

Rosenberg, Reducibility and Consciousness

Rosenberg's general argumentative strategy in favour of panpsychism is an extension of a traditional pattern. Although his argument is complex and intricate, I think a model that is historically significant and fundamentally similar to the position Rosenberg advances might help us understand the case for panpsychism. Thus I want to begin by considering a Leibnizian argument for panpsychism.

Leibniz's general argument requires some heavy duty metaphysical principles. The first, and most central, can be labelled the 'reducibility claim': all relations, and relational properties, can be reduced to the intrinsic properties of things. This claim involves two fundamental ideas. The first is that relations and relational properties supervene on the arrangement of intrinsic properties of individuals. Some conception of 'intrinsic property' is needed to fully explicate this principle. Unfortunately, this is a very complex question with nothing even approaching a settled answer (see Humberstone 1996 for a good overview). Intrinsic properties are the properties things have in and of themselves, independent of every other thing. Very crudely, we can say that intrinsic properties are those which are shared by suitable duplicates. Intuitively, if we, for example, make a duplicate of a brick it will share mass, shape, size, colour, etc with its original, and hence these are all intrinsic (as they more or less seem to be at first glance); but the duplicate brick need not share location, history or ownership with its original, so these sorts of properties are not intrinsic (again, as seems intuitively correct). This attractive idea founders on the impossibility of giving a non-circular definition of 'suitable duplicate', but I nonetheless think that the characterization is clear enough for our purposes here.

The second key idea is that the supervenience of relations and relational properties on intrinsic properties is 'constitutive': relations hold or things have their relational properties in virtue of their intrinsic properties. Leibniz certainly believed that once all the intrinsic properties of individuals are fixed, the system of relations into which they enter is also fixed and that there really is nothing more to the system of relations and relational properties than is provided by the system of individuals with all their intrinsic properties. Of course, it is very difficult to decide whether or not Leibniz is right about this. It is true that a great many familiar examples support his position. The relation of 'being taller than' which holds between Plato and Socrates seems to constitutively supervene on their individual heights (in every possible world in which Plato and Socrates have their actual heights Plato is taller than Socrates and the relation holds 'in virtue of' their having the heights they do).

This example suffers from the defect that it is not at all obvious that height is really an intrinsic property. Relativity as revealed that length, shape, rigidity and mass are all relational properties. But I don't intend here to provide any guide to what the intrinsic properties of things are. It is a key feature of Rosenberg's argument that this is not an easy question to answer and that we might be surprised about what the intrinsics are – they may be quite remote from both the everyday

material world and the world of fundamental physics. But the example will serve to illustrate how it might be that relational properties reduce to intrinsic properties. It is the intelligibility of the idea that relational properties could reduce to intrinsic properties that matters here, and I think the example makes the sort of reduction at issue quite clear.

Here it is worth noting an imprecision here in our characterization the reducibility claim (see Langton 1998). A strong version is that the system of relations and relational properties reduce to the intrinsic properties of any given individual. A weak claim is that they reduce to the intrinsics of the system of individuals. The given example supports only the weak version of reducibility since the relation depends on the intrinsic properties of both individuals involved. Leibniz, however, held the strong version but did so because he thought that the intrinsic properties of *every* thing in the world followed from the intrinsic properties of *each* thing in the world. One can accept reducibility without endorsing Leibniz's ultra strong version of it. It is also worth noting, since it will be important below, that there is a distinction between what might be called the full reducibility principle, which asserts that reducibility (either weak or strong) applies to all relations and relational properties, and a restricted reducibility principle, which asserts only that some more or less extensive proper subset of relations and relational properties are reducible to intrinsic properties.

Let us, more or less following Leibniz, call any (putative) relational property which an individual can gain or lose without undergoing any intrinsic change a 'purely extrinsic denomination'. While there initially seem to be any number of these, Leibniz argued that in every case the relational property depends on intrinsic properties. Some of his examples misleadingly suggest that the relational properties depend upon a more or less subtle interaction between the relata. For example, Leibniz makes the interesting remark that 'a thing seen really differs from when it is not seen, for the light rays reflected from the thing even produce some change in it' (Mates 1986, p. 225). But this is problematic in several more or less important respects. Trivially, it seems strange to think that the reflected rays necessarily differ when someone 'receives' them (i.e. sees the object) and when the light runs off to infinity. More important, it is not sufficient to support the reducibility claim that objects suffer intrinsic changes as they enter into or break off a relation. It must also be the case that the relation holds or does not hold in virtue of these changes.

Suppose that S sees O. Even if we agree that the light rays which permit S to see O have effected a change in O, it does not seem to be the case that this intrinsic alteration of O in any way constitutes S's seeing, for were S not there, the light rays would still have made the intrinsic change in O.

