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Open Access Journal

این مقاله با درجه علمی \hat{E} پژوهشی پذیرفته شده است.

جاویدان خرد، شماره ۴۲، پاییز و زمستان ۱۴۰۱ صفحات ۱۸۹-۲۰۴

نه فردها و نه روابط؟

نقدی بر واقع‌گرایی ساختاری انتیک از موضعی طبیعی‌گرایانه

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چکیده

من در این مقاله استدلال می‌کنم محتوای متافیزیکی ایجابی واقع‌گرایی ساختاری انتیک — یعنی این ادعا که ساختار از نظر هستی‌شناختی بنیادین است — از منظری طبیعی‌گرایانه قابل دفاع نیست. راهبر من این است که نشان دهم شواهد و استدلالاتی که مدافعان واقع‌گرایی ساختاری انتیک برای اقناع آموزه ایجابی شان طرح کرده‌اند، انتخاب میان این آموزه و آموزه دیگری را که با آن در تناقض قرار دارد ناقص متعین می‌کنند. استدلال می‌کنم بدون اختیارکردن رویکردی غیرطبیعی‌گرایانه به ذهن انسان، هیچ راه آشکاری برای رفع این تعین ناقص وجود ندارد. با این حال، محتوای متافیزیکی سلبی واقع‌گرایی ساختاری انتیک — یعنی حذف فردهای بنیادینی که دارای طبیعت درونی‌اند — از گزند این نقد مصون است و چه‌بسا بتوان مستقلاً از آن دفاع کرد. **کلمات کلیدی:** طبیعی‌گرایی، جهان، عقل، نوپدیداری، واقع‌گرایی ساختاری، متافیزیک، فیزیک.

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تاریخ پذیرش: ۱۴۰۱/۱۲/۶

تاریخ دریافت: ۱۴۰۱/۶/۱۲

SOPHIA PERENNIS

The Semiannual Journal of Sapiential Wisdom and Philosophy

Vol. 19, Number 2, autumn and winter 2023, Serial Number 42

Neither Individuals Nor Relations? A Criticism Of Ontic Structural Realism From A Naturalistic Stance

PP: 189-204

DOI: 10.22034/IW.2023.389514.1676

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Abstract

I argue that the positive metaphysical content of ontic structural realism – the claim that structure is ontologically fundamental – is indefensible from a naturalistic perspective. My strategy is to show that the evidence and arguments advanced by ontic structural realists to motivate their positive thesis underdetermine the choice between it and another, contradictory thesis. I argue that there is no apparent way to break this underdetermination without adopting an anti-naturalistic approach to the human mind. The negative metaphysical content of ontic structural realism, however – the elimination of fundamental individuals with intrinsic nature – is untouched by this criticism and may be defended independently.

Key words: Naturalism, World, Reason, Emergence, Structural realism, Metaphysics, Physics

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Recived date: 3/9/2022 Accepted date: 25/2/2023

1. Underdetermined ontology

Ontic structural realism (OSR) is a metaphysical project which emphasises how seriously it takes naturalism. I sympathise with that priority, and I think that the literature in defence of OSR is rich with insight and creativity. Nevertheless, my aim here is to argue that OSR does not work as a positive metaphysical thesis. The value of the project, in my opinion, lies in the *negative* metaphysical thesis that is characteristic of it. I will argue that all of the potentially effective arguments advanced by OSRists are in support of this negative thesis alone, while the positive thesis they put forward has no plausible naturalistic defence. Accordingly, the conclusion which I hope the reader takes away from this paper is that the positive metaphysics of OSR is a dead-end even if its negative metaphysics is worthy of close attention.

Scientific realism in its standard form is the view that our most mature and successful scientific theories are approximately true. *Structural realism* is a modification of that view which holds that the logico-mathematical structure of those theories is an approximately accurate representation of the structure of the real system or systems relevant to the theories. James Ladyman (1998) introduced a distinction between epistemic and ontic structural realism. Epistemic structural realism is the view that mature theories give us knowledge of only the fundamental structure of the world but not its nature, and ontic structural realism is the view that the world fundamentally *is* only structure. Ladyman defended OSR in his paper and continues to champion it along with other scholars (especially Steven French – see his 2014). There are also various permutations of the view in the literature and papers discussing and developing it (e.g., Esfeld and Lam 2010, Tegmark 2008, Thébault 2016, McKenzie 2017).

