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# ONTIC STRUCTURAL REALISM AND THE CASE OF THE MISSING KANTIAN RESIDUE

## Realismo Estructural Óntico y el caso del residuo kantiano perdido

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**Abstract**

As the name suggests, Ontic Structural Realism (OSR) entails the claim that structure is all there is. However, several critics have argued that OSR's ontology is incomplete. There must be something ontologically significant beyond structure. I will suggest an ontology for these critics, one that invokes what Ladyman and Ross call "Kantian residue". In doing so, I modify Rae Langton's *Kantian humility* thesis to incorporate some extra-structural noumenal "something=x" (as Kant puts it). This involves positing (a) that a mysterious something=x *exists* and (b) that something=x is *responsible* for structure (specifically structure's non-arbitrary properties). Responsibility is a modal relation that is potentially equivalent to some asymmetric relation (causation, explanation, determination, grounding, or the like). Regarding the nature of something=x, I argue in deflationary spirit that we can only know that it is that which is responsible for structure.

**Key words:** Ontic Structural Realism; James Ladyman; Epistemic Structural Realism; Kantian Humility; Rae Langton; Noumena.

**Resumen**

Como su nombre indica, el Realismo estructural óntico (OSR por sus siglas en inglés) sostiene que la estructura es todo lo que existe. Sin embargo, varios críticos han argumentado que la ontología del OSR es incompleta: debe haber algo ontológicamente significativo más allá de la estructura. Propongo una ontología para atender a esta crítica, una que recurre a lo que Ladyman y Ross denominan "residuo kantiano" ("Kantian residue"). Al hacerlo, modifico la tesis de "humildad kantiana" ("Kantian humility") de Rae Langton para incorporar "algún x" nouménico extraestructural (como lo formula Kant). Esto implica postular (a) que existe un misterioso algo = x y (b) que ese algo = x es responsable de la estructura (específicamente, de las propiedades no arbitrarias de la estructura). La responsabilidad es una relación modal que podría ser equivalente a alguna relación asimétrica (como la causalidad, la explicación, la determinación, la fundamentación, u otra similar). En cuanto a la naturaleza del "algo = x", sostengo, en un espíritu deflacionista, que solo podemos saber que es aquello que es responsable de la estructura.

**Palabras clave:** Realismo estructural óntico; James Ladyman; Realismo estructural epistémico; Humildad kantiana; Rae Langton; Noúmeno.

## Introduction

What does the world's fundamental ontology consist in? Scientific realists often claim that metaphysical investigations of our best science can provide an answer. Ontic Structural Realists (OSRists) defend the (counter-intuitive) thesis that the world's ontology consists solely in structure. It is not merely that structure is all we can know – as Kant (1998) or John Worrall (1989, 2020) have it – but rather that structure is all there is; there is nothing that is structured as such.

This view has been criticised for being incomplete. Critics often argue that something is missing from the OSR ontology; there must be some *thing* 'beyond' structure. Jacob Busch (2003), for instance, thinks that James Ladyman's (1998) version of OSR promotes "mysterious structures" because it is mysterious how structure can exist without *objects* that are structured (i.e. how there can be relations without relata) (see Chakravartty, 2003; Floridi, 2008; Briceño & Mumford, 2016 for similar criticisms). My goal in this paper is to suggest an ontology that might satisfy (at least some of) the critics.

Different versions of OSR have been worked out by Ladyman and Don Ross (2007), Steven French (2014), and Michael Esfeld and Vincent Lam (2008) (I discuss these variations further in Section 4). I will, however, largely focus on the Ladyman version of OSR (henceforth referred to as "$OSR_L$"). This is for the following reasons:

1. $OSR_L$ outwardly has a wider scope than OSR. The former tries to give an account of the whole of science, and my modification should, therefore, also have a wider scope.
2. On my reading, $OSR_L$ is the most plausible version of OSR.
3. $OSR_L$ appears to be the most widely recognised version of OSR.
4. Focusing on $OSR_L$ keeps this paper focused and avoids getting into the weeds of the internal debate between different OSRists.

This last reason might mean that my argument does not apply to OSRists besides Ladyman (and perhaps his collaborators[1]). Nonetheless,

[1] Ladyman's collaborators include Nora Berenstain (Berenstain & Ladyman 2012), Tomasz Bigaj (Ladyman & Bigaj 2010), Steven French (French & Ladyman 2003), Lorenzo Lorenzetti (Ladyman & Lorenzetti, forthcoming), and John Collier, David Spurrett, and Don Ross (Ladyman & Ross 2007), each of whom defends $OSR_L$ with different degrees of conviction and varied nuance.

I believe that it should, at least, give other OSRists something to think about.

Ladyman writes of $OSR_L$ that it

> is not an epistemological modification of standard scientific realism wholly, primarily or even partly… OSR is an epistemic thesis to the extent that it incorporates the epistemic commitment to our best science that all forms of scientific realism involve, but it is distinctive in proposing a metaphysics along with it (Ladyman, 2021, p. 240).

This metaphysics entails the ontological claim that everything is structure. Proponents of $OSR_L$ have, however, not given a complete account of structure *itself*. Given their understanding of naturalism, they refuse to talk about the nature of structure (even if they discuss how structures might function during scientific inquiry). However, one wonders why structures (be they mathematical, modal, or otherwise) cluster in certain parts of the world, why they take certain forms, and why they exhibit certain behaviours. Is there not some extra-structural noumenal stuff – some "Kantian residue" as Ladyman and Ross (2007, p. 131) call it – that is *responsible* for these features (i.e. the properties that the relevant structures possess)? Kant considers that which lies beyond structure to be a mysterious "something=x" (1998, A250). I will centre my argument around this something=x (which might turn out to be neither structural nor substantial).

Note that my goal is not to argue against OSR *per se*. As mentioned, others have done so. OSRists have, of course, replied. I do not intend to engage in this debate here (in fact, some commentators consider the debate to have reached a stalemate). My goal is, instead, to put forward an ontology that might appeal to critics who are sympathetic to OSR but believe that there must be something beyond structure (i.e. something responsible for the non-arbitrary features structures exhibit). So, my goal is not to dismiss $OSR_L$ and replace it with something new. It is, instead, to show that we can say both more and less about structure than $OSR_L$ists think. $OSR_L$ists say too much when they claim that structure is the last word on ontology, and they say too little when they claim that there is nothing beyond structure.

I will draw on Rae Langton's (1998, 2018) interpretation of Kant in developing my thesis. In gist, I intend to defend the following claim:

*Something=x exists and is responsible for structure*.

Thus, I am not denying that structure plays an important ontological role (in science or elsewhere). Structure exists, but I want to sketch a metaphysical picture for those who largely agree with the general OSR thesis but believe that there is more going on. I suggest that Kant's ontological intimations might be useful in this regard. In doing so, I will embrace OSR's general ontology (specifically the $OSR_L$ version). That said, I am going to add some 'thing' extra – something more ontologically fundamental that appears to be missing.