If it was the case that whenever we perceive something we must positively interact

with it in some way fundamentally different from when we do not perceive it, where this interaction is constitutive of such perception, then Leibniz would be on stronger ground. It is rather striking that the concept of measurement in quantum mechanics does come at least very close to having exactly this character. Even in cases where we measure a single observable repeatedly, so that we are not altering the state of the measured system, the system is in some sense affected by the measurement via the so-called quantum Zeno effect. It may be that at some basic level perception is not the passive affair common sense takes it to be, but is rather essentially interactive. This idea may also shed some light on Rosenberg's rather difficult notions of effective and receptive properties with their in-built mutual constraints (see below for a little more about the effective/receptive distinction).

Be that as it may, the abstract point is that the ongoing and complete causal interaction of everything in the world is not going to entail by itself the reducibility claim. This point is reinforced by other examples. One that Leibniz used is the relational property of widowerhood. He says 'no one becomes a widower in India by the death of his wife in Europe unless a real change occurs in him' (Mates 1986, p. 225). This is hard to believe, even if we grant *instantaneous* causal interaction between all things so that the wife's death does propagate a disturbance which affects the husband (even in the real world it is true that such a disturbance does exist, except of course it does not instantaneously affect the husband). For it is hard to see how these changes *constitute* the property of being a widower.

Furthermore, it seems to be a merely contingent fact that the changes in the wife alter the intrinsic state of the husband. That is, it seems conceivable that, because of the exact nature of the changes in the wife, plus the dynamic conditions of the environment encompassing both husband and wife, it could be that the effects on the husband that would be produced by the particular disturbance created by the wife's death are exactly cancelled out by the total causal situation. The lesson is that causal factors impinging on the husband are simply irrelevant to the relation's holding or not.

No, the reducibility principle is an essentially metaphysical principle. The basic problem here is that at least some relations do not possess any plausible constitutive intrinsic grounds, even granting that such relations might have associated intrinsic 'correlates'.

This is most clearly true of what might be called pure extrinsic denominations, of which the most obvious examples are spatial relations. It seems clear that an object can move around in space without necessarily undergoing any intrinsic change. We can interchange two rooks on a chessboard without changing the intrinsic natures of either piece. Somewhat paradoxically, Leibniz is famous for defending a relational theory of space. 'Space', he said 'is nothing else but an order

of the existence of things' (Mates 1986, p. 234). Yet he allowed that this order of existence must be ultimately grounded in some intrinsic properties of the things thus ordered, just as for every other relation or relational property. Mates laments however that 'unfortunately we are given no details or even clues as to how, in general, propositions about space, time, and motion are to be reduced to propositions ascribing qualities to the bodies concerned' (Mates 1986, p. 235).

The tactic Leibniz deployed in the example of the seen versus unseen object might come into service here, and the finite speed of causal interaction will now help rather than hinder the thesis. The thoroughgoing causal interaction of all things gives hope that tracking the intrinsic changes in things will reveal their spatial ordering. As causal 'signals' propagate from one thing to another the timing of intrinsic changes can stand in for distance relations. Rosenberg follows this line, attempting to reduce spatial and temporal relations to more fundamental causal relations. This is interesting in light of how Rosenberg deploys a version of the reducibility principle to causal relations, as we shall see below.

But this proposal fails to effect the reduction of spatial and temporal relations and relational properties, because mere causal interaction within space and time does not serve to *constitute* spatial-temporal ordering.

Is there any even remotely plausible way to 'ground' all of these extrinsic denominations in the intrinsic properties of things? Leibniz did find a very clever way to do this, but the system is metaphysically radical and leads to panpsychism. Although Leibniz did not put it this way, I think it is fair to say that the key idea is to replace mutual causal influence with 'mutual information'. Suppose that 'carrying information X' is an intrinsic property of things. And suppose everything in the world carried within it information specifying its distance and direction from everything else. This information would suffice to at least reconstruct the system of spatial relations.

The obvious and by now familiar problem here is that the postulated information is merely a 'mirror' of the spatial relations which leaves open the nature of space and leaves standing the spatial relations themselves. As to the first, Leibniz is, as noted above, famous for championing the idea that space is nothing but a system of relations – there is nothing to space (and time) save the system of ordering we call distance and direction. From the point of view of the general argument we are considering, this is an interesting position: it appears to assert that something can consist of nothing but 'relational structure'. This is a direct affront to the reducibility claim and of course Leibniz cannot end the story about space with his relational picture.

