in Denby [2006] classifies properties into intrinsic, extrinsic, and mixed ones.

[2] It can be stated differently, in terms of "perfectly natural" or "fundamental" properties. But it is a prominent feature of perfectly natural or fundamental properties that they are intrinsic.

[3] Weatherson [2002] makes a good case for the philosophical importance of the distinction.

[4] I do not know of any published implementation of that strategy. It has been suggested to me by Gideon Rosen.

2 Duplication and Recombination

What are intrinsic properties? The first of the answers I discuss is that intrinsic properties are those that duplicates have in common with each other. We have a good pre-theoretical grasp of what duplication is. Typically, it is the goal of such activities as xeroxing or key-cutting to produce a duplicate of a given thing. In cookie-baking, all the products will ideally be duplicates of each other.

This suggests the following analysis: A property is intrinsic if there are no two duplicates between which it differs. But this will not do. We understand duplication because some of our activities aim at it, not because we are often confronted with duplicates. For all we know, there are no pairs of duplicates outside the realm of elementary particles. If so, the proposed analysis entails that any property which never differs among elementary particles is intrinsic—clearly an unacceptable result.

An obvious remedy is to quantify over pairs of possible rather than actual duplicates:

1) X is intrinsic $\Leftrightarrow$ X is shared by all possible duplicates.[5]

As the term is used here, that a property is "shared" by two individuals does not mean that both of them have it. They share it if either they both have it or both lack it.

This proposal does not preclude an explication of the notion of duplication in yet other terms. For example, duplication might be said to be the sharing of a certain metaphysically privileged class of properties, "perfectly natural" or "fundamental" properties.[6] Or the duplication of wholes might be explained as a function of the duplication of their parts.[7]

The second idea is that being intrinsic is a matter of lacking certain implications. Consider the non-intrinsic property of being an uncle. My having that property implies

[5] Duplication is a cross-world relation: its relata may be in the same or in different possible worlds.

[6] A proposal along these lines has been made by David Lewis [1986] and defended by Theodore Sider [1996].

[7] Weatherson [2006] discusses principles of that sort.

that two things distinct from me exist, one of whom is a parent of the other. My having an intrinsic property such as being more than six foot tall of course has implications for how I am. For example, it implies that I am more than five foot tall. But it does not seem to have implications about anything distinct from me. This suggests that intrinsic properties are those whose instantiation by a thing only has implications for that very thing.

However, this characterization immediately needs to be qualified: that I am more than six foot tall does have implications for things besides me, for example, that everything is accompanied by something that more than six foot tall. However, the property thus implied is not intrinsic. It is still true that the instantiation of an intrinsic property has no implications for what intrinsic properties are instantiated by other things.

The qualification makes it appear that we cannot define 'intrinsic' in terms of lack of implication. Specifying intrinsic properties as those whose instantiation has no implications for other intrinsic properties is circular. However, it is not immediately obvious that the class of intrinsic properties cannot be picked out as the class whose members never imply the instantiation of each other. I will discuss in section 6 whether we can hope for that. In any case, there is a great deal to be said about intrinsic properties even if it should turn out that we cannot define the notion.

Implication may here be understood modally: A implies B if and only if B is true in all possible worlds in which A is true. That my being more than six foot tall does not imply anything about the rest of the world then translates into the claim that whatever is possible for the rest of the world is compossible with me being taller than six foot. Here is the link to combinatorial principles. A claim to the effect that whatever is possible for two things individually is possible for them jointly is known as a *combinatorial* principle, or *recombination* principle.

The best-known recombination principle is the one David Lewis introduced in Lewis [1986]. It allows cutting, copying, and pasting parts of spacetime, as it were. It is officially stated in terms of duplicates. But this ought not to mislead us into thinking that the concept of recombination presupposes the concept of duplication. The idea of a combinatorial principle is straightforward enough. Suppose that F and G are properties and a and b are individuals. Then a full combinatorial principle implies the existence of sixteen distinct possibilities: a world where both a and b have both F and G; a world where a has G but not F, and b has both F and G; and so on. The combinatorial principles used to implement the strategy for capturing intrinsic properties have a different form, to be discussed later.

The second idea leads to the following schematic proposal:

2) X is intrinsic $\Leftrightarrow$ X belongs to a class that satisfies suitable combinatorial principles.

This proposal is obviously schematic, since it does not specify what these principles are. I will improve upon 2) in section 4, but for the current discussion, the approximation will do.

The idea to invoke combinatorial principles in an analysis of intrinsicness is several decades old. The initial claim was that a property is intrinsic if and only if it could be had by a *lonely* object. An object is lonely if it is the only thing existing in a world, apart from possibly its own parts and necessary existents.[8] This is a very modest combinatorial requirement, and was soon realized to be inadequate. The non-intrinsic property of being lonely itself presents a counterexample. While analyses of that kind have been proposed for a while, they have only in the last few years explicitly be described as combinatorial.[9]

Both 1) and 2) purport to tell us which properties are intrinsic. Both are based on plausible ideas: the idea that intrinsic properties are those that never differ between duplicates, and the idea that intrinsic properties are those whose instantiation by a thing does not imply anything for things distinct from that very thing, respectively.