I will call my view *Kantian responsibility*. This notion of 'responsibility' constitutes my novel contribution to the debate on scientific ontology. Responsibility is a modal relation that is potentially equivalent to some asymmetric relation (causation, explanation, determination, grounding, or the like). Regarding the nature of something=x itself, I will argue in deflationary spirit that we can only know that it is that which is responsible for structure.[2]

My Kantian responsibility thesis might interest structural realists of both the ontic and epistemic variety. In fact, as we will see, it could serve as a middle way of sorts between Epistemic Structural Realism (ESR) and $OSR_L$. This is approximately what Bas van Fraassen calls "in-between structuralism" (2006, p. 280): Structure is neither all we can know nor all that there is. Instead, we can know that there is something more to the world than structure, even if we know very little about what exactly 'it' might be.

Kantian responsibility might also be interesting to those attracted to Langton's view, but who struggle with Kant's notoriously tricky claim that noumena (or things in themselves) exist while we cannot know anything about them. My deflationary approach could provide a fruitful way to think about this problem. Note, however, that this paper is neither about Kant nor about solving the problem of what noumena are or how exactly they relate to phenomena. My aim is more modest in merely drawing inspiration from Kant while attempting to grapple with the above-mentioned problems with OSR, specifically $OSR_L$. Although I am going to talk about Kant and noumena, my contribution is mostly to the debate around OSR and its ontology of structure.

Note also that I will presuppose that metaphysical inquiry is a worthy pursuit. My thesis will not interest those who do not care to inquire into the world's fundamental ontology. I am not assuming that there *is* an

[2] Kantian responsibility is not truly deflationist, given the ampliative inference involved. It is, nonetheless, deflationary in spirit when attempting to constrain this ampliation to the very least that can be inferred from structure's non-arbitrary (or complex) nature.

answer here, but merely that such an inquiry is worth engaging in, even if it may ultimately prove fruitless. As Kant suggests, we seek something more than phenomenal appearances. He speaks of an "unquenchable desire to find a firm footing beyond all bounds of experience" (Kant, 1998, A796/B824; see also Langton, 1998, ch. 1).

Note also that I recognise that OSR's ontology is not identical to Kant's ontology. In other words, OSR's structure is not indistinguishable from Kantian phenomena. My thesis nonetheless relies on the reader accepting that there is a similarity (if not exact indiscernibility) here. We can, I contend, draw inspiration from Kant's ontology to talk about, critique, and perhaps improve $OSR_L$.

In Section 1, I discuss $OSR_L$'s ontology. I emphasise the view's quietism about anything beyond structure. In Section 2, I discuss $OSR_L$'s ostensible incompleteness. There might be some "Kantian residue" left unaccounted for. In Section 3, I discuss whether Langton's view – which she calls *Kantian humility* – might offer solutions to $OSR_L$'s problems from Section 2. In Section 4, I argue that we can modify Langton's Kantian humility in developing a way forward. This way forward is what I am calling Kantian responsibility, which is exemplified in the claim mentioned above: *Something=x exists and is responsible for structure*. For dialectical purposes, I will initially break this claim into two separate claims:

1. Something=x *exists* beyond structure.
2. Something=x stands in a relation of *responsibility* to structure.

## 1. $OSR_L$: Structure all the Way down

Conventionally, OSR stands in contrast to ESR. In developing ESR, Worrall (1989) cites Poincaré, whose 'Kantian structuralism' entails the claim that scientific theories capture "true relations" between "real objects which Nature will hide forever from our eyes" (Poincaré, 1905, p. 161). OSR collapses what Luciano Floridi (2008) calls ESR's "Kantian dualism" between knowable structure and unknowable extra-structural stuff. In OSR, individual objects or substances are not "*residua* but *figmenta*"; the problem of dualism in ESR "is solved because there is nothing to know about the intrinsic nature of individual objects anyway" (Floridi, 2008, p. 222). In ESR, structure exhausts what we can *know* about the world; the world's metaphysical nature is beyond the remit of inquiry.[3] In contrast,

[3] Cf. Morganti (2004), who argues that ESR is best understood as being agnostic about the existence of an extra-structural ontology.

$OSR_L$ reifies these structures (as fundamental relations).[4] We only have epistemic access to structure because that is, in fact, all there is.

In $OSR_L$, structures can be identified as objects or individuals for practical purposes. But these macroscopic entities are, on closer inspection, themselves structures. Specifically, they are higher-order structures composed of lower-order structures. Given a self-ascribed "weak physicalism", $OSR_L$ists maintain that science supports no notion of self-subsistent individuals or substantial intrinsic properties of the sort analytic metaphysicians conceive of (Ladyman, 1998, 2007; Ladyman & Ross, 2007, chs 3 and 5). As French and Ladyman put it, "some sort of innate 'objectness' of the object… is fatally underdetermined by the physics" (2003, p. 44). This specifically relates to technical issues involving the identity of indiscernibles, which need not concern us here (see, however, Ladyman 2007; Ladyman & Ross 2007, ch 3; Ladyman & Bigaj 2010).[5]

OSR performs what Matteo Morganti calls a "jump from epistemology to metaphysics" (a jump he thinks is "ungranted") (2004, p. 90). French, in contrast, calls this an "entitled… kind of transcendental inference" (2010, p. 92). OSR thus "reduces the amount of humility we have to swallow by reconceptualising… underlying (putative) objects themselves in structural terms" (French, 2010, p. 92; see also Ladyman, 2021).

A key principle guiding $OSR_L$'s ontological inquiry is the principle of naturalistic closure (PNC). Abridged for current purposes, the principle states as follows:

> PNC: Metaphysical claims should not go beyond what science delineates as empirically investigatable (Ladyman & Ross, 2007, pp. 37-38).

[4] Ladyman often uses the terms 'structure' and 'relations' interchangeably (the same applies to 'individuals' and 'relata'). Dan Dennett's (1991) notion of 'real patterns' also plays a significant role in Ladyman's account (most recently in Ladyman, 2021 and Ladyman & Lorenzetti, forthcoming) (see McKenzie, 2017 for an overview; see Suñé & Martínez, 2021 for a technical critique). I will, however, put this aspect aside to avoid getting into the technical details, which seem orthogonal to my agenda here. Focusing on structure, rather than real patterns, also potentially makes my thesis more relevant to OSRists who do not invoke the latter in defending their ontology.

[5] I will not attempt to engage with the formal aspects of quantum mechanics (see, however, Lombardi et al., 2019 for the status of the current debate around the pertinent ontology; see also López, 2024). As stated, my goal is to put forward a possible ontology for those who already hold the intuition that there must be something ontologically significant beyond structure. Regarding general relativity, Ladyman and Ross (2007, ch. 3) maintain that the theory identifies the gravitational field (structure) rather than space-time points (individuals) as fundamental. Ernst Cassirer (1923), in contrast, considers general relativity to support a Kantian conception of scientific knowledge (cf. Einstein, 1949a, 1949b).