I will proceed by reconstructing OSR into three distinct theses which I take as essential perhaps to any position calling itself OSR, but certainly at least to any OSR meant to be kindred to the eliminative varieties defended by James Ladyman and Steven French, whose works will be the points of reference for my argument:

- Epistemic Thesis:** We have at least approximately represented the structures of certain real, unobservable systems in the models of our best scientific theories.
- Eliminative Thesis:** Belief in the existence of ontologically fundamental individuals with intrinsic nature is poorly motivated and should be abandoned.
- Ontological Thesis:** Real systems ultimately consist of relations alone.

In this paper, I will be taking the Epistemic and Eliminative Theses as given and arguing that we do not have a good reason, from a naturalistic point of view, to accept the Ontological Thesis as true.

First, a note on the definition of structure and the relationship between structure and relations. In the relevant literature, “structure” sometimes seems to be used simply as a collective noun for a network of relations¹, and sometimes has the more technical sense of referring to an abstract pattern which may or may not be instantiated by any given network of relations. In any case, the notion of “structure” is inseparable from that of “relation”. While there are different shades of OSR, what unites them is the belief that structure is ontologically primary (see McKenzie 2017). This means that, for OSRists, all real systems have their ultimate metaphysical ground in relations. If they allow for the existence of objects at all, those objects are ontologically dependent on relations. This is what gives us the Ontological Thesis. On this view, the distinction between the mathematical structures used by scientists and the physical systems which they are supposed to represent is tricky to clarify (see French 2014, Chapter 8) but that issue need not concern us here. I will be referring to real systems, which all hands agree instantiate structures via their internal relations. The difference between OSRists and their opponents is that, for OSRists, to represent the structure of a real system in fundamental physics is to represent that system in its entirety, while their opponents think that there is more to what a real system fundamentally *is* than just that.

Let us touch briefly on the supporting arguments for the first two theses. The Epistemic Thesis can be defended with the no miracles argument, which would have it that the success of our best theories would be a miracle if it were not true. The Eliminative Thesis has been defended through appeal to physics. It’s been argued that the putative entities which appear in fundamental physics are too ambiguous in their metaphysical status to be regarded as real individuals with their own intrinsic nature. If we want to insist that there are individuals in fundamental reality, the argument goes, there isn’t an unproblematic way to identify them when interpreting modern physical theories. OSRists therefore argue that an individual-less ontology is more appropriate for the interpretation of those theories (Ladyman 1998; Ladyman and Ross 2007, Chapter 3; French 2014, Chapter 2).

¹ An example from French and Ladyman (2003, p.46): “...these relations are not supervenient on the properties of unobservable objects and the external relations between them, rather this structure is ontologically basic.”

Again, we are not going to ask whether these are good arguments or not. Let's just assume that they work and that the Epistemic and Eliminative Theses are true. What, then, motivates the Ontological Thesis?

Taking a look at that seminal paper of Ladyman's (1998), here's the key passage where he moves from the Eliminative Thesis to the Ontological Thesis:

It is an ersatz form of realism that recommends belief in the existence of entities that have such ambiguous metaphysical status. What is required is a shift to a different ontological basis altogether, one for which questions of individuality simply do not arise. Perhaps we should view the individuals and nonindividuals packages, like particle and field pictures, as different representations of the same structure. There is an analogy here with the debate about substantivalism in general relativity. Recently it has been suggested that this issue also calls for a different fundamental ontology within which to assess the reality of spacetime. Robert DiSalle (1994) has suggested that the structure of spacetime be accepted as existent without being supervenient on the existence of spacetime points. This is a restatement of the position developed by Stein in his famous exchange with Grünbaum, according to which spacetime is neither a substance, nor a set of relations between substances, but a structure in its own right.

So we should seek to elaborate structural realism in such a way that it can diffuse the problems of traditional realism, with respect to both theory change and underdetermination. *This means taking structure to be primitive and ontologically subsistent.* (Ladyman 1998, p.420. Emphasis mine.)