[8]That is, x is lonely in w if x overlaps any contingent y that exists in w.

[9]The pertinent articles are Weatherson [2001] and Denby [2006].

Both are thus attractive, and may even appear compelling. This raises the question what the relationship between them is. Do they supplement each other, or are they rivals? In the literature, it is often assumed, implicitly or explicitly, that they are both true, and *a fortiori* that they are compatible. More precisely, it is assumed that 1) is true, perhaps with a bit of regimentation of 'duplication', and that an improved version of 2) is also true. I call this view *convergentism*.

In this paper, my main aim is to argue against convergentism. If I am right, 1) and 2) cannot both be be true. I argue that the right-hand sides 2), suitably modified, elucidates a coherent concept. I label the concept expressed by the right-hand sides "duplication-intrinsicality" and "implication-intrinsicality," respectively.[10]

The choice of labels suggests that I take both concepts to be concepts of intrinsicality. This is a substantive claim, but it is not one that I am defending here, nor even one that I am strongly wedded to. I am ready to be persuaded by further considerations that one or both of these concepts are distinct from our core concept of intrinsicality.[11]

3 Commitments of Convergentism

Roughly, my label 'convergentism' stands for the view that analysing intrinsicness in terms of duplication and in terms of recombination come to the same thing. In this section, I first state this view more precisely, and then argue that it is false.

Convergentism is weaker than it appears at first. It need not claim that both biconditionals above constitute *analyses* of 'intrinsic'. Perhaps it is analytic that there can be at most one analysis of a concept.[12] What convergentism is committed to

[10] Alternatively, I could use the term "combinatorial intrinsicality."

[11] It is familiar that there are different concepts in the neighborhood. Humberstone [1996] usefully distinguishes many of them. However, I think that none of the distinctions considered there and elsewhere in the literature coincides with the one between implication-intrinsic and duplication-intrinsic properties.

[12] Or better, it is perhaps analytic that if Φ and Ψ are both analyses of the same concept, then one of them results from the other by substituting an analysandum by an analysans. For example, an analysis of intrinsic properties as those shared by all possible duplicates and an analysis as those

is merely the truth of the biconditionals 1) and 2), or of improved cousins thereof. (The qualification that such improved versions of 1) and 2) are what matters for the discussion is often omitted in the following.) The view is thus committed to the following biconditional, entailed by 1) and 2):

3) X is shared by all possible duplicates $\Leftrightarrow$ X belongs to a class that satisfies suitable combinatorial principles.

As such, convergentism is silent on whether 1), or 2), or neither of them counts as an analysis of 'intrinsic'. It merely asserts that these biconditionals are necessary. However, convergentism is naturally supplemented by the claim that both 1) and 2) are conceptually illuminating in some way. While analyses are paradigms of conceptual illumination, clearly a proposition may be conceptually illuminating without being an analyis.

'Convergentism' is my label. I claimed that the view is denoted is popular in the literature. Typically, philosophers who attempt to spell out combinatorial conditions for intrinsicality take 1) for granted, and indeed use 3) as an adequacy condition of their combinatorial analysis. They accept 1) as a biconditional, although they take it to be too obvious to count as an analysis. The combinatorial conditions, on the other hand, are deemed to be sufficiently informative to provide an analysis.

Much of the recent literature takes the theory offered in Langton and Lewis [1998] as its starting-point. It is thus worth asking whether that account may count as convergentist. The answer to that question, like the theory itself, is not simple, but I contend that the account is convergentist in spirit.

Langton and Lewis do not provide combinatorial conditions that are satisfied by a property if and only if it never differs between duplicates. Rather, they provide combinatorial conditions for a property's being basic-intrinsic, which they use to define

shared by all possible things sharing all their perfectly natural properties are not rivals, provided that being duplicates is analysed as sharing all perfectly natural properties.

duplication. (They say “basic intrinsic”; I hyphenate to stress that this is a technical term.) In short, they accept 1), 4), and 5):

4) Individuals x and y are duplicates $\Leftrightarrow$ x and y share all their basic-intrinsic properties.

5) A property X is basic-intrinsic $\Leftrightarrow$ X is independent of accompaniment, not disjunctive and the negation of a disjunctive property.

Lewis later acknowledged that the detour via basic-intrinsic properties is unsatisfactory:

> A previously noted reason for dissatisfaction with the DI definition is that it works in a roundabout way. ... Some disjunctive properties are impeccably intrinsic. Yet we dealt with the troublemakers by throwing out disjunctive properties wholesale, only to reinstate many of them at the final step when we passed from ‘basic intrinsic’ to ‘intrinsic’ *simpliciter*. Why not throw out just the troublemakers, and skip the final step? (Lewis [2001, p. 389])

Thus in so far as the theory in Langton and Lewis [1998] is not convergentist, this has later been denounced as a flaw by one of the authors of that paper.

After clarifying what convergentism is, and adducing evidence that it is indeed widely assumed, I now want to undermine its appeal. For the time being, I continue to work with my simplified and schematic account of implication-intrinsicality.