The PNC putatively blocks speculation into the properties of structure itself. For Ladyman and Ross, it is "pointless" to speculate about regions of spacetime that we cannot make empirical contact with (2007, p. 309). $OSR_L$ists refuse to answer ontological questions beyond what they consider to be the modal scope of our best empirical science. The 'clusterings' – the complexity or form and behaviour – that structures exhibit are taken as brute:

> [T]here is nothing more to be said about this that doesn't amount to empty words and venture beyond what the PNC allows. The 'world-structure' just is and exists independently of us and we represent it mathematico-physically via our theories (Ladyman & Ross, 2007, p. 158; see also French & Ladyman, 2003, p. 45).

In $OSR_L$, the mathematical and the physical are merged.[6] Reality has no nature underlying its modally representable structure (Ladyman, 2018, 2021).

As mentioned, I am going to argue that a Kantian account might be suitable for those who do not think that structure is the final ontological word. $OSR_L$-style structure is, then, more like Kantian phenomena than like the world's fundamental ontological constitution. Note that in developing this account, I intend to stay as close as possible to $OSR_L$'s ontological picture. I do not intend to posit an extravagant ontology populated by numerous kinds of metaphysical entities. My goal is, instead, to suggest a minimalist ontology, one that stays largely true to OSR while accommodating the intuition that there is something beyond structure. Notably, I am not going to posit the kind of individuals (or relata) that OSRists think are ontologically problematic. In other words, my thesis applies to philosophers who think that there is something 'causing' (or what I call "responsible for") structure's complexity (or non-arbitrariness).[7] As we will see, I am not concerned with arguing that there must be individuals (or relata) for there to be structure (or relations).

## 2. The Problematic 'O' in OSR

Ladyman and Ross note that scientific measurement values often display "a statistical distribution of clusters", yet they decline to look

[6] Sebastián Briceño and Stephen Mumford (2016) think that $OSR_L$ "flirts" with Pythagoreanism. Jack Ritchie (2023) makes a similar argument.

[7] Michael Bitbol similarly asks why structures should "be stable" (ms., p. 1).

for "special properties *of the clusters themselves*" (2007, p. 245, original emphasis). However, if our measurement values are clustering in some specifiable way, then one senses that there is something out there causing, explaining, or determining that clustering. $OSR_L$ does not account for the fact that the structures posited in scientific theories exhibit certain lawlike and predictable behaviours across space and time.[8] If this were not the case, then the world should be a homogeneous 'gunk' or a haze of chaos. In gist, this amounts to the claim that OSR cannot account for the properties that structures (specifically modal structures) possess.

This objection is similar to one made by Anjan Chakravartty (2003). He argues that OSR cannot account for why certain properties tend to be found together (e.g. negative charge and a certain rest mass) (see also Ladyman, 2023). Put otherwise, OSR cannot account for the "sociability" of properties or "the empirical discovery that certain groups of properties tend to cohere" (i.e. why they tend to cluster together) (Chakravartty, 2003, p. 873). Chakravartty mentions the following example:

> A particular set of properties, for example, come together as a package to constitute electrons, whether we construe this particular as a particle or an excitation event. These sets of properties seem to like one another's company; they are always detected together – coincidence, or object? (2003, p. 873).

Chakravartty makes a pointed criticism. However, as we will see, I do not think that we must choose between "coincidence" and "object". A (largely) 'mysterious' Kantian something=x might be capable of playing the relevant 'explanatory' role. I will, however, specifically refer to something=x being *responsible* for (rather than explaining) structure's clustering habits (or the sociability of structures' properties) (Section 4).[9]

Structure exhibits various properties; it takes certain forms and exhibits certain behaviours that seemingly cannot remain mysterious for structure to be the last word on ontology (see also van der Merwe 2024,

[8] Michael Esfeld (2012) argues that OSR does not account for how structure is "implemented", "instantiated", or "realised". See Borge (2024) for an interesting discussion of peer disagreement in the context of ontological debates about laws of nature (see also Mettini, 2018).

[9] Chakravartty invokes dispositions to explain property sociability. I will not engage in the debate around dispositions (see, however, Choi & Fara, 2021 for an overview). Suffice it to say that the dispositionalist leaves it mysterious why any given entity (or structure) has certain dispositions rather than others. As we will see, on my account, we really cannot say something as specific as Chakravartty does to explain sociability.

forthcoming). Kantians can attribute such asymmetries in structure's form and behaviour to noumena, but proponents of $OSR_L$ choose to remain silent. $OSR_L$ists appeal to structure to explain some (macro-)clusterings (e.g. why atoms are stable and 'sociable') but fail to account for the (micro-) clustering of structure's own properties. Structure's properties must be treated as brute. Many find this unsatisfying (e.g. Esfeld, 2012; Briceño & Mumford, 2016). It is somewhat unclear why $OSR_L$ists think that the form and behaviour of atoms require a 'deeper' explanation, but the form and behaviour of structure do not. Roman Frigg and Ioannis Votsis consider this to be "a case of burying one's head in the sand" (2011, p. 60). To be consistent, $OSR_L$ists should surely apply the same inferential method 'all the way down'. $OSR_L$ists invoke naturalised metaphysics to defend halting the inferential (or explanatory) chain at structure. However, not all ontologists are sympathetic to naturalised metaphysics, if only for the reason that it is unclear what exactly it means for metaphysics to be 'naturalised' in the first place (or, more broadly, what exactly it means for philosophy to be "continuous" with science, as Quine encouraged) (see Jaksland, 2023 for a recent critique; cf. Chakravartty 2017, pt. 1).

If there is no neat demarcation between naturalised metaphysics and (vanilla) metaphysics, then it is unclear why the same inferential method $OSR_L$ists employ in reaching their ontology of structure cannot be employed to infer that there is something beyond structure. Ladyman and Ross (2007) employ inference to the best explanation to arrive at their ontology. And, without presupposing (or stipulating a specific kind of) 'naturalisation', we might be justified in using the same approach to accept the existence of some Kantian residue that is left unaccounted for in OSR's ontological picture (I return to this topic in Section 4). $OSR_L$ists deny the need to infer beyond structure, but this renders structure's properties a mystery. This, in turn, leads many to consider $OSR_L$ incomplete. Stating that it is structure all the way down clearly does not help. In any event, I am not going to engage with the debate around the merits and cogency of naturalised metaphysics. I am, instead, stating upfront that my overarching argument might only appeal to those who are, like me, sympathetic to OSR's general ontological picture while holding the intuition that there is something ontologically significant beyond structure.

The discussion in this section points to why one might want to demote structure from something metaphysically fundamental to something more like the Kantian's or the empiricist's phenomena. If so, then $OSR_L$'s claim to have answered the question of 'what there is' appears to be overambitious. We might, nonetheless, be able to modify or extend $OSR_L$ to incorporate a kind of Kantian ontology, one that can account for structure's non-arbitrary

nature. I will argue in Section 4 that Langton's Kantian humility thesis can serve as a template for a way forward in this regard. Before doing so, I should briefly explicate Langton's view.