Instead, he has to find a way that intrinsic properties of individuals can constitute spatial relations. And this is where the move toward panpsychism begins. What sort

of intrinsic property could conceivably underpin the seemingly purely extrinsic relations of place and motion? Not mere information *about* these relations, but what about the *experience* of them as presented to the mind? If spatial relations are – by their nature so to speak – *merely* relational then information about them would be nothing but structural information. If, on the other hand, there was some ‘matter’ to these relations, or underlying them, then Leibniz’s doctrine of the relational nature of space would be false. The way out of this dilemma is that our *experience* of space can provide something more than structural information which ‘picks out’ spatiality as the target system of relations without imbuing those relations themselves with anything more than relational structure. In this way, perceptual experience can constitute spatial relations such as to abide by the reducibility claim. This is possible because in experience things are represented as being a certain way, which includes their spatial arrangement. We can call the spatial arrangement presented in a perceptual experience a ‘spatial viewpoint’.

There are some problems though. In the first place, we do not experience the complete set of spatial relations which taken together form space. Secondly, there are regions of space we *cannot* experience (regions too small for us to perceive for example). There are (at least) two solutions to these problems. One is to posit an experiencing individual corresponding to each *point* in space. Thus no region will be left ‘uncovered’ and the construction of the set of relations which constitute space on the basis of the intrinsic experiential properties of these individuals will be complete. The second solution is to make the rather bold claim that in fact each individual does experience all of space. Some story will then have to be told about why it does not seem to us that we possess such extensive – in fact, infinite – information.

Leibniz chose to employ both solutions, driven by the desire to endorse a principle of plenitude and the need to make each possible world entirely unique. Consideration of the first option drives one toward the second, for a set of incomplete spatial viewpoints will lead to an intractable problem: how to tell if the world contains a single all encompassing space or a set of disjoint spaces.

A traditional answer to this latter problem involves an appeal once again to causal interaction. Things which are in thorough mutual causal interaction are in a single space. The inadequacy of this solution, at least from the Leibnizian point of view under consideration, is revealed when we note that causation is itself a relation, and hence must itself be founded on the intrinsic properties of things as per the reducibility claim. At best, causation will provide us with a new set of relations isomorphic to the spatial relations and the original problem will recur, plus added problems, such as the seeming possibility of causally isolated regions of space.

Leibniz’s answer stems from the observation that if there is an experiential subject for every point of space and each such subject has a totally complete

representation of all of space within its experience then the system of such subjects will determine one space to the extent that they all agree on what is happening everywhere. Leibniz did not stop with the astonishingly audacious hypothesis of complete spatial information. Each of his monads has within its experience a complete and total representation of the entire world. This completeness and totality allows for the grounding of all relations and relational properties by the intrinsic properties of the monads. In fact, it permits Leibniz to endorse the strong reducibility claim that all relational properties and relations reduce to the intrinsic properties of any of the relata (or indeed to any one of the monads at all).

A set of complete viewpoints will specify one world with one space. The cost is the vast population of hyper-knowledgeable monads. One aspect of this price required Leibniz to make a significant innovation in the concept of mind itself. In order to explain the obvious fact that we do not have any awareness of the knowledge we must have within ourselves, Leibniz introduced the idea of the 'petite perception', which is usually understood as involving unconscious mental states. It is arguable that Leibniz did not regard these as unconscious so much as merely unavailable to introspective awareness (perhaps Leibniz did not have a clear distinction between introspective availability and consciousness). But, whether or not Leibniz really endorsed the idea of unconscious mental states, we are certainly free to advance the argument via the premise of mere introspective inaccessibility. Perhaps the petite perceptions are merely too faint or too fleeting to be capable of engaging the mechanisms of self-awareness.

To modern philosophical sensibility, steeped in epistemological concerns, the question of why Leibniz posits more than a single monad will seem natural. But for Leibniz, the fact that each windowless monad is perceptually trapped within itself does not imply lack of knowledge of the infinitude of other minds. Reason can reveal the overall structure of things, whose form is dependent on an at least partially known divine nature.

Leibniz's amazing metaphysical edifice allows him to maintain the reducibility claim for all relational properties and relations. The intrinsic mentalistic properties of the widower will express the death of his wife, such properties of Socrates will imply not just what his own height is, but will also entail that he is shorter than Plato. There is also a genuine sense in which relations are constituted from the possession of intrinsic properties, for only the monadic horde is 'real' - everything we experience is merely the *phenomena*.

We can crudely summarize this Leibnizian argument for panpsychism as follows. All relational properties must be grounded in intrinsic features of things, including those relations which seem most evidently purely extrinsic, such as the pure spatial relations of distance and 'relative direction'. The only intrinsic properties which could with any plausibility serve as the intrinsic constitutive ground for all relational

properties are informational relations, and the only way for information to be carried in a way that is itself not merely relational (requiring interpretation or 'decoding') is via mental states possessed of intrinsic experiential content.