Consider again the biconditional 3) to which the convergentist is committed:

3) X is shared by all possible duplicates $\Leftrightarrow$ X belongs to a class that satisfies suitable combinatorial principles.

The logical relationships between the modal notions deployed in 3) can be discussed more easily in the language of possible worlds and individuals. The left-hand side of 3) is a universal quantification: all possible duplicates are alike with respect to it.

In contrast, the right-hand side of 3) is an existential quantification. This is slightly harder to see. In my rough formulation above, a combinatorial principle says that whatever is possible separately is also compossible. Thus combinatorial principles are universal quantifications, but not over possible worlds or possible individuals. Rather, they quantify over all combinatorial possibilities, as it were, and claim that they are realized. In a possibilist language, this would be cashed out by a sequence of *existential* quantifications.

Typically, an analysis of a concept in modal terms makes the extension of that concept be a function of what is possible and what is not. The analysis does not have implications about modal space. But the situation is different when we have two biconditionals, plus the claim that they coincide. 3) has very substantive modal implications.[13] Or to put the same point differently: many views about what is possible entail that 3) is false, and hence that convergentism is false.

Metaphysicians disagree about the modal status of laws of nature. Necessitarians, such as Sydney Shoemaker and Chris Swoyer, hold that the laws of our world are true in all possible worlds. If necessitarianism is true, then certain combinatorial principles for the properties that figure in laws fail. Let a be a time-slice of a world w_1, with total energy E_1, and let b be a time-slice of a world w_2, with total energy E_2, distinct from E_2. A combinatorial principle entails that there is a possible world w_3 with time-slices c and d that have energies E_1 and E_2, respectively. But then, the law of conservation of energy fails in w_3, contradicting necessitarianism. Thus necessitarians need to reject the right-hand side of 3) for $X = \{\text{energy}\}$.[14] However, they most plausibly accept the left-hand side: it appears that if two things, or systems, do not have the same energy, they are not duplicates. Since necessitarians accept the left-hand side and reject the right-hand side of 3), they are committed to reject convergentism.

Perhaps an objector will dispute that energy is always shared by duplicates. But

[13]This echoes a point made in Cameron [forthcoming]. However, I am not addressing here the epistemological question that he is concerned with.

[14]More precisely, if X contains all the different determinates of energy.

the same point can be made with a property that is often viewed as paradigmatically intrinsic, namely mass. Surely mass does not differ between any duplicates, and thus the left-hand side of 3) is true for $X = \{\text{mass}\}$. However, there are laws involving mass that the necessitarian will consider to be necessary, such as the inverse-square law of gravitational attraction. The argument that a combinatorial principle is violated would be a bit more complicated now, but it would still go through.

The necessitarian is not alone in rejecting 3). Consider what I call "quasi-Leibnizian" individuals. A quasi-Leibnizian individual satisfies three conditions: it i) has no duplicates in any world, ii) exists in more than one world, and iii) in each world, it "mirrors" the properties of the other individuals.[15] If all possible individuals are quasi-Leibnizian, then all properties are shared by all possible duplicates. This condition holds trivially, since there are no duplicates between which they could differ. But due to the mirroring requirement, no contingent properties will satisfy combinatorial principles. Thus a quasi-Leibnizian metaphysics is one on which the biconditional 3) fails for every class of contingent properties X.

I introduced necessitarianism and the quasi-Leibnizian view to make vivid that convergentism has substantive modal implications. Some convergentists may be unfazed by this, since they hold for independent reasons that the laws of nature are contingent, and that the quasi-Leibnizian metaphysics is false. David Lewis, for one, whose work inspires much of convergentist theorizing, had such independent reasons. A convergentist of a bold disposition might even argue from the truth of 3) to the falsity of necessitarianism and quasi-Leibnizianism. Given how difficult it is to assess such views, any considerations should count, and it would thus hardly be misguided to suppose that two successful analysis could together tell us a great deal about how modal space looks like.

Another move to save convergentism is to not only endorse its modal implications, but also claim that it is partly constitutive of modality that 3) is true. The conceptual

[15] Condition ii) is clearly not Lebinizian.

illumination provided by an analysis need not flow just in one direction. Or to put it in the terminology of familiar from Lewis [1983b]: we do not need to consider the modal terms and 'duplication' as the old terms and 'intrinsic' as the new one. Rather, we can think of 'intrinsic' and the modal ones, and 'duplication' as well if we wish, as new terms, which are introduced all at once. If so, there ought to be nothing in principle dubious about analyses of intrinsic implying facts about possibility and necessity.

I think that these responses are successful as far as they go. It is of course disputable whether in that particular case, the evidence for convergentism outweighs whatever considerations there are for necessitarianism. But I will not try to adjudicate this issue here, but simply point out that convergentism carries strong modal commitments.

Nonetheless, I think that convergentism is in trouble. If a concept has an analysis that quantifies over possible worlds, then we expect that the concept is really a family of different concepts. Most obviously, this is true of possibility and necessity. But it is also true of supervenience, or of determinism, which come in a metaphysical and a nomological variety. Can we likewise distinguish metaphysical from nomological intrinsicness? It seems that the convergentist is forced to deny this. Let us assume that 1), 2), and 3) above quantify over metaphysical possibilities, and let us grant the convergentist that the metaphysically possible worlds outrun the nomologically possible ones. If we replace 'intrinsic' by 'nomologically intrinsic', and quantify over nomological possibilities instead, we get the following variants:

1') X is nomologically intrinsic $\Leftrightarrow$ X is shared by all nomologically possible duplicates.