## 3. Langton's Kantian Humility

Several scholars interpret Kant as an idealist or phenomenalist (e.g. Allison, 1983; van Cleve, 1999; Breitenbach, 2004; see also Walker's 2002 review of Langton's 1998). As in ESR, this implies a 'veil of appearances' with noumena as that which is hidden behind the veil. This 'veil' is the manifold of perceptible phenomena (similar to that which the empiricist thinks constitutes the final ontological story). For Kant, this veil – or what is sometimes called the "realm of experience" or the "realm of appearances" (e.g. Wilson, 2022, pp. 49, 145) – is (at least partly) mind-dependent.

Langton instead interprets Kant's phenomena/noumena distinction as a metaphysical or ontological one. It is, she says, a distinction between the extrinsic (or relational) properties and the intrinsic (or essential) properties of things (see Paton, 1951 for a similar interpretation of Kant; see Stang, 2021, for an overview of the debate).[10] Langton's *ontological* interpretation and her reference to *relational* properties make her Kantianism potentially applicable to $OSR_L$ (this applicability does not appear to have been discussed in the topical literature).[11]

Kant claims in the *Critique*[12] that things as we know them consist "entirely of relations" (1998, A285/B341). Things – as sensed – are "merely relations, formal, or also real [sic]" (Kant, 1998, A265/B321; see also Langton, 1998, p. 37). However, on Langton's interpretation, "there is a particular sort of thing that is beyond the bounds of sense, something abstractly characterizable in metaphysical rather than epistemological terms" (1998, p. 2). There is an "occult something" – some "non-physical… ghost in the world machine" (Langton & Robichaud, 2010, p. 158). The obvious and oft-repeated counterargument is that, if we have no knowledge of things in themselves, then we cannot know that they exist. Any proposed Kantian ontology must deal with this problem – a problem Henry Allison (1983) calls the "acid test" for interpretations of Kant.

[10] Langton understands the distinction between intrinsic and extrinsic properties to be interchangeable with a distinction between intrinsic and relational properties. I follow her convention here. Lloyd Humberstone (1996) argues, however, that this conflation is a mistake.

[11] In a footnote, Ladyman and Ross dismiss Langton's view as a version of ESR but do not elaborate (2007, p. 127, fn. 53).

[12] All references to the "Critique" are to the *Critique of Pure Reason*.

Allison's acid test relates specifically to explaining how we can concurrently say that there are things in themselves *and* that they are unknowable. Put otherwise, the problem is how we can make claims about things that we do not know about, since we presumably need to know about something to engage in ontological talk about it. Langton describes Allison's acid test as the need to "dissolve a very old contradiction: things in themselves exist, and are the causes of phenomena, and we have no knowledge of things as they are in themselves" (1998, p. 2).

For Langton, relational properties are not reducible to, nor do they supervene on, intrinsic properties. Intrinsic properties do not cause or explain relational properties; only relational properties have causal or explanatory power. In other words, "although we are affected by things that have intrinsic properties, it is not through those intrinsic properties that we are affected" (Langton, 1998, p. 139). We can think of a thing in itself "only as a 'something': not an object of knowledge" (Langton, 1998, p. 31). According to Kant, this something is

> only the transcendental object; and by that is meant a *something=x*, of which we know... nothing whatsoever, but which... can serve only for the unity of the manifold (1998, A251, emphasis added; see also Langton, 1998, p. 31).

For both Kant and Langton, it follows that existence is not a property possessed by an entity (Kant, 1998, A596/B624-A602/B630; cf. Rami, 2014).[13] We can know that something exists while remaining ignorant of all its properties. This ontology, says Langton, passes Allison's acid test because we can know

> *that* there are things that have intrinsic properties without knowing *what* those properties are. Knowledge of things *as* they are in themselves involves the ability to ascribe 'distinctive intrinsic [properties]' to a thing. That involves more than simply knowing that there are things that have intrinsic properties (1998, p. 13, original emphasis).

[13] Targeting OSR, van Fraassen (2008) has argued that objects do not only have structural properties; they have, at least, one non-structural property: existence. Whether or not existence is a property is a historically important topic (see Nelson, 2020, for an overview). The ontological argument for the existence of God, for example, relies on existence being a property, while Russell's (1905) theory of definite descriptions turns on distinguishing existence from properties. A thorough engagement with this topic is outside the scope of this paper. I will, therefore, simply follow Kant and Langton in maintaining that existence is not a property. This seems to be the received view (Nelson, 2020).

By analogy, "[s]omething else is there, but we cannot reach it" (Langton & Robichaud, 2010, p. 159). Applied to the topic of this paper, we can say that something else – something=x – is beyond (or 'behind') structure, but we cannot reach it (I flesh out this claim in Section 4).

There is, however, a salient problem with Langton's view as it stands. This is that she makes several knowledge claims about noumena despite stating that we can only know that they exist. In other words (as we will see below), she sometimes slips into knowledge-talk about supposedly unknowable, noumenal intrinsic properties. Yet, as Kant's critics insist, the claim that noumena exist cannot but be a knowledge claim. If we claim that noumena exist, then we are claiming *a fortiori* that we *know* they exist. This appears to be an inescapable commitment, one that is necessary to get Kantian ontologies 'off the ground'. Without this most elementary knowledge claim about noumena, Kantianism is no different from phenomenalism or idealism. Even on Langton's view, we know that noumena exist (even if we do not know about their inner workings). If so, then Kantians are committed to (at least) one extra-phenomenal (or extra-structural) knowledge claim:

K1: Noumena exist.

Perhaps this is not so problematic. As Langton (2018) points out, claiming *that* something exists is different from claiming *how* it exists. The problem is that she also seems to assign noumena certain knowable properties.[14] She claims, for instance, that noumena are the "'substrate' of phenomena" (Langton, 1998, p. 192; see also 2018). At other times, she claims that noumena are "causally inert" and that they can exist in the "absence of laws" (1998, p. 119).[15] However, as Angela Breitenbach notes,

> [s]trictly speaking, we cannot even call something of which we have no knowledge a 'thing' or 'object', or describe it as having certain kinds of property… Nothing can be asserted of them, not even that they have unknowable intrinsic properties (Breitenbach, 2004, pp. 141-142; see also Lucy Allais' 2006 critique of Langton's view).

It seems that as soon as one attempts to account for the sense in which noumena exist, one fails Allison's acid test. Langton's Kantian humility

[14] Ann Whittle (2006) argues that Langton's view leads to quidditism (see also Schaffer, 2005).