I think Rosenberg's complex argumentation can be navigated with the help of this Leibnizian chart of the philosophical waters. The strategic choices that Rosenberg makes lead to an interesting contrast with Leibniz, with the upshot for the overall plausibility of the argument sometimes favouring Leibniz, but more often leaning in Rosenberg's direction.

First, what of reducibility? Rosenberg does not explicitly endorse the full reducibility claim: that all relational properties and relations can be reduced to intrinsic properties. But he does seem to endorse a restricted version which holds for certain key relational properties, most importantly causal relations. These do require an intrinsic ground. He also wishes to construct spatial and temporal relations from more fundamental causal ones, so that the reducibility of the latter implies the derivative reducibility of the former.

As noted above, the urge toward reducibility is encouraged by a host of examples (recall the relational property of being taller than Socrates, which certainly seems to be reducible to the intrinsic properties of the relata). Although these examples are merely illustrative insofar as the defensibility of ordinary 'intrinsic' properties such as size, shape, mass, etc. is highly questionable, there does seem to be a powerful intuition that relational properties are – and perhaps ought to be – based upon features of the relata.

However, at least four sorts of relational properties seem particularly recalcitrant to reduction. These are properties of 'pure identity', properties which depend on the histories of things, pure spatial properties and causal relational properties.

The problem of identity is that it seems perfectly possible for there to be two intrinsically identical things which are numerically distinct. Thus the relational property of 'being identical to A' will not be determined by intrinsic properties. It is somewhat controversial whether identity is a relation at all, but many have thought that it is. Why should not 'being the same thing as' have as much right to be regarded as a relation as 'being the same size as'? Thus this issue is worth considering. One might save reducibility here by introducing primitive intrinsic identity properties, but this seems rather ad hoc. Instead, one might follow Leibniz, and declare that there are no two intrinsic duplicates. If each individual carries, intrinsically, the complete specification of its entire world – so complete as to constitute directions for its creation – then Leibniz's position seems quite reasonable, but it does of course entail the principle of the identity of indiscernibles. Thus, two intrinsically identical things could be such only if inhabiting absolutely identical possible worlds, but there are no distinct but

indistinguishable possible worlds. Simple counterexamples, such as the world which consists of two intrinsically identical iron spheres (see Black 1962), are ruled out by the requirement that each individual specify the entire world, including its place in it (otherwise, there would indeed only be one monad). Thus the information included within each monad must include so-called *de se* or indexical information.

Consider the property of 'being 10 years old'; certain bits of metal in my pocket have this property but duplicates of these I might produce in my basement do not. Temporal relational properties just don't seem to reduce to intrinsic properties. 'Being 5 miles from a burning barn' is not shared amongst duplicates. We have discussed how Leibniz deals with these sorts of relational properties. Crudely speaking, the monads perceptions include ones about the past and future, the near and far.

Causal relational properties form the final recalcitrant set of properties. It is possible to read Hume as advancing the position that causal relations are pure extrinsic relations: duplicates do not need to share causal powers. It is also possible, I think, to read Hume as merely a skeptic about the intrinsic nature of causal powers. On this view, he is saying only that we could never know what it is about something that gives it the causal powers it possesses. It doesn't matter here which is the right way to read Hume; we can follow Rosenberg in accepting that Humean thought on causation presents a metaphysical challenge to the reducibility thesis.

It is interesting that Rosenberg seems to accept explicitly the reducibility of spatial, temporal and causal relational properties. Will historical relational properties be derivatively reducible given the reducibility of the other three sorts of problematic relational properties? A concrete example is the relational property of being genuine currency (or the property of not being counterfeit). It seems fairly evident that if we can reconstruct the set of spatial, temporal and causal relations from the intrinsic properties of things then we could also reconstruct the histories of things, and hence distinguish the genuine from counterfeit currency. It may thus be that Rosenberg will end up almost agreeing with Leibniz on the full reducibility principle (save perhaps for identity based relational properties which may not form a very significant class, but see note 5), but, presumably, only in its weak version rather than the exceedingly strong version which allows the reconstruction of the entire world from the intrinsic properties of any single individual.

While space, time and history are all intuitively extrinsic relations, I think causation does tend to strike us as based on the intrinsic features of things, their 'causal powers'. How could causation be extrinsic?

The Humean challenge to reducibility is his metaphysical claim that 'anything could cause anything' and that causation is at bottom merely a catalogue of observed

associations. As an epistemological thesis, Hume's observations about the promiscuity of the causal relation are apt – we can't see what it is about things that grants them this or that ultimate causal power. Of course, as Hume pointed out, there are plenty of explicable causal powers, but these all trace back to what appears to be just brute causal activity as we reach the limits of our science. As a metaphysical thesis, Hume's view is less solid. As Rosenberg points out, no one has ever managed to generate a Humean theory of causation that is not subject to powerful objections.