I have put in italics the part representing the Eliminative Thesis at the start of the passage and the part representing the Ontological Thesis at the end (if real systems are fundamentally composed of primitive and subsistent structure, then they ultimately consist of relations alone). Between them, Ladyman states that we need an ontology which accommodates the Eliminative Thesis, points to some earlier work suggestive of the Ontological Thesis, and says that adopting the Ontological Thesis enables structural realism to diffuse the problems of underdetermination and discontinuity in traditional realism. The idea seems to be that we want to eliminate objects from our fundamental ontology due to underdetermination in physics, and a fundamental ontology of only structure achieves that elimination while accounting for theory change,¹ so we ought to adopt such an ontology.

But there is a problem here if this choice of ontology is itself underdetermined by the motivations provided for it. I will argue that this is

¹ It is supposed to account for theory change because, according to structural realists, the structure of successful scientific theories is preserved across even the most radical theoretical changes.

indeed the case. For while the Ontological Thesis is consistent with the Eliminative Thesis, so too is this thesis which I call the Neither-Nor Thesis:

Neither-Nor Thesis: Real systems ultimately consist neither of individuals and their relations nor of relations alone.

On this thesis, whatever ultimately realises the structures of real systems cannot be adequately captured by human conceptual schema.¹ OSR requires us to believe that the Ontological Thesis is true and the Neither-Nor Thesis is false. I will argue that there are no good naturalistic reasons to believe that.

There is a point of clarification that I cannot emphasise too much: *I am not trying to convince the reader that the Neither-Nor Thesis is true.* My goal is rather to show that we should not be committed to its falsity – not if naturalism is important to us – and therefore should not be committed to the truth of the Ontological Thesis (since they are contradictory, holding one of these theses to be true is committing to the falsity of the other). I will argue that we do not have good naturalistic reasons to determine which of these theses is true and which is false, and that we therefore ought not to make a determination one way or the other. Even if we agree with the Epistemic and Eliminative Theses, when asked what real systems ultimately consist of, the truthful answer is “we don’t know”. That, of course, brings us back to something which could be described as an epistemic form of structural realism (if we want to call it a form of realism at all). It offers no positive metaphysical description of fundamental reality, though it would contain the negative metaphysical claim of the Eliminative Thesis.

I will proceed by looking at potential objections and at a couple of the key principles used by OSRists to motivate their position. I’ll show that none of these should motivate us to think that the Ontological Thesis is true and the Neither-Nor Thesis false.

¹ I am assuming that human conceptual schema must necessarily employ individuals or relations to represent systems. I am open to the possibility that this is not true, but exploring that possibility would be a major digression which could not affect my case. My arguments are designed to show that real systems might not ultimately consist of individuals or relations and might not be cognizable. If they also might not ultimately consist of individuals or relations and yet be cognizable, then that can only be a bonus.

2. Two-headed gerbils and the burden of proof

I begin with what I suspect might be many or most OSRists' first reaction to the case I am making here, which is informed by this passage from *Every Thing Must Go*, Ladyman and Ross's book-length defence of OSR:

Should we reject the existence of things in which we could have no reason to believe, or suspend judgement about them? Perhaps the latter is the more enlightened option, but then we ought to be agnostic about a literal infinity of matters—whatever anyone can conceive without contradicting physics. Should we be agnostic about the existence, somewhere, of two-headed gerbils that sing the blues? If the agnosticism a philosopher advises us to take up towards the unknowable noumenal objects is strictly analogous to this then we are sanguine about agreeing to it. (Ladyman and Ross 2007, p.131)

This is a concession they are making for the Eliminative Thesis. They are saying that they are happy to accept that they're actually agnostic about the existence of unknowable individuals, but they take this as strictly analogous to agnosticism about the existence of two-headed, blues-singing gerbils. The effect is that they are not declaring *certainty* that there are no individuals with intrinsic nature out there, but are saying that they don't see a reason to take seriously the claim that there are such individuals.

Some might want to adopt the same attitude toward the Neither-Nor Thesis. They might be happy to admit that it's *possible* that the Neither-Nor Thesis is true and the Ontological Thesis false, but would add that this is not a possibility that they are willing to take seriously in their metaphysics because the Neither-Nor Thesis is concerned with unknowable realities which we couldn't even begin to conceptualise in order to ask whether they exist or not. So, the response would be, "technically we're agnostic about the Neither-Nor Thesis, but practically we'll reject it - we won't take it seriously".