[15] For Kant (1998), noumena also have the property of residing outside space and time.

might, then, not be humble enough. At the very least, Langton claims to know that noumena exist *and* that they are intrinsic properties of things. These constitute two apparent knowledge claims about the supposedly unknowable. If so, then Langton (and arguably Kantians in general) are committed to (at least) one further extra-phenomenal knowledge claim:

K2: Noumena bear at least one knowable property.

This knowable property cannot itself be the property of existing, since, as mentioned, Kant and Langton do not consider existence to be a property (I discuss this topic further in the next section). Nonetheless, as I will argue in Section 4, committing to K1 *and* K2 seems unavoidable. Langton's Kantianism (as it stands) cannot help but fail Allison's acid test.

It is important to note at this point that I am not saying (a) that postulating the existence of something=x leads us to know that it exists, or (b) that if we know it exists, then it indeed exists. Instead, my claim is merely that by making an existence claim, one also makes a knowledge claim.[16] In other words, if I say that entity E exists, then I am also saying that I *know* E exists. This seems unavoidable, even if both claims are false. It is not that I *de facto* know that E exists; it is that I am claiming that I know that E exists when I claim that it exists. This means that K1 does not entail that noumena *de facto* exist. Instead, the idea is that Kantians are committed to K1 when they say that noumena exist. In other words, I am not presenting an argument or proof that noumena exist. Instead, this part of the paper relates to what Kantians are ontologically and epistemologically committed to.

The same applies to K2. My claim is not that noumena *de facto* bear at least one knowable property. It is, instead, that Langton (and Kantians in general) seem (tacitly) committed to K2. My general argument is that if one believes that there is some noumenal stuff beyond structure, then one is committed to K1 and K2. As stated in the introduction, I want to sketch a metaphysical picture for those who largely agree with the general OSR thesis but believe that there is more going on. So, I am assuming upfront that something like K1 is the case, and then arguing that K2 follows for those who buy into that supposition. My argument is, therefore, specifically for those who already have Kantian inclinations when it comes to metaphysics (i.e. those who think that OSR-style structure is not the final ontological story, even if they are sympathetic to the gist of it).

[16] Thank you to an anonymous reviewer for pressing me on this point.

I now press the point that those who are inclined toward $OSR_L$ but think that there is more to the ontological story should commit to something like K1 and K2. Doing so represents the most minimal extension one can make to $OSR_L$ – an extension that retains most of $OSR_L$'s general metaphysical picture while accommodating the intuition that the view is omitting something ontologically important. We can, then, think of my Kantian responsibility thesis as an addition to, rather than a replacement of, $OSR_L$ (and perhaps even OSR more generally).

Although I am not arguing for Kantianism *per se*, I will take inspiration from Langton's Kantian humility in suggesting a way to make sense of both (a) that which appears to lie beyond structure (something=x) and (b) how this something=x might relate to structure. (For now, I am going to continue to follow Kant in referring to that which lies beyond structure as 'something=x'. I will, however, discard this placeholder term in Section 4.3 when I discuss what something=x's identity might be.)

## 4. A Way forward: Being Responsible

My argument in this section proceeds in three stages:

1. Affirm that something=x exists beyond structure.
2. Explicate the possible relation between something=x and structure.
3. Investigate what the identity of something=x might be.

In Stage 1 (Section 4.1), I flesh out K1. The aim is to affirm that something=x exists and that it is consistent for us to claim to know as much. My argument will be brief, given that much of Sections 2 and 3 already dealt with this issue.

In Stage 2 (Section 4.2), I restate K2 by proposing that something=x bears the property of being *responsible* for structure. Responsibility is that relation modally instantiated by the *de facto* affective relation (causation, explanation, determination, or the like) that would obtain between structure and something=x should we come to know the nature of such a relation.

In Stage 3 (Section 4.3), I conclude in deflationary spirit that all we can know about the identity of something=x is that it is that which is responsible for structure.

### *4.1. Something=x exists*

As mentioned, I will not attempt to say what noumena are or which specific relation they might bear to structure (or phenomena). My specific concern here is with $OSR_L$ and not with Kant. Let us, nonetheless, briefly

look at an analogous inferential argument Kant makes in the *Critique*. He notes as follows:

> [F]rom the perception of… attracted iron filings we know of the existence of a magnetic matter pervading all bodies, although the constitution of our organs cuts us off from all immediate perception of this medium (Kant, 1998, A225-6/B273-4).

If we imagine Kant's iron filings to be OSR's structure, a similar inference can be made:

> From the perception of the clustering of *structures* (or structures' properties), we can know of the existence of a *something=x* pervading all structures, although the constitution of our organs cuts us off from all immediate perception of this medium.

The analogy might not be perfect, but it gives a rough idea of how we can reasonably infer the existence of something=x from structure's non-arbitrary constitution. If this inferential strategy is permissible for scientific entities (e.g. atoms), then there is no non-*ad hoc* reason why it should not also apply to structure itself (or so say the critics). Those not already wedded to OSR should find this quite reasonable.

Given the arguments preceding this section, we can restate Langton's first noumenal knowledge claim – K1 ("noumena exist") – as follows:

K1′: Something=x exists.

The sceptic will surely demand more detail on the identity of something=x. I will attempt to answer the sceptic in Section 4.3.

For now, if I merely held to K1′, then I would, in effect, be advancing a version of ESR (which, recall from Section 1, incorporates the claim that there is something behind structure but all we can know about it is that it exists). The problem is that such a view cannot account for the relation between structure and that which is 'behind' structure (*viz*. something=x). As Chakravartty notes, if there is no grip on the noumena, then "Kant's transcendental idealism runs the risk of collapsing into idealism *simpliciter*" (2007, p. 95).[17] Such an account is necessary given that we are

[17] According to Bitbol, "eliminative structural realism [OSR] concedes too much to idealism. It comes very close to the proposition Weyl took as the 'central thought of idealism': 'The objective image of the world may not admit of any diversity which cannot

inferring something=x from structure's form and behaviour. ESR renders something=x independent of structure; it would be what we might call an "ontological dangler". Something=x could float free from (untether from) the structures we investigate in the sciences or disappear entirely without us being any the wiser. This possibility undermines the idea that there can be *completely* unknowable things in themselves.

As critics (of both ESR and Kant) point out, it seems incoherent to infer the existence of A from B but also maintain that there is no (or, at least, ignore any) relation between A and B that makes such an inference possible. In other words, there must be some real and knowable relation between structure and something=x.[18] For extensional scientific knowledge of the sort I am concerned with to go in one direction, there must be something coming back in the opposite direction to 'spark' that knowledge. What we have knowledge of must (in Kant's and Langton's words) "affect" us in some non-trivial way (Langton, 1998, ch. 2; see also van Cleve, 1995, 1999, ch. 10; van der Merwe, 2023, 2025). Put otherwise, for us to infer the existence of something=x from structure, there must be some affect proceeding from something=x to structure. To state that knowledge of some 'thing' relies on that thing affecting us in some way (even if indirectly) seems indisputable regardless of one's meta-philosophical preferences (naturalistic or otherwise). In Kantian (i.e. transcendentalist) spirit, we can say that something=x must affect structure for the very possibility of K1′.