But here's a possible example of an extrinsic causal power. God had the freedom to set the gravitational constant to any value He wished. There is no a priori or purely logical inconsistency in G being any real number. So there are worlds which differ in the value of G . Duplicates will differ in their power to gravitate across these worlds. Therefore, this 'causal power' is not intrinsic nor dependent upon the intrinsic properties of things. God could even, if He wished, set G to zero in some possible world and thereby eliminate the causal power to gravitate. (In such worlds, mass could still be measured via other forces, such as that of static electricity.)

Defenders of the reducibility thesis must resist examples such as this. It is not hard to think of ways to do this. For example, one could argue that the Newtonian equation presupposes the extrinsic nature of gravitation and so yields the appearance that duplicates could differ in the gravitational powers via adjustment in G . Of course, it *looks* as if gravitational power could vary across duplicates, but this is just a reflection of what Rosenberg regards as the merely associational nature of physical science (see pp. 143 ff.). Since physics only specifies the relations as they appear to us, there is no attempt at or possibility of an account of why these relations must hold at the most basic level. Note this does not mean that somehow there is only one set of causal powers that God could choose – it only demands that variation in causal powers track variation in intrinsic properties. God could only change G via a change in the intrinsic properties of things. Physics has nothing to say about such intrinsic properties and so lets G appear as a free parameter (in Newton's equation).

Rosenberg's adherence to a restricted reducibility principle is evident in the 'carrier theory of causation'. The idea that causal relations are, so to speak, mediated by the twin features of effective and receptive properties is a way to ground causal powers in the intrinsic properties of things. Although exactly what Rosenberg intends by the effective/receptive distinction is not completely clear, I think that a possible interpretation is in terms of intrinsic properties that are, so to speak, attuned to one another although they are distinct. While it may be a 'conceptual' truth that effective properties must have receptive matches, particular cases are not trivially related but rather both impose real constraints on the relations into which the subjects can mutually enter (Rosenberg also uses the effective/receptive

machinery in his account of the emergence of higher level natural individuals, but I am not concerned with this aspect of his views here). The obvious metaphor is that of the plug and socket: once the structure of each is fixed the connections which are possible between them are fixed (think of the 'powers' of North American plugs in Europe).

Because the effective/receptive structure of things is essentially multifaceted, and generates real, dynamic causal relations, Rosenberg does not follow Leibniz in 'enfolding' the entire world into each and every individual. Although in itself this is rather more plausible than Leibniz's hypothesis of hermetically sealed and unconsciously omniscient monads, it does raise a problem. This is the possibility of a non-mental intrinsic ground for causation. Leibniz avoids this problem because of the plausibility of the claim that only intrinsic perceptual states will carry information in a way that will ground all relational properties.

There is a sort of dilemma here. Follow Leibniz all the way to the enfolding of the world within each individual and get the experiential as really the only candidate for generating the complete reducibility of all relational properties, or step back to a restricted reducibility principle, and thereby raise the spectre of a non-experiential intrinsic ground for causation.

For if reducibility is restricted then the need for a mentalistic or experiential intrinsic ground for the restricted set of relational properties is reduced. Rosenberg's best case (see pp. 237 ff.) for experientiality is that no other intrinsic properties are known which could serve as the 'carrier' of causation (that is, the intrinsic ground of receptivity). It is an undeniably striking fact that the only instantiated intrinsic features we know of are conscious states. But the human mind is weak and our experience extremely limited, so we might expect that there are ranges of intrinsic properties of which we have, and can have, no knowledge.

Spinoza's claim that there are an infinite number of attributes of which we have no knowledge is one important historical example of recognition that there could be intrinsic features that are, so to speak, absolutely hidden in nature (Kant is another example and one who endorsed the extrinsic nature of causal relations, see Langton 1998). Spinoza's panpsychism is not threatened by this admission since Spinoza, like Leibniz, endorses the idea that there can be nothing in the world that is not at least reflected in the realm of mind. The more restricted panpsychism of Rosenberg however might feel some pressure from the idea that there are non-mental intrinsic features which underlie the higher level feature we call mind or consciousness.

Spinoza also maintained that each attribute is completely independent of all the others, an idea which is surely echoed in Leibniz's insistence that the monads be 'windowless' (modulo their differences about the number and nature of substance).

Implicit in this view is the claim that radical emergence is impossible, at least of the sort that would have mind emerge from elements which are themselves entirely non-mental in their nature. There is an important distinction between what might be called intra-attribute emergence and inter-attribute emergence. A venerable argument for panpsychism depends on the supposed impossibility of inter-attribute emergence (see Clifford 1874/1886, Nagel 1974, Strawson 2006). If mind and matter are distinct attributes, and inter-attribute emergence is impossible, then mind and matter must be co-fundamental, or else one of them is in some sense illusory (the latter tack is Leibniz's).