But this is an inappropriate response, particularly from a naturalistic point of view. There are two basic reasons why it is inappropriate:

1. There are good naturalistic reasons to take the Neither-Nor Thesis seriously in metaphysics (even though I don't think we should be committed to its truth).
2. There are no good naturalistic reasons to place the burden of proof on the Neither-Nor Thesis when contrasted with the Ontological Thesis.

The good naturalistic reasons for taking the Neither-Nor Thesis seriously come from a naturalistic consideration of human cognitive capacities. That means treating the human mind as a subject of scientific inquiry and aspect of the natural world which enjoys no special *a priori* privileges over any

other. As natural objects, we take human minds to fall within a fixed range of constitutions and abilities, and our beliefs about that range is informed by our best science primarily if not exclusively. Please note that by “natural object” I do not mean “physical object” or any such metaphysical description – I just mean that the mind is a part of nature (however “nature” is construed) and we should draw conclusions about it accordingly. One of those conclusions is that science is the best way of learning about the mind because science is the best way of learning about nature.

From this point of view, human cognitive abilities are a subset of the abilities of a kind of animal which evolved on the African continent. Every kind of animal in existence gained its entire range of abilities, as far as we know, from millions of years of mutations in combination with natural and sexual selection pressures. Given this context, my charge is that it is unjustifiable to *expect* that this or any animal is capable of representing every aspect of the fundamental nature of reality. We certainly have no reason to think that the range of human cognitive abilities *necessarily* corresponds to the range of possible ways that fundamental reality might be. Nor do we have good reasons to think that we have already successfully represented what fundamental reality is like.

The no miracles argument cannot make any difference here. It can't convince us that we have represented the fundamental nature of actual systems because the Epistemic Thesis adequately explains the success of science and is equally compatible with both the Ontological and Neither-Nor Theses. This is part of the original selling point of structural realism as proposed by Worrall (1989): it is supposed to solve the tension between the no miracles argument and the pessimistic meta-induction (Laudan 1981) by abandoning any pretence of describing the fundamental nature of the world and cleaving to structure instead. OSR is an entirely different story because it claims that structure *is* the fundamental nature of the world.¹ This metaphysical claim is clearly not itself an explanation of what makes any particular scientific theories successful and therefore cannot be directly supported by the no miracles argument (nor do OSRists claim that it can be). The relevant argument is rather that this claim is unfazed by the pessimistic meta-induction since structure is preserved across theory change. As I have indicated, the Ontological Thesis is positively motivated simply by the want

¹ One advantage that this claim gives OSRists over Worrall is that it neutralises Newman's (1928) objection for them. That is because OSRists do not shy away from describing the nature of the relations which they take to be forming the worldly structures described in successful scientific theories. There is therefore no question of the existence of those worldly structures being trivial.

for a positive metaphysical thesis consistent with both the Epistemic and Eliminative Theses. My argument is that this motivation underdetermines the choice between the Ontological and Neither-Nor Theses.

Returning to our naturalistic reasons to take the Neither-Nor Thesis seriously, we can ask: if it were the case that the fundamental nature of reality is beyond our cognitive abilities, what might we expect physics to look like? I would suggest that we would expect physics to be pretty baffling. It would be full of results which violate our intuitions, and the metaphysical interpretation of theories would be extremely difficult as we attempt to apply our conceptual schema to mathematical results which just don't fit easily within them. This, of course, is just the situation we are in with physics.

To summarize: on a naturalistic approach to the mind, we would not expect that the human mind matches up perfectly with the fundamental nature of reality. It would be quite the coincidence – or, you could say, a miracle – if our minds just happen to be capable of grasping the fundamental nature of reality. And secondly, empirically, physics looks very much like what we would expect it to look like if our minds aren't capable of grasping the fundamental nature of reality.

Here, of course, the OSRists might point out that physics also looks just like how we would expect it to if the Ontological Thesis were correct. On their view, we have represented the fundamental nature of reality because it turns out that all we needed in order to do that was the ability to do mathematics. According to them, fundamental reality matches various mathematical structures up to isomorphism, and when we have represented reality with those structures there is nothing that we're missing, nothing more there that we have failed to represent.