2') X is nomologically intrinsic $\Leftrightarrow$ X satisfies suitable combinatorial principles for nomological possibility.

3') X is shared by all nomologically possible duplicates $\Leftrightarrow$ X satisfies suitable combinatorial principles for nomological possibility.

$1'$) and $2'$) pull in different directions. If determinates of mass are shared by all duplicates, then they are *a fortiori* shared by all nomological duplicates. Thus mass, if intrinsic at all, is going to be nomologically intrinsic by $1'$). But mass does not satisfy the pertinent combinatorial principles for nomological possibility. The argument for this is exactly the same as the one given above for the claim that according to the necessitarian, mass does not satisfy these principles.

Moreover, some properties that are not shared by all possible duplicates might be shared by all nomologically possible duplicates. A degenerate case of this is provided by nomologically impossible but metaphysically possible properties, such as being a uranium sphere with a diameter of more than a mile. More interesting cases are provided by causal powers. For example, the property of being able to smash a window if broken is a causal power. In nomologically possible worlds, all duplicates share that properties, but not in a world where the laws are different, a duplicate of a stone does not have that property. Thus causal powers are nomologically intrinsic by $1'$). However, since causal powers do not suitably recombine with intrinsic properties in the space of all metaphysically possibe worlds, they do even less so in the space of all nomologically possible worlds.

More generally, if the convergentist accept $1'$) and $2'$), she is in trouble. For given that all nomological possibilities are metaphysical possibilities, she is committed to the following:

5) X is nomologically intrinsic $\Leftrightarrow$ X is metaphysically intrinsic.

For 1) and 1') imply the right-to-left direction, and 2) and 2') imply the left-to-right direction.

It is true that 5) does not imply that metaphysical possibility and nomological possibility coincide. There might be metaphysically possible worlds that are nomologically impossible, but no property differs among duplicates in the larger sphere unless it also differs among duplicates in the smaller sphere, and no combinatorial principle that is false in the smaller is true in the larger sphere. But 5) comes close to having that implication. While a necessitarian might well be happy to assert the coincidence of metaphysical and nomological modality, surely the contingentist will not.

In this section, I have argued against stronger forms of convergentism, which claim that both 1) and 2) are analytic or at least conceptually illuminating. The modest claim that 1) and 2), and hence 3), are true biconditionals has not been attacked directly yet. I will try to put pressure on it in section 5, after providing more detail about implication-intrinsicality.

4 Explicating Implication-Intrinsicness

I have made a preliminary case against convergentism. If we reject it, there are different theoretical options left. First, to deny that we have a coherent concept of duplication-intrinsicality, or of implication-intrinsicality. Second, to allow that both are coherent, but claim one of them has little or nothing to do with intrinsicalilty. Third, to conclude that they are two distinct concepts of intrinsicality. I cannot offer a full discussion of what speaks for and against each option. Many potentially controversial claims I am taking for granted in this paper: that duplication-intrinsicness is a coherent concept, and the conditional that if both duplication-intrinsicality and implication-intrinsicality are coherent, none of them has a superior claim to be "the" concept of intrinsicality. However, that the concept of an implication-intrinsic property is a coherent concept is better not taken for granted. When trying to formulate it, one quickly runs into difficulties. In this section, I try to show that these difficulties can be overcome, and that a satisfactory theory of implication-intrinsicness can be developed.

So far, my working notion of being implication-intrinsic was to belong to a class that satisfies suitable combinatorial principles. The satisfaction of these principles was meant to explicate the idea that a thing's instantiating the property does not imply anything about distinct things. However, I postponed a discussion what exactly the combinatorial principle is that intrinsic properties satisfy. In this section, I formulate such a principle, building up to it in several steps.[16] In section 6, I discuss whether such a principle, which in the first instance is a necessary condition for the class of intrinsic properties, can be supplemented to obtain a necessary and sufficient condition.

I start with a simple and strong combinatorial principle. Several modifications will then lead us to the one that intrinsic properties satisfy. A maximally strong combinatorial principle requires that every combinatorially possible distribution of properties represents a metaphysically possible distribution. Implication-intrinsic properties do not satisfy such a principle. If F is implication-intrinsic, so is its negation. But the combinatorially possible assignment of both F and $\neg F$ to the very same individual is not metaphysically possible. Borrowing terminology from Denby [2006], I call the sort of recombinability characteristic of implication-intrinsic properties "external recombinability." Roughly, a set of properties is externally recombinable if whenever different assignments of properties to individuals are possible, they are also compossible.

Some terminology: The *domain* D_w of a possible world w is the set of individuals that exist in that world.[17][18] If I is a set of individuals and X a set of properties, then worlds w and w' *agree on* $\langle I, X \rangle$ iff for any $x \in I$ and $F \in X$, x exists in w iff it exists in w', and x instantiates F in w iff it instantiates F in w'.