Although Rosenberg has an intricate theory of the emergence of 'natural individuals' he does not directly discuss the inter/intra-attribute distinction. Since natural individuals are defined in fundamentally mentalistic terms, the question of inter-attribute emergence does not arise. It is worth noting that the anti-physicalist argument which Rosenberg advances in chapter 3 does not address the issue of inter-attribute emergence. In fact, it opens the door to such a radical emergentism. A full blooded emergentism will reject physicalism, assert the claim that genuinely novel attributes appear in nature which are not necessitated by the laws of physics, but also claim that these attributes are determined by the joint action of fundamental physical features plus certain irreducible laws of emergence (see Morgan 1923). Thus emergentists can agree that consciousness is not entailed merely by the physical structure of things while still being able to deny that the submergent basis of things has an experiential character. Perhaps natural individuals, as Rosenberg conceives them, are not at the foundation of the world, but radically emerge from a non-experiential basis.

Finally, let us consider what is perhaps a more fundamental challenge to Rosenberg's metaphysics. Let us challenge even the restricted reducibility principle as it applies to causal relations or causal relational properties (causal dispositions). Could it be that certain relational properties do not require any grounding in the intrinsic properties of things?

There are at least two ways this could be. One might accept that relational properties require a ground of some kind within things, but insist that this fundament could consist of further relational properties. Thus, if we deny that there is an intrinsic ground, we are asserting the possibility of an infinite 'nesting' of deeper and deeper relational properties. The relational properties of things (or at least some of them) would thus have the character of an infinite Russian doll. Rosenberg explicitly considers this (see pp. 236-7) and seems to regard it as metaphysically possible but *empirically* unlikely on the grounds that modern physics suggests that below the dimensions of the so-called Planck length (about 2×10^{-35} meters) modern theories break down insofar as naive deployment of them at that scale leads to absurdities. One interpretation of this situation is that space and time themselves 'disappear' at sufficiently small scales, that is, space and time

are ultimately granular rather than continuous.

But this makes the claim of panexperientialism a merely empirical claim about this world and a hostage to the fortunes of future science. Current theories (both relativistic and quantum field theory) in fact treat space and time as continuous quantities and it may be that their successors will continue to do so, but without the difficulties which current theories face as they approach the Planck scale. Rosenberg's approach also reinforces the idea that there are alternatives to positing an experiential basis for natural individuals.

Furthermore, there is a danger here of confusing the physical ground of the world with its metaphysical ground. The fact that this week's physics suggests that space and time as studied by science are granular does not obviously determine whatever metaphysical constraints there may be on the appearance of space and time. Consider Rosenberg's own elaborate machinery of effective and receptive properties. Rosenberg asserts that science does not go beyond the effective side of this duality. Now, if current science's proclamation about the likely granular nature of space and time is taken to be metaphysically determinative, then why not take current science's 'neglect' of receptive properties as simply indicating their non-existence? The complaint that this leaves us with only a relational structure as the ground of causation would, in this context, be merely question begging.

It seems to me it would be preferable to show that the Russian doll hypothesis involves a vicious regress. Suppose that the number of individuals is finite. The Russian doll hypothesis would then entail that the polyadicity of the relations increased as one followed the chain of relational properties. This would require a kind of inverse of the reducibility principle; in this case n -place relations would reduce to relations of polyadicity greater than n , and this inflationary process would be endless. Perhaps this is not incoherent, but it certainly seems implausible. Perhaps this is, at best, only a consideration in favour of there being an infinite number of individuals.

There may be another way to attack this problem however. Let's call the doctrine that relational properties do not require any intrinsic ground relationalism. If the Russian doll hypothesis regress was vicious, and we wished to continue to deny the reducibility claim, then there would have to be 'self standing' relational properties which simply do not require any further grounding. That is one version of relationalism. If the regress is not vicious then we have an infinite system of relational properties, but that is just another form of relationalism. If – somehow – it could be shown that relationalism itself is incoherent then both the self standing and Russian doll options would be ruled out. That is to say, if relationalism is incoherent then there cannot be an infinite chain of 'nested' relational properties simply because the idea that reality is a system of such properties is ruled out.

However, it is a very tall order to demonstrate that relationalism is false. Perhaps the most promising argument can be assembled from material provided by Max Newman's (1928) attack on Russell's (1927) view that we know only the structural features of the external world. If we assume that relations and relational properties at the very least require the existence of their relata, then Newman demonstrated that relational structure is, so to speak, given for free merely from the existence of the relata (just so long as there are enough of them). This is because relations – if we regard them apart from any intrinsic features of their relata – are nothing more than sets of ordered sequences of entities, and these sets all exist if the entities exist. This makes the doctrine of relationalism devoid of content – it says nothing more than that the individuals in the world exist.