So, the key question here is whether we should simply assume that this one species of animal, by virtue of being able to do mathematics, has everything it needs to represent the subtle fabric of reality in its entirety, missing nothing. Or, whether we should actively suspect that, while mathematics has enabled the animal to represent the structures of real systems, the animal might not have the cognitive tools to pick up on every aspect of those systems' natures. Because the latter option fits comfortably with naturalistic expectations, it cannot be considered analogous to the idea that we should actively suspect that there are two-headed, blues-singing gerbils somewhere. If the OSRist wants us to reject it, they must give us some good reason to do so.

This brings us to the second part of my present case. Given that the truth values of the Ontological and Neither-Nor Theses are underdetermined by the evidence, an OSRist will want to place the burden

of proof on the Neither-Nor Thesis. But I see no legitimate reason to do this, from a naturalistic stance.

We should acknowledge that both of the theses in question are very weird. OSRists rightly don't let critics dismiss their view on the grounds that it is weird, since our intuitions shouldn't be made the arbiters of what is acceptable metaphysics or not. Consider the following quotations:

[I]maginability must not be made the test for ontology. The realist claim is that the scientist is discovering the structures of the world; it is not required in addition that these structures be imaginable in the categories of the macroworld (McMullin 1984, p. 14).

The demand for an individuals-based ontology may be criticised on the grounds that it is the demand that the structure of the mind-independent world be imaginable in terms of the categories of the world of experience. (Ladyman 1998, p.422)

The first, from Ernan McMullin, has been quoted approvingly in multiple places to help vindicate OSR (Ladyman 1998, p.422; Ladyman and Ross 2007, p.132) and the second is Ladyman applying the idea to OSR.¹ Clearly, then, the OSRist has no grounds on which to be biased against the Neither-Nor Thesis because it is weird or counter-intuitive. However, we could imagine someone arguing that while both the Ontological and Neither-Nor Theses are weird, the former is significantly less weird than the latter in that it at least preserves a portion of our core metaphysical intuitions. Moreover, it might be argued that there is at least a sense in which the Ontological Thesis is intuitible while the Neither-Nor Thesis seems impossible to intuit whatsoever. Because of these points, it might be argued that the burden of proof should lie on the Neither-Nor Thesis because of its *relative* counterintuitiveness.

How does that work? It might be argued that humans intuitively believe the following conjunction:

Conjunction: Reality is fundamentally composed of individuals AND relations.

This, of course, is rejected by OSRists. However, OSRists maintain and rely on the truth of a closely related proposition – this one disjunctive:

Disjunction: Reality is fundamentally composed of individuals OR relations.

The Ontological Thesis follows from this disjunction plus the Eliminative Thesis. The negation of the disjunction gives us the Neither-Nor Thesis.

¹ McMullin was not himself defending OSR in the original source.

Since this disjunction is much more in line with our default outlook (the conjunction) than its negation is, it could be argued that the burden of proof should lie with someone who negates the disjunction, not with someone who upholds it.

First of all, we can see that this is not a naturalistic argument. It still relies entirely on appeal to intuition and that, from a naturalistic perspective, should not be the deciding factor in what we believe the world is like. But moreover, when we approach the same controversy (i.e., whether to pick the Ontological Thesis or Neither-Nor Thesis) from a strictly naturalistic perspective, the landscape starts to look very different. Keeping in mind the naturalistic approach to the human mind I presented before, we can restate the Ontological and Neither-Nor Theses in painfully naturalistic terms as follows:

- a) Real systems ultimately consist only of aspects of reality whose nature corresponds to the concept of 'relation' as found in human minds.
- b) Real systems are ultimately constituted in ways that human minds are unable to comprehensively represent.

Note that (b), the Neither-Nor Thesis, does not deny that relations are involved in realising structure; what it denies is that relations are all there are at the ultimate level of analysis. And here, (a) strikes me as a weirder commitment to have than (b). We might want to choose (a) because it preserves our ability to understand reality where (b) does not, but what we *want* to be the case should be irrelevant in good metaphysics. We should also note that (a) is the stronger of the two claims in the sense that it specifies the ultimate nature of reality (ruling out all possibilities except one) while (b) only rules out a fixed range of possibilities, allowing for indefinite others. One might want to place the burden of proof on (a) for this reason. I am not going to press that point because I'm not attempting to put the burden of proof on either of them. I mention this only to show that there is at least as much reason to be suspicious of the Ontological Thesis on *a priori* grounds as there is the Neither-Nor Thesis.