Admittedly, these 'must' statements are asserted *a priori*. $OSR_L$ists will surely respond that doing so violates their supposition of naturalised metaphysics. As mentioned, however, the boundary between naturalised and non-naturalised metaphysics is somewhat blurry. In any event, this objection appears orthogonal to my thesis, given that I have specifically aimed it at ontologists who are already sceptical of the 'limitedness' of OSR's ontology.

I now argue that a relation of *responsibility* is the pertinent affective relation that obtains between structure and something=x. As in ESR, something beyond structure exists, but I go a step further by proposing that we can know at least one of its properties: the property of bearing a relation of responsibility to structure. Something=x must have, at least, one property that relates it (assuming 'it' is singular rather than plural) to structure in some non-trivial way. If not, then structure's complexity or clustering (its

manifest themselves in some diversity of perception'" (ms., p. 4).

[18] The same will presumably apply to the empiricist's phenomena. There must be some relation between phenomena and something=x (assuming that we accept something=x's presence 'behind' the phenomena).

form and behaviour) remains a mystery, and K1′ is metaphysically idle (as it seems to be in Kant's and ESR's ontologies).

*4.2. Something=x is responsible for structure*

I have suggested that there is some broadly affective relation that must obtain between something=x and structure for us to be able to infer the existence of the former from the clustering (or complexity or sociability) of the latter. An affective relation between A and B is one that is broadly influential or difference-making from A to B. Affect is, thus, *asymmetric* from A to B. Such a relation must be asymmetric (i.e. disproportionate or irregular), otherwise we could not infer something=x from structure. As noted, for knowledge to go in one direction, there must be some affect coming in the opposite direction. Affect and asymmetry go hand-in-hand.

Usually, such a relation is understood to be one of realisation, determination, supervenience, grounding, causation, explanation, or the like. However, we do not know which of these affects the kind of structure I am discussing. We can think of these metaphysical relations as forming a kind – a kind that is characterised by bearing the property of being broadly affective. I will call this kind "$R_1,\ldots,R_n$", where R is any affective relation. $R_1,\ldots,R_n$ includes not only those relations just listed but also any possible affective relation we have not yet conceived of or discovered (i.e. a relation that shares the pertinent property with the other members of $R_1,\ldots,R_n$).

As mentioned, Ladyman and Ross (2007) use inference to the best explanation to arrive at an ontology of structure, and I am suggesting that the same kind of method should lead us to conclude that something=x exists and is responsible for structure. R is, though, any broadly affective relation (explanation being just one possibility). Thus, I am, in a sense, 'kicking away the ladder' that got me to this point in the argument. Strictly speaking, my Kantian responsibility thesis does not state that something=x *explains* structure's form and behaviour. Rather, it states that explanation is one of the members of $R_1,\ldots,R_n$ that *might affect* structure's form and behaviour. One can talk in terms of explanation if one chooses to do so, but this talk must be accompanied by the (fallibilistic) realisation that some other member of $R_1,\ldots,R_n$ might be the *de facto* relation in play. In deflationary spirit, we do not know which R obtains between structure and something=x, even if we can know that it is some member of $R_1,\ldots,R_n$.

Note that responsibility is a modal notion; it could apply to any *possible* member of $R_1,\ldots,R_n$.[19] The term 'responsibility' denotes the member

[19] See Stang (2016) for a book-length discussion of modality in Kant's philosophy.

of $R_1,\ldots,R_n$ that modally instantiates the *de facto* affective relation between structure and something=x (should we come to know the nature of such a relation). Note also that Kantian responsibility is *currently* (rather than necessarily) deflationary because we do not know which of the alternative instantiations (e.g. causation, explanation, or determination) would result in a non-minimalist and non-deflationary account. If and when we do, then my account will be non-minimalist and non-deflationary.

We can see that responsibility is not a distinct member of $R_1,\ldots,R_n$. This is because some familiar affective relation (causation, explanation, determination, etc.) could be the appropriate affective relation. Responsibility does not compete with the members of $R_1,\ldots,R_n$. Instead, it is whichever R is the *de facto* affective relation modally instantiated. All the possible relations in $R_1,\ldots,R_n$ have the property of being affective, but only the relation that actually obtains between something=x and structure has the property of being responsible. We can then think of 'responsibility' as a *placeholder concept*. Responsibility serves as a modal placeholder for the pertinent, but (currently) unknown, relation. If we somehow come to know the nature of *the* actual relation, then we can discard the notion of responsibility. (I suggest later that we might need empirical confirmation to gain this knowledge.)

'Responsibility' can then be defined as follows:

> Responsibility: The modal and affective relation between structure and something=x that is some member of $R_1,\ldots,R_n$.

$OSR_L$ already has a similar notion in play. In $OSR_L$, objects rely on structure for their identity. In other words, higher-order structures (e.g. medium-sized dry goods) rely on lower-order structures (e.g. fundamental physical 'objects') for their identity. The relation between the two is asymmetrical from structure to 'object'. Alternatively, there is a "special type of genetic dependence" of "second-order" structures on "first-order" structures (Ladyman & Ross, 2007, pp. 242-243; see also Wolff, 2012). This suggests that, in $OSR_L$, there is something like an asymmetric, affective relation between structures at different scales of measurement. If so, then $OSR_L$ already contains a responsibility-type relation in its general metaphysical schema. This notion only needs to be extended to one that obtains between structure and that which is beyond structure, rather than only between different structures.

Thus suitably modified, K2 ("noumena bear at least one knowable property") reads as follows:

K2′: Something=x bears the knowable relational property of being responsible for structure.

We now appear to have a plausible deflationary (or minimalist) account of how that which is beyond structure stands in relation to structure. I have not explicated how something=x exists and is responsible for structure in a way that is wildly different from $OSR_L$'s own strategy. Although the details are outside the scope of this paper, Kantian responsibility seems outwardly incorporable into $OSR_L$ with 'minimal mutilation'. All things considered, the extra-structural knowledge claims I have made – including those related to modality – are (ceteris paribus) consistent with $OSR_L$'s own rules for ontological inference (Section 1), even if we are not strictly speaking in terms of 'naturalised' metaphysics.

*4.3. What is something=x?*

Up until now, I have been following Kant in calling that which lies beyond structure "something=x". A sceptic might object that I have not said anything significant about this something=x itself – about what exactly stands in a relation of responsibility to structure. In an attempt to stay as close as possible to $OSR_L$'s general schema, I will not provide a full-blooded metaphysical account. I do, nonetheless, owe the sceptic some kind of answer for the sake of philosophical lucidity.

A central question in the Kantian debate about the identity of the noumena that lie beyond structure is whether noumena themselves might have a structural or substantial constitution (assuming we can say something about them). For my purposes, this question consists of two parts:

Q1: Can something=x have an entirely structural constitution, and, if so, is it itself structural?
Q2: Alternatively, if something=x is not structurally constituted, then is it necessarily substantial?