Of course it remains possible to assert that there are some *real* or *genuine* relations which are somehow something more than some set theoretic structure of entities, but it is not very clear what this amounts to. Two of the most interesting examples would be our old friends space and time. It seems there must be something about 'being ten feet from X' that qualifies this relational property as something more than X being the second member of a certain set of ordered pairs. But often enough, what this 'something more' is amounts to some kind of substantial space or spacetime with its own intrinsic metrical properties. Another important example is causation (see Maxwell 1971), but it is hard to see what could 'breathe fire' into the causal relation except intrinsic features of the entities involved in causal processes. Any purely or genuinely relational base for them would thus be something completely unknown to us. I do not see any advantage in postulating an unknown self standing relational system of dubious coherence in place of an unknown system of intrinsic properties serving to ground known relational structures such as causation, space or time. All the more so, when we recall that the grounding of relations in intrinsic properties is familiar and intelligible.

Some of Rosenberg's own remarks suggest a closely similar argument against relationalism, although he does not seem to want to push the argument quite that far. In an interesting kind of inversion of usual practise, Rosenberg characterizes the intrinsic/extrinsic distinction in terms of the relational system in which an individual thing takes part. Thus, what would usually be called the intrinsic features of the pieces in a chess set are extrinsic according to Rosenberg's nomenclature, because these properties are not defined in terms of the identity conditions for being a chess piece – they are extrinsic to chess considered as a functional system. However, it is evident that these extrinsic features are necessary condition for the very possibility of playing chess (they are, in Kantian language, a transcendental condition on the possibility of chess). This analogical argument about relational structures would carry more weight were it not for the seemingly obvious fact that functional systems can be nested one within the other. This explains the respect Rosenberg pays to the troublesome possibility that the physical world could be an infinitely deep but purely functionally definable system of interconnected relational

properties.

But if it is difficult to refute relationalism, we might have more luck attacking *absolute* relationalism. Only a single premise is needed for a simple argument against this view, and it is known to be true. This premise is simply that there are some intrinsic properties. If there are, then absolute relationalism is false.

We know this premise is true because states of consciousness themselves provide the paradigm examples of intrinsic properties. One's state of consciousness is what it is, metaphysically independent of every other thing. To be sure, there are some interesting challenges to the claim that states of consciousness are intrinsic. One is Descartes's argument that merely from the nature of consciousness one could infer a God who is metaphysically necessary for the existence of consciousness itself. It is debatable if this really shows that consciousness is not intrinsic – why could there not be metaphysical conditions on intrinsic properties which do not destroy their intrinsic natures, just as the fact that there are generally causal conditions on the acquisition of intrinsic properties does not undermine their claim to be intrinsic? After all, the reducibility principle itself entails that intrinsic properties (sometimes) imply facts that go beyond the subject. A cruder point is that Descartes's arguments seem patently inadequate and in fact ends up bolstering the claim of the metaphysical independence of consciousness. A much more recent challenge comes from the doctrine of semantic externalism, which makes all content carrying properties into relational properties (see Dretske 1995 for the classic application of externalism to consciousness). If all conscious states are content carrying states, and such states are relational then states of consciousness are relational. It follows that an intrinsic duplicate of a conscious being, lacking the relations which constitute content, will entirely lack consciousness. But of course, externalism as applied to consciousness is extremely controversial and in my view this consequence amounts to a *reductio* of the position. Perhaps the majority view is that consciousness cannot be reduced to intentionality or mere content carrying states. The driving intuition behind this is precisely the idea that there is an intrinsic component to conscious states (variously called qualia, phenomenal character, 'what it is like' etc.).

If absolute relationalism is false, this does not imply that all relational properties are reducible to the intrinsic features of things. But consider the question whether intrinsic properties can emerge from the merely relational. Although it is easy to understand the mechanism by which relational properties and relations might depend upon intrinsic properties it is very hard to understand how any intrinsic property could be determined by relational features. Candidates seem instead to make the putatively intrinsic feature into merely another relational property (as in the case of the externalist theory of consciousness). For example, mass (at least, nowadays, rest mass) is traditionally regarded as an intrinsic property or at least is frequently used as an intuitive example of one. If certain physical speculations are

true however, mass is determined by the interaction of particles with a novel kind of quantum field, called the Higgs field. If this turns out to be correct then the proper story is not that an intrinsic property is 'turned on' by a relational feature but rather simply that mass turns out to be a relational property, somewhat in the way that weight was revealed to be a relational property by Newton (albeit a relational property determined by what Newton took to be the intrinsic property of mass itself).