The following is a first shot at the sought after combinatorial condition on a set of properties X:

D1 X is (finitely) externally recombinable if for any possible worlds w and w' and possible individual $x \in D_w \cap D_{w'}$, there is a world w'' such that i) $D_{w''} = D_w$, ii) w' and w'' agree on $\langle \{x\}, X \rangle$, and iii) w and w'' agree on $\langle D_{w'} \setminus \{x\}, X \rangle$.

[16] There are already rather sophisticated combinatorial theories on the market, such as those proposed by Weatherson [2001] and Denby [2006]. However, Weatherson's is in my view not general enough, and Denby's employs a rather strange and ill-understood primitive. A detailed discussion of their theory is beyond the scope of the current paper, though.

[17] I simplify here by assuming that the things at every possible world form a set.

[18] I try to avoid substantive metaphysical assumptions about how the domains of different worlds relate to each other, and thus allow that some individuals are in more than one world, and also that worlds have different domains.

Slightly less formally: given world w and w' and an individual x that exists in both, there is a third world where x is just as it is in w' (in X-matters), and all other individuals just as they are in w (in X-matters).[19]

A generalization to finitely many individuals and worlds is a straightforward consequence of D1. Suppose that X is finitely externally recombinable, and that w is a possible world. Then for any finite set of pairs x and w_x, where x is a possible world and w_x is a possible world in which x exists, there is a world w' that agrees with w_x on $\langle x, X$, for each x, and with w on the rest of the individuals in D_w. However, the infinite generalization does not follow. In that respect, D1 is a simplification. Using set-theoretic machinery, we could formulate a condition that covers the infinite case too. Since the the main philosophical questions hardly depend on those details, this simplification is harmless.

That X is externally recombinable has no implications for possible domain sizes of worlds. In particular, it does not imply that the members of X can be had by lonely objects. In this respect, it differs from the combinatorial conditions standardly offered in the literature, e.g. by Langton and Lewis. This seems to me an advantage of my formulation.

Is the set of implication-intrinsic properties externally recombinable? No, it satisfies only a weaker condition. What implication-intrinsic properties x has may have implications for what implication-intrinsic properties y has, provided that x and y overlap. There may be sets of properties that satisfy the strong condition of external recombinability. If some properties can only be had by mereological simples, then the question whether the properties of overlapping things restrict each other does not arise. The property of attending to oneself is perhaps also unconstrained by mereological relations: whether a thing attends to itself does not imply anything about whether its

[19]If any two worlds have disjoint domains, it is trivially the case that every set of properties is externally recombinable. There are at least three options. First, one can accept that consequence, and argue that the *properties* do not preclude any recombination (more on this below). Second, one can modify D1 such that it is enough that x has a unique counterpart in w'. Third, one can switch to combinatorial principles of the sort discussed in section ...

parts do, and whether any overlapping things do. But a property may be intrinsic even though its instantiation by overlapping thing is not modally independent. The additivity of mass, i.e. the fact that the mass of the whole is the sum of the masses of its part, is certainly no bar to mass being implication-intrinsic.

The remedy is familiar: implication-intrinsic properties only need to recombine among individuals that are not just numerically, but also mereologically distinct, i.e. non-overlapping. To modify D1, I need more terminology. Say that worlds w and w' are *mereologically compatible* with respect to an individual x if for all $y \in D_w \cup D_{w'}$, x and y overlap in w if and only if x and y overlap in w'. Define the *part-closure* $PCL(x, w)$ of an individual x in w to be the set of all y that are parts of x in w, and the *overlap-closure* $OCL(x, w)$ of x in w to be the set of all y that overlap x in w. (If only worlds that are mereologically compatible with respect to x are under consideration, I will omit the argument-place for worlds.) I now define what I call *mereological* (rather than "external") recombinability:

D2 X is (finitely) mereologically recombinable if for any mereologically compatible worlds w and w' individual $x \in D_w \cap D_{w'}$, there is a world w'' such that i) $D_{w''} = D_w$, ii) w' and w'' agree on $\langle PCL(x), X\rangle$, iii) and w' and w'' agree on $\langle D_{w'} \setminus OCL(x), X\rangle$.[20]

Let F be the property of being married, and suppose that x is married in w. Let w' a world that is mereologically compatible with respect to x in which nobody is married. Since there is no world in which x is married, but nothing that does not overlap with x is married, {being married} is not mereologically recombinable.

It is a limitation of this definition of mereological recombinability that it only applies to properties, but not to relations. In the next section, when I continue my

[20]Note that given two worlds and an invidividual that satisfy the antecedent of the condition in D2, the world whose existence is guaranteed by the consequent is not uniquely determined, not even with respect to the properties in X. Two such worlds may differ in the distribution of X among individuals that overlap x, but are not part of it. However, if the properties in X are necessarily additive in the way mass is, there will not be any multiplicity.

case against convergentism, I will discuss how a more general definition could look like. For now, I turn to the question how the defined concepts enter into an account of intrinsic properties.