Regarding Q1, we might want to appeal to Esfeld and Lam's (2008) Moderate Structural Realism (MSR). In MSR, a fundamental substance is conceptually necessary, but its intrinsic properties are (like its extrinsic properties) entirely structural. Lucy Allais (2006) interprets Kant this way (see also Esfeld's 2001 review of Langton's 1998; cf. van Cleve, 1995).[20]

[20] Esfeld and Lam are not "opposed to acknowledging the existence of intrinsic

However, as French points out, if "all there is to objects are the relations in which they stand, then there is nothing to objects at all, and the position collapses into the eliminativist form of OSR" (2010, pp. 104-105). In other words, MSR seemingly collapses into something like $OSR_L$. Indeed, claiming that something=x is structurally constituted amounts to claiming (with $OSR_L$ists) that there is only structure (all the way down). Yet, as we saw in Section 2, this move is unhelpful.

Regarding Q2, if something is not structural (i.e. a relation), then it is usually considered to be substantial (i.e. a relatum) (Strawson, 1966; Langton, 1998, pp. 16-20). Ladyman and Ross appeal to this dichotomy when asking us to choose between structure and substance. In doing so, they describe 'substance' as "little things" engaged in "microbangings" or "'gunk' in the sense of matter whose every part has proper parts (infinitely divisible matter)" (2007, p. 20). Ladyman and Ross conclude that, if the world's ontology is not substantial in this way, then it must be structural. However, they do not explicitly consider that the world's fundamental ontology might consist in a third, currently unconceived kind of 'stuff' that is neither substantial nor structural.

It is also unclear what exactly substance is or how we can know about it (see Robinson, 2021, for an overview of the debate). At times, Kant seems to think of 'substance' and 'mystery' as synonyms. Although he sometimes talks of things in themselves as substances, he does not consider substances to be the kind of *things* that Ladyman and Ross insist "must go". In his *Reflexionen* notes, Kant states, for example, that "[t]he substantial is the thing in itself and unknown" (Kant in Langton, 1998, 16) and "[t]he substantial is completely unknown" (59). However, as noted in Section 3, Kant of the *Critique* makes several noumenal knowledge claims.

In any event, on the view I am outlining here, if 'substance' is synonymous with 'mystery', then we can readily claim that something=x is substantial. However, if 'substance' means "little things engaged in microbangings" or "gunk", then something=x is not substantial. Either way, something=x seems to have a nebulous nature, one that does not appear to be analysable using standard metaphysical means (at least not on the kind of deflationary approach I am taking). Indeed, that which is responsible for structure might have a constitution that is entirely inconceivable to our Darwinian (and therefore imperfect) cognitive capabilities (see Boudry et al., 2020; van der Merwe & Broadbent, 2024; see also Kant, 1998, A277/B333). Marc Alspector-Kelly argues likewise that

properties, as long as such intrinsic properties do not amount to an intrinsic identity…" (2011, p. 155).

> perhaps some or even all of an entity's characteristics are simply too exotic to be perceptually representable… no matter what causal connections we might arrange between ourselves and it. At least some quantum-mechanical properties might well be literally unimaginable (and unperceivable) in this way (2004, p. 348).

Ladyman and Ross suggest as much when they state that "there is no reason to imagine that our habitual intuitions and inferential responses are well designed for science or for metaphysics" (2007, p. 2).

In deflationary spirit, I therefore propose that we cannot know any more about the mysterious something=x lying beyond structure other than that it is that which is responsible for structure. Thus, doing away with Kant's term 'something=x', K1′ ("something=x exists") can now be stated as follows:

> K1″: That which stands in a relation of responsibility to structure exists.

K2′ ("something=x bears the knowable relational property of being responsible for structure") can likewise be restated as follows:

> K2″: That which stands in a relation of responsibility to structure bears the relational property of being responsible for structure.

Some might notice an ostensible circularity here. However, even though I am defining both something=x and its one knowable property in terms of the relation of responsibility, we already have an independent account of responsibility in place (Section 4.2). This serves to 'ground' both K1″ and K2″. K1″ and K2″ are not substantial metaphysical claims about noumena *qua* intrinsic properties or the like. They are, instead, deflationary claims arrived at through minimally inferring the ontological status of something beyond structure directly from its relation to structure. With Langton (Section 3), something=x does not directly affect us. Instead, it affects structure, which, in turn, affects us. Structure mediates the inferential epistemic access we can have to that which is responsible for structure, and this epistemic access is limited to K1″ and K2″.

In short, Kantian responsibility involves merging K1″ and K2″ into the following *knowable*[21] thesis:

[21] An anonymous reviewer questioned whether this inference can truly lead us to *know* about the existence of the thing we postulate rather than simply allow us

*That which stands in a relation of responsibility to structure exists and bears the relational property of being responsible for structure.*

Kantian responsibility parallels a view some take in the debate about the ontological status of scientific theoretical entities. Chakravartty, for example, states that "[w]e do not know what the natures of theoretical entities are, but we can assert that they exist and stand in certain relations" (2003, p. 869). Similarly, here, we do not know the nature of that which lies beyond structure, but we can know that it exists and that it bears the property of standing in a certain relation to structure – the relation of responsibility. Although outside the scope of this paper, this suggests that there might be applications for Kantian responsibility in other areas of the philosophy of science where similar problems arise. Something like Kantian responsibility could be applicable wherever there is some clustering or complex (i.e. non-arbitrary and non-uniform) structure, phenomenon, process, or pattern we want to understand in terms of something more fundamental.

## 5. Possible Objections

I now discuss four possible objections to my Kantian responsibility thesis.

*Objection 1*

If that which is responsible for structure is mysterious, then some might object that positing 'it' to account for structure merely invokes a mystery to solve a mystery. I have merely deferred the mystery rather than dissolved it. Granted, Kantian responsibility does not offer a robust ontology. It forgoes metaphysical detail regarding that which lies beyond structure and only offers a kind of ontological mysterianism (albeit with the important relation of responsibility). Nonetheless, positing something

to *believe* or *suppose* it. In response, I think that the stronger knowledge claim is justified in this case. Given the suppositions I have in place, it follows that the inference leads us to *know* about the existence of something=x rather than merely *believe* or *suppose* it to exist (although believing and supposing seem to ride along with knowing). The relevant suppositions are K1 (Section 3) and the legitimacy of inference to the best explanation (Introduction). My argument is, then, that the clusterings or complexity of structure (roughly what Chakravartty calls "sociability") allow us to infer that there is something responsible for structure in an epistemically robust way (i.e. we can *know* it). This leads to K2″, and then to the "knowable thesis" I have stated in the main text (*viz*. the merger of K1″ and K2″). Without those suppositions, the reviewer's objection would be on point.

extant beyond structure, even if it is largely mysterious, constitutes a positive move forward in our general ontological inquiry (at least when it comes to $OSR_L$). This is because Kantian responsibility extends our epistemic reach beyond structure. It also potentially has more of the kind of unificatory power that Ladyman and Ross (2007, ch. 1) are very concerned with. Something=x unifies different kinds of structures (i.e. structures with different properties) by being that which is uniquely responsible for their form and behaviour.