So there have to be some intrinsic properties of things. If we accept that inter-attribute emergence is impossible, we can immediately derive some version of panpsychism as outlined above. However, the foregoing remarks suggest a more radical conjecture. For all candidate intrinsic properties, it is possible to see how they could be revealed to actually be relational properties. Mass is one example, but all physical attributes seem to be similar in this respect. In fact, to the extent that we take the scientific characterization of things as revelatory of their natures, then science apparently reveals that all properties are relational. This follows from what Rosenberg discusses as the inability of science to go beyond the effective properties of things. All effective properties turn out to be characterizable in 'functional' or 'structural' terms and thereby become relational properties. The seeming possibility of an infinite nesting of functional systems may be an artifact of a starting point that abstracts away from everything except the 'effective architecture' of things.

The scope, reach and success of science suggests that *everything* can be regarded in this way. Except, that is, for one feature of things: consciousness. One way to express the special difficulty of the hard problem is that it is impossible to understand how consciousness could be explicated in such a way that it would be intelligibly rendered a relational property of things. Since science reveals only the relational structure of things, it cannot so much as begin to deal with the nature of consciousness. It is necessarily limited to investigating the way consciousness is linked to physical structures. There does not seem to be any other feature of reality which limits scientific investigation in this way. The idea that only consciousness presents this problem suggests a radical conjecture: there is only one kind of intrinsic property, which characterizes states of consciousness and nothing else.

If so, even a restricted reducibility principle implies that consciousness must be the intrinsic root of things, and panpsychism is established. I think that further reflection on the nature of intrinsic properties, their relation to consciousness and the viability of the reducibility principle is likely to illuminate the problem of consciousness in interesting ways. Rosenberg's work provides a highly interesting, sophisticated and fruitful starting point for these reflections.

William Seager
University of Toronto at Scarborough

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Notes

1. The Leibnizian theory presented here is not intended to be Leibniz scholarship, and may at certain points depart from Leibniz's views to a greater or lesser extent.
2. This independence is 'ontological' independence. The claim is not that intrinsic properties cannot be causally conditioned but rather that they are not metaphysically dependent on other things. Thus, Descartes's view that God is required for the metaphysical sustenance of the world at every instant would seem to render all properties relational – they all entail the existence of God. Intrinsic properties are also not to be assimilated with the essential properties of something. There could be accidental intrinsics. And there could be essential relational properties, as in the Cartesian example.
3. There is a curious echo of Leibniz's attempt to ground reducibility on causal interaction in Heisenberg's famous analysis of the uncertainty principle in terms of an imaginary microscope. In fact, quantum uncertainty is much more deeply integrated into the theory than a mere interactionist explanation would suggest. Similarly for Leibniz, reducibility is a metaphysical principle which goes far beyond the causal interconnection of things. One might well say that both Heisenberg and Leibniz have the order of explanation backwards (though in fact I think they both well understood the deeper nature of their respective principles which cannot be read off their efforts to explicate them).
4. Depending on assumptions we make about the propagation speed, we can say something about the geometry of space as well. Set a fixed speed of propagation, independent of the state of motion of objects, and the spacetime of special relativity will emerge.
5. One might think that God could create two intrinsically identical monads, A and B, and make one of them, say A, the sole inhabitant of its world, while B is situated in a 'normal' system of monads as specified by B's intrinsic informational states. The property of 'being alone in a world' is thus an irreducible relational property. This shows that Leibniz must (as he did) strictly maintain the identity of indiscernibles so that the envisaged scenario is impossible. The implausibility of this puts some strain on Leibniz's system and casts doubt on the general reducibility principle. Leibniz would certainly not have agreed with the idea that relational properties are identified as ones that entail

the existence of something other than the bearer of the property. Perceptual states are both intrinsic and specify a world around the subject. Normally, we think that the *accuracy* of a perceptual state is not intrinsic to it, hence perceptual states regarded as intrinsic do not entail anything beyond the subject. This is a deep problem for Leibniz. It could be solved if it was impossible (metaphysically impossible) for God to make a fundamentally deceived monad.

6. This is most plausible for duplicates in different possible worlds. Hume actually says that bread is not necessarily nutritious. Would Hume allow that something that was otherwise identical to bread might fail to be nutritious? I think he would. There is nothing incoherent in the idea of something which is indiscernible from bread in every respect save being nutritious. However, the metaphysical challenge to be advanced here requires only the weaker claim however to get off the ground.
7. Kant read Hume as providing such a metaphysical challenge and accepted that causation was 'extrinsic', that is, things which agreed on all intrinsic properties could differ with respect to their causal powers (see Langton 1998).
8. It's also important to note that the intrinsic nature of conscious states does not imply that they are not content carrying, or even that they are not intrinsically representational. The issue of consciousness and content is very complex and unsettled (see Chalmers 2004).