All of that serves to show that adopting a dismissive agnostic attitude to the Neither-Nor Thesis in line with Ladyman and Ross's two-headed gerbil analogy is inappropriate. The Neither-Nor Thesis is something that a reasonable person might expect to be true on naturalistic grounds, and while I don't think we should be committed to its truth, we do have a responsibility to take the possibility of its truth seriously when forming our metaphysical commitments. After all, we don't want a situation wherein metaphysicians simply dismiss without argument reasonable possibilities which contradict their own positions. So, we are still owed some reason from

the OSRists to believe that the Ontological Thesis is true and the Neither-Nor Thesis false.

We will now move onto some key principles used by OSRists to which they might hope to appeal in order to positively motivate the Ontological Thesis.

3. Faraday's Principle and the Principle of Naturalistic Closure

One principle to which an OSRist might want to appeal in order to counter my argument is that metaphysics ought to be limited to the content of science. They might say, "relations appear in mature scientific theories, including in fundamental physics, while vague *stuff* that we can't conceptualise does not. We are only willing to entertain ontologies which align with what is presented in science, so we refuse to entertain the Neither-Nor Thesis but will entertain the Ontological Thesis."

This is similar to a principle that Steven French adopts from Faraday and puts to use as motivation for OSR. He quotes Faraday as saying: "Why then assume the existence of that of which we are ignorant, which we cannot conceive, and for which there is no philosophical necessity?" (French 2014, p.59) Let's restate this as a thesis instead of a rhetorical question and call it Faraday's principle:

Faraday's Principle: We should not assume the existence of that of which we are ignorant, which we cannot conceive, and for which there is no philosophical necessity.

French makes use of this by arguing that what he calls "object-oriented realism" violates this principle. I have no quarrel with that. In fact, I agree entirely with this principle. That is why I don't think anyone should commit to the truth of the Neither-Nor Thesis. What I am arguing is that we should not be committed to its falsity. To argue against *that*, we would need a different, more aggressive principle:

FP intensified: We should assume that nothing exists of which we are ignorant, which we cannot conceive, and for which there is no philosophical necessity.

Adopting *this* principle would commit us to the falsity of the Neither-Nor Thesis and counter my argument. But this intensified principle strikes me as alarmingly problematic in general, and especially so from a naturalistic stance. As I have already explained, a naturalistic philosophy of mind sees the human mind as a natural object without special *a priori* metaphysical privileges. What would possibly lead us to believe that this natural object *necessarily* contains within it the ability to accurately represent the fundamental nature of reality, no matter what that nature is? It is impressively anti-naturalistic to make the human mind the measure of reality as an *a priori* philosophical principle.

That point holds even if we believe that mathematics enables us to represent the structure of any possible system – a view to which Ladyman and Ross gesture (2007, p.2). Even if that is true, it doesn't follow that we're necessarily capable of representing anything non-structural which might have a role in the constitution of real systems.

So, while it's fine for a naturalist to say that they won't positively believe that anything exists which isn't attested to in science, it is blatantly anti-naturalistic for them to insist that nothing exists which can't appear in science. That is incompatible with a naturalistic approach to the mind, as I have explained. Doing science is a human ability, and we have absolutely no naturalistic reason to believe that the nature of reality is necessarily restricted to the cognitive abilities of any species of animal.

Finally, let us consider Ladyman and Ross's particular brand of naturalism within which they present OSR. It revolves around what they call the Principle of Naturalistic Closure (PNC):

Any new metaphysical claim that is to be taken seriously at time *t* should be motivated by, and only by, the service it would perform, if true, in showing how two or more specific scientific hypotheses, at least one of which is drawn from fundamental physics, jointly explain more than the sum of what is explained by the two hypotheses taken separately... (Ladyman and Ross 2007, p.37)

They really do mean 'taken seriously' here: if a metaphysical claim does not satisfy this exact purpose, they think it should be dismissed. So, if the Neither-Nor Thesis doesn't satisfy this explanatory demand, then someone who adopts the PNC could reject the Neither-Nor Thesis for that reason alone.