Obviously, the definitions are designed to make the following come out true:

6) Every set of implication-intrinsic properties is mereologically recombinable.[21]

Principle 6) lays down a strong and substantive necessary condition on the class of implication-intrinsic properties. It has as a consequence that having a brother is not intrinsic, for example. As But by itself, 6) provides only a weak theory of implication-intrinsicality. A natural additional principle would be that the class of implication-intrinsic properties is *maximally* mereologically recombinable, i.e. mereologically recombinable and no proper subclass of any mereologically recombinable class. Since I have defined mereological recombinability only for sets, I need to formulate a pertinent principle in a somewhat round-about way:

7) If $I \cup \{F\}$ is mereologically recombinable for every set I of implication-intrinsic properties, then F is implication-intrinsic as well.

Harmless as it seems, this sort of maximality-principle has potentially controversial consequences. It follows from D2 that if F is a universally necessary property, like being self-identical and being such that 2+2=4, then and X mereologically recombines, then $X \cup \{F\}$ mereologically recombines as well. The same is true for an F that is universally non-contingent, such as being Socrates, or being human.[22] Thus 7) implies that all these properties are implication-intrinsic. Some might find this consequence objectionable. Nonetheless, I propose to accept 7). It is a standard feature of accounts

[21] Why "every set" rather than "the set" or "the class"? Some philosophers think that the intrinsic properties form a proper class, not a set. But it is not clear whether the notion of mereological recombinability can be defined for proper classes. To be sure, X in D2 may be read as ranging over classes, since X is not said to be a member. However, it is not clear whether a more general formulation which covers the infinite case as well would be applicable to classes to. In order to avoid technical issues of these sort, I use the universal quantification over sets.

[22] I call a property "universally necessary" if every possible individual has it necessarily, and "universally non-contingent" if no possible individual has it contingently.

of intrisic properties in the literature that they count universally necessary properties as intrinsic. In particular, they are also duplication-intrinsic. Properties that are merely non-contingently necessary, in contrast, need not be duplication-intrinsic. However, I am not using this as a basis for my claim that duplication-intrinsicality and implication-intrinsicality come apart. It seems to me that in so far as the discussion of intrinsicality is concerned, necessary properties seem to be a degenerate case, not a test case for a proposed account.

I have proposed two claims about implication-intrinsic properties in this section. Of course, these claims do not amount to an analysis. An analysis offers a condition that is sufficient as well as necessary. In section ..., I will give reasons for skepticism about whether a useful analysis can be given, but also urge that we may still have an ambitious theory of implication-intrinsicality. In the next section, I will draw on the apparatus developed here to discuss the question whether the two notions of intrinsicality diverge with respect to vectorial properties and distance relations.

5 Vectors and Distances

The predicates 'intrinsic' and 'extrinsic' are most naturally applied to monadic on-off properties. However, a good account of the distinction would generalize to relations, and to monadic properties that take different values. In this section, I suggest that 3) is false when X contains distance relations, and when it contains fundamental vectorial properties. Distance relations are duplication-intrinsic but not implication-intrinsic, while fundamental vectorial properties are implication-intrinsic but not duplication-intrinsic, I contend.

Let a and a', and b and b', be two pairs of duplicates. Suppose that the distance between a and b is different from the distance between a' and b'. Question: Is it consistent to suppose that the mereological sum of a and b is a duplicate of the mereological sum of a' and b'? It seems that it is not. Since distance cannot differ between duplicates, it is an intrinsic relation. Indeed, that is how it is classified by David Lewis in his influential taxonomy of relations: distance, though external, is still intrinsic, in contrast to relations such as having a common friend.

Can two things be duplicates even though they have vectorial properties not pointing in the same direction? The answer seems to be yes, and hence vectorial properties fail to be duplication-intrinsic. The judgements about duplication-intrinsicality that I rely on I take to be common lore. I do not defend them here, even though I realize that they can be challenged.

Suppose I am right about duplication-intrinsicality. To complete my argument that it comes apart from implication-intrinsicality, I need to show that some vectorial properties are implication-intrinsic or that distance fails to be implication-intrinsic. To do this, I need to develop some aspects of a theory of recombination. Unfortunately, this development will not be uncontroversial. But still, I think I can make a plausible case for the above disjunction, even if I leave it open which disjunct is true.

First, distance relations. On the standard understanding, distance is a metric, and obeys the triangle inequality: the distance between x and z cannot be greater than the sum of the distance between x and y and the distance between y and z. Hence these distances do not vary independently from each other. From this, we cannot conclude right away that distance is not implication-intrinsic. Even in the case of monadic properties, some restrictions on recombination are compatible with implication-intrinsicality: properties instantiated by things that overlap, i.e. are not mereologically distinct, may restrict each other. But how do these mereological notion apply to the sort of entities that instantiate relations, namely ordered pairs? Do $\langle x, y\rangle$ and $\langle y, z\rangle$ overlap in the pertinent sense?