*Objection 2*

Related to Objection 1, some might wonder whether Kantian responsibility's minimalism renders that which is beyond structure a dormitive virtue. Alyssa Ney, for instance, asks Langton the following question:

> [W]hat could serve as the intrinsic ground of unit positive charge? Well, it seems, whatever intrinsic property it is that is *responsible* for repelling other things with unit positive charge and attracting those with negative charge – the intrinsic correlate of positive charge. We cannot say anything more about the ground than this (Ney, 2007, p. 45, emphasis added).

Ney goes on to reject this notion of an intrinsic property whose only purpose is to be "responsible" for extrinsic properties because it violates physicalism and is not evident in everyday experience. According to her, such a minimal intrinsic property would be like Molière's dormitive virtue;[22] it would be "explanatorily otiose".

However, Kantian responsibility does not necessarily require that something=x *explain* structure. Instead, Kantian responsibility tries to avoid explicitly positing an explanatory relation. As outlined in Section 4.2, Kantian responsibility posits a relation of *responsibility*, which is not identical to explanation (even if that is what it could turn out to be). That said, there is a resemblance here. Something=x has certain features in common with Molière's dormitive virtue. Nonetheless, I believe that I can bite this bullet because my Kantian responsibility thesis could, in gist, be thought of as an empirical hypothesis, one that is awaiting experimental confirmation. Something=x might (currently) resemble a dormitive virtue,

[22] In Molière's play *The Imaginary Invalid*, a doctor 'explains' that opium induces sleep because it possesses the dormitive virtue to do so.

but this situation is (hopefully) only temporary. As stated in Section 4.2, 'responsibility' is something of a placeholder concept. Future empirical inquiry (probably in fundamental physics) might uncover the nature of that which is responsible for structure and thereby render Kantian responsibility redundant.

In other words, something=x is *currently* (at this point in time) mysterious. So, we do not currently know what is *responsible* for structure. In principle, it is, however, possible that some (currently unconceived) experiment might uncover what that something=x is. It is, admittedly, difficult to imagine what such an experiment might look like given that something=x resides in the metaphysical, rather than physical, domain. Nonetheless, there have been cases where something that was initially posited as a metaphysical entity was later empirically confirmed (assuming there is such a thing as empirical confirmation). Examples include Democritus's claim that matter is composed of atoms and Einstein's claim that gravity results from the curvature of space-time. In fact, many scientific 'facts' start out as theoretical (or metaphysical) posits. Other examples are the unconscious mind, the Big Bang, antimatter, and black holes.

In any event, I would like to keep open the possibility that my Kantian responsibility thesis (or, at least, part of it) is, in principle, empirically testable. And I am sure that Ladyman and Ross would, in principle, be willing to give up OSR if some experiment necessitated as much (even if the nature of such an experiment is hard to imagine). We would not need the notion of Kantian responsibility (at least, not in the form presented here) if and when such an empirical scenario occurs.[23]

*Objection 3*

A further possible objection is related to the previous one. Some might question whether a mysterious something=x being 'responsible' for structures is a genuine kind of Kantian residue. Might the possibility of experimentally discovering its nature actually be a realist thesis concerning a still-undefined 'mysterious' entity? This is what Michael Bitbol's (ms.) 'transcendental structuralism' seems to suggest.[24] In this sense, one might

[23] There might then be some 'thing' else beyond something=x that is 'responsible' for *it*. But we would have to engage with that question if and when the situation arises.

[24] Thank you to an anonymous reviewer for raising this objection and for bringing my attention to Bitbol's manuscript. Bitbol talks about "transcendental structuralism", where structures are not discovered but instead constituted by the conditions of experience and knowledge. The structures found in physics, for instance, are not reflections of an objective, mind-independent world. Structure is, thus, not 'out there'. Instead, it arises

ask whether my thesis effectively supports the OSR project or rather postulates a kind of *mysterian realism* (Busch, 2003). On mysterian realism, there is a mind-independent reality (i.e., realism is retained). But this reality might be fundamentally beyond our full conceptual or empirical grasp (hence the mysterian aspect).

In response, it is important to note that my thesis does not suggest an "entity" beyond structure, but rather an unknown something=x, which, as stated in Section 4.3, might be a "currently unconceived kind of 'stuff' that is neither substantial nor structural" (pending empirical confirmation). I am also not trying to "effectively support the OSR project". Rather, my goal is to extend it by adding something=x and the notion of responsibility. In this sense, my thesis might well be a form of mysterian realism, albeit a minimalist one. If I understand the view correctly, then I do not mind adopting the label 'mysterian realist'.

*Objection 4*

Proponents of $OSR_L$ might object that we cannot inquire into the nature of structure in the way that we do with other things. We cannot ask what is responsible for – what stands in relation to – structure, since structures *are* relations. However, as outlined in Section 2, structures possess certain (complex and non-arbitrary) properties. Structures are neither indiscernible nor chaotic. Instead, they display specifiable form and behaviour (*viz*. clusterings or Chakravarttian sociability). We can reasonably ask how or why this is the case. We might want to know what accounts for – what is *responsible* for – these non-trivial properties that structures possess. Kantian responsibility does not involve considering structure and its properties to be basic but rather invokes 'something' that is responsible for them (or, at least, appears to be responsible, pending possible empirical illumination in the future).

## Conclusion

Kantian responsibility does not require that we explicitly invoke causation, explanation, determination or the like when outlining our ontology. Instead, the existence of something beyond and responsible for

from how we (as knowers) organise and interpret experience. Bitbol also develops a Kantian interpretation of quantum theory's ontology in his 2010 and 2024 papers. The reviewer further suggested that Bitbol's view might complement Langton's Kantian interpretation in interesting ways. I will, however, defer an investigation into this matter to a future project.

structure is arrived at through minimal inference. This means that we can remain close to the general $OSR_L$ approach while accommodating the intuition that there is more to the world's ontology than just structure. In doing so, we recognise some ineliminable Kantian residue and thereby encourage genuine Kantian humility, or what I am calling Kantian responsibility.

As mentioned, van Fraassen (2006) has discussed a hypothetical position midway between "moderate structuralism" (*a la* Esfeld and Lam) and "radical structuralism" (*a la* Ladyman and French). He calls this "in-between structuralism" (Introduction). Here, "the structure described by science does have a bearer, but that bearer has no other features at all" (van Fraassen, 2006, p. 280). According to van Fraassen, this view has not been defended in the philosophy of science. It nonetheless sounds quite like Kantian responsibility, albeit with the "bearer" (*something=x*) possessing the knowable property of being responsible for structure.

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