I do not think that the Neither-Nor Thesis satisfies the demands of the PNC, but I observe that *the Ontological Thesis doesn't satisfy the demands of the PNC either*. If we look at how Ladyman and Ross utilize the PNC to defend OSR in Chapter 3 of their book, we find that the metaphysical claim that they are defending due to its explanatory value is the *Eliminative Thesis*. They discuss quantum and spacetime physics at some length, but their conclusion always takes the form 'this makes better sense if we eliminate objects' such as in this quote toward the end of their section on spacetime:

[I]t seems that the insistence on interpreting spacetime in terms of an ontology of underlying entities and their properties is what causes the problems for realism about spacetime. (Ladyman and Ross 2007, p.143)

This, of course, is motivation only for the Eliminative Thesis. I have found only one passage where Ladyman and Ross attempt to defend the Ontological Thesis as distinct from the Eliminative Thesis:

If science tells us about objective modal relations among the phenomena (both possible and actual), then occasional novel predictive success is not miraculous but to be expected. Furthermore, the fact that scientific

theories support counterfactual conditionals is also explained. Provision of these explanations is not a matter of satisfying philosophical intuitions, but of unifying scientific practices and theories. We thus suggest that in addition to the negative thesis that physical theory should not be interpreted in terms of underlying objects and properties of which the world is made, we are motivated in accordance with the PNC to take seriously the positive thesis that the world is structure and relations. (Ladyman and Ross 2007, p. 153)

Here, they appeal to the no miracles argument to insist that science is teaching us about real, objective modal relations, and explain how they see this as justifying the Ontological Thesis in accordance with the PNC. But, on my formulation, the notion that science is discovering objective modal relations, and every implication of that notion – from the no miracles argument to “unifying scientific practices and theories” – is captured by the Epistemic Thesis and is consistent with the Neither-Nor Thesis. We can believe that science is teaching us about the objective modal relations of real systems without attempting to describe the ultimate nature of those systems. So, the choice between the Ontological and Neither-Nor Theses is underdetermined here, as well.

Perhaps someone would suggest that the PNC will have us prefer the Ontological Thesis because the Neither-Nor Thesis posits additional aspects of reality which stand in need of explanation themselves, so it could be considered a worse explanation in that sense. But the additional realities posited by the Neither-Nor Thesis, *ex hypothesi*, can't be explained. So, they don't stand in need of explanation. If someone were to counter that the Neither-Nor Thesis is a worse explanation precisely because it posits things that can't be explained, again we reply that we have naturalistic reasons to suspect that there may be things which can't be explained. Therefore, we certainly can't disqualify or be otherwise prejudiced against an explanation solely for suggesting that there are things which can't be explained. If it were a consequence of the PNC that we should be so prejudiced, then the PNC is not as naturalistic as it seems. But I don't think that we need to challenge the naturalistic credentials of the PNC here. The PNC, as written, simply doesn't give us any reason to believe either the Ontological or the Neither-Nor Thesis. This, I think, is a mark in its favour

4. Conclusion

We don't have any reason, from a naturalistic point of view, to think that the Ontological Thesis is true and the Neither-Nor Thesis is false, nor can we responsibly ignore the Neither-Nor Thesis. If we are convinced by the Epistemic and Eliminative Theses and are asked what real systems ultimately consist of, the honest and responsible answer is "we don't know".

This does not leave us with a structural realism that is purely epistemic. The Eliminative Thesis is a metaphysical claim – but it is a purely negative one: it tells us what metaphysical commitments we should *not* have. The Ontological Thesis is the positive metaphysical content of OSR. Without it, we are left with a structural realism which encourages a radical revision of our intuitive picture of the world's constitution, but which does not replace this picture with another one. The question should not be whether this satisfies us, but whether we are justified in anything more.

Acknowledgements

I would like to thank Adam Caulton for many helpful comments and suggestions as well as Aboutorab Yaghmaie for helpful correspondence following The International Conference on Naturalism and its Challenges, where an earlier draft was presented. I am grateful to the organisers of the conference and to the audience for discussion.

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