The theory of implication-intrinsicality offered in the last section is not general enough to cover relations. But formally, it is straightforward to extend it. Instead of speaking of individuals, we may speak more generally of "loci of instantiation." Individuals are the locus of instantiation of monadic properties, and n-tuples of individuals are the locus of instantiation of n-adic relations. To generalize D2, we need a notion of distinctness for loci of instantiation. At least three candidate conditions for such loci to overlap may be considered:

i) $\langle x_1, ..., x_n \rangle$ and $\langle y_1, ..., y_n \rangle$ overlap if for some i and j, x_i and y_i overlap.

ii) $\langle x_1, ..., x_n \rangle$ and $\langle y_1, ..., y_n \rangle$ overlap if for some i, x_i and y_i overlap.

iii) $\langle x_1, ..., x_n \rangle$ and $\langle y_1, ..., y_n \rangle$ overlap if for all i, x_i and y_i overlap.

It seems to me that c), the strictest condition on overlap, is defensible, even though I cannot adequately argue that here. If it is, then the necessity of the triangle inequality implies that distance relations are not implication-intrinsic.

Second, vectorial properties. Vector-valued properties play a large role in modern physics. For example, electromagnetic forces, velocity, momentum, spin are represented by vectors. Thus the metaphysics of properties has increasingly found it necessary to engage with these sorts of properties too, rather than just the familiar all-or-nothing properties or scalar properties like mass or temperature, which take values in the real numbers. One attitude would be to dismiss examples based on vectorial properties in a discussion of intrinsicality, suggesting that our intuitions are not clear enough. I recommend a different attitude, of looking at these somewhat unfamiliar cases to improve our understanding of the concept. After all, it is a very useful technique in philosophy to look at remote and exotic cases to clarify concepts.

Do they satisfy the combinatorial principles that implication-intrinsic properties satisfy? It is unproblematic to assume that a vectorial property in a point recombines independently from on-off or scalar properties in other points. If the vectorial property is fundamental, there is no reason to assume that it is not thus independent. What is not immediately clear is whether a vectorial property in one point recombines independently of vectorial properties in another point. If vectorial properties derive from vector fields, and if vector fields are differentiable, then recombination is of course restricted. Indeed, the vectorial properties in points in a neighborhood around x will completely determine the vectorial property at x. However, while vectorial properties are arguably derived from differentiable vector fields in our world, a convergentist is hardly in a position to declare that a necessary truth.

The dialectic is as follows: If someone wants to claim that implication-intrinsicality and duplication-intrinsicality coincide across the board, I confront them with a dilemma: are you a necessitarian about laws or not? If they go for the necessitarian option, then there are examples of duplication-intrinsicality without implication-intrinsicality: energy, mass, distance, and others. If the reject the necessitarian option, then there are examples of implication-intrinsicality without duplication-intrinsicality, namely vectorial properties. It would seem *ad hoc* for my opponent to take a non-necessitarian line for vectorial properties only. Unless, of course, some story can be provided why vectorial properties are special in that respect. But pending such a story, I conclude that duplication-intrinsicality and implication-intrinsicality do indeed come apart.

6 Sufficient conditions for being implication-intrinsic?

The claims 6) and 7) from section ... state necessary conditions that the class of implication-intrinsic properties must satisfy: it must be maximally mereologically recombinable.[23] Can we add further claims to 6) and 7) to obtain a conjunctive condition that is sufficient as well as necessary, and thus a candidate for an analysis? Unfortunately, just adding further formal conditions that the class of implication-intrinsic properties needs to satisfy will not do. This has been convincingly argued by Dan Marshall [forthcoming].

A simplified version of Marshall's argument goes as follows. A formal conditions on a class of properties is one that is preserved by a certain isomorphisms between

[23] I am speaking loosely here, since I haven't defined mereologically recombinability for classes in general, but only for sets.

the individuals in different worlds. He then shows that given plausible metaphysical assumptions, there are such isomorphisms that map the intrinsic property of being an electron (E) to the non-intrinsic property of being a lonely positron or an accompanied electron ($LPAE$). Hence any formal condition satisfied by $\{E\}$ is also satisfied by $\{LPAE\}$. The maximality condition does not help to break the formal symmetry. E belongs to a maximally mereologically recombinable class, but so does $LPAE$.

For some properties, like being married, 6) implies that they are not implication-intrinsic. But for many properties, like $LPAE$, 6) and 7) fail to imply that they are not implication-intrinsic. That much is shown by Marshall's argument. In other words, the conjunction of 6) and 7) fails as an implicit definition, since it is satisfied by different classes of properties. If we want necessary and sufficient conditions, something needs to be added to the purely formal conditions. I can identify three strategies: the way of paradigms, the way of naturalness, and the way of comparison. I want to briefly describe these strategies. My aim is not to propose one to the exclusion of the others, but rather to emphasize that the impossibility of providing necessary and sufficient formal conditions does not in itself suggest that we cannot characterize the class of implication-intrinsic properties.

The way of paradigms starts from the observation that 6) and 7) are much more powerful when conjoined with claims that particular properties are implication-intrinsic. For example, it follows 6) and the claim that being a positron (P) is implication-intrinsic that $LPAE$ is not. For let x in w have both P and $LPAE$. Let w' consist of x and y, which do not overlap. Since there is no world where x has P and $LPAE$ and a non-overlapping y exists, $\{P, LPAE\}$ is not mereologically recombinable.

Thus we might hope that even though the class of implication-intrinsic properties cannot be captured by purely formal conditions, it can be captured by formal conditions plus paradigms. If it could be shown that if any two classes X and Y both satisfy the conditions, they must be disjoint, then indeed one paradigm would do. Unfortunately, I see no prospect of showing that. David Dendy, who develped a sophisticated combinatorial theory, in effect pursued the way of paradigms. He tried to prove certain equilibrium results for the classes of properties satisfying his conditions. The proofs get complicated very quickly, and he is far away from proving a general equilibrium.

The way of naturalness has been popular with combinatorial theorists, arguably due to the influence of Langton and Lewis. Combinatorial conditions are supplemented by the conditions that the properties in question are natural, or more precisely, that they form the closure of a set of natural properties. Unfortunately, this leads to accounts with clauses that appear to be *ad hoc*. For example, Lewis and Langton added the clause that basic-intrinsic properties are neither disjunctive nor negations of disjunctive properties. I will not talk much about naturalness conditions, since judgments of relative naturalness tend to be highly controversial.

There is a challenge to combinatorial theories, due to John Hawthorne [2001], that cannot be handled well by either going the way of paradigms or the way of naturalness. Hawthorne considers a perfectly natural relation R, whose obtaining between any ordered pair is completely unconstrained by its obtaining between any other ordered pair. R has none of the logical properties such as reflexivity, symmetry, or transitivity which we use to characterize relations. Moreover, R is not constrained by the distribution of intrinsic properties. Hawthorne offers the relation expressed by 'x attends to y' as an example. What he calls the *existential derivative* EDR of R is the property of bearing R to something. He then points out that EDR satisfies all combinatorial principles. Moreover, $I \cup \{EDR\}$ satisfies all combinatorial principles too, if I is the class of intrinsic properties. For that reason, throwing in paradigms of intrinsic properties will not work. But naturalness conditions seem unable to rule out EDR, which by any standards ought to count as fairly natural, though not perfectly natural. A different response is called for.

In the last section, I formulated combinatorial conditions that apply to relations as well as properties. If I is the class of monadic implication-intrinsic properties, then the classes $I \cup \{R\}$ and $I \cup \{EDR\}$ are mereologically recombinable, but $I \cup \{R, EDR\}$

is not. Thus 6) together with the assumption that all members of I are implication-intrinsic entails that either R or EDR fails to be implication-intrinsic. If R counts as a paradigm of an implication-intrinsic relation, then the way of paradigm rules out EDR, after all. But this strategy is slightly dubious, since arguably all the paradigms are monadic properties. Thus another approach is worth trying, which I call the "way of comparison." What are being compared are various maximally mereologically recombinable classes with respect to the merit of their candidacy for being the class of implication-intrinsic properties. In the example, $I \cup \{R\}$ and $I \cup \{EDR\}$ are subclasses of different such candidates, which satisfy both 6) and 7). Formally, a comparison is here a partial ordering among maximally mereologically recombinable classes.

One way to partially order that class is by the relation of supervenience. $I \cup \{EDR\}$ supervenes on $I \cup \{R\}$, but not vice versa. There is a good sense in which Hawthorne's challenge would be answered if a a case could be made for the following principle:

8) If I is the class of implication-intrinsic properties, I does not asymmetrically supervene on another maximally mereologically recombinable class.

Unfortunately, I cannot defend 8) here, but rest content that the way of comparison might provide a "heroic" way of bridging the gap between merely necessary and necessary and sufficient condition for implication-intrinsicality. An ordering imposed by the supervenience relation may be supplemented lexicographically by an ordering by cardinality (provided the maximally recombinable classes are sets). But as I pointed out, any such requirement would be in need of justification.

I noted that the three ways may be seen as complementing each other. Indeed, imposing an ordering by supervenience or by cardinality does not help with the problem of how to privilege the candidacy of P over $LPAE$, for which the ways of paradigms and of naturalness seem more appropriate.

7 Conclusion

It is often assumed that the concept of intrinsic properties can be explicated in two different ways, in terms of duplication and in terms of combinatorial principles. This view, which I call "convergentism," faces serious objections. First, it has rather more substantive metaphysical commitments than we would like an account of intrinsic properties to have. Second, and relatedly, it cannot allow that there is a family of concepts of being intrinsic which correspond to different restrictions on modal space. Third, vectorial properties and distance relations appear to be counterexamples to the claim that the two explicantia are co-extensive.

I have taken it for granted in this paper that we have a concept of intrinsicality that is closely linked to duplication. In contrast, I have tried to spell out the concept of lacking certain implications by combinatorial principles, to dispel doubts about its coherence. I take it that it is a concept of intrinsicality too. From the falsity of convergentism, I have concluded that there are two concepts of intrinsicality.

Suppose I am right that there really are these two different concepts. Then an important question remains: What, if any, are the repercussions for the various philosophical debates in which intrinsicality is appealed to? Perhaps there are some arguments involving intrinsic properties can be shown to equivocate on the two different concepts. Perhaps there are claims that appeared analytic that can now be seen to be substantive. Unfortunately, I have to leave an exploration of such questions for another occasion.

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