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ORIGINAL RESEARCH

Russellian Monism and Structuralism About Physics

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Abstract

It is often claimed that Russellian monism carries a commitment to a structuralist conception of physics, on which physics describes the world only in terms of its spatiotemporal structure and dynamics. We argue that this claim is mistaken. On Russellian monism, there is more to consciousness, and to the rest of concrete reality, than spatiotemporal structure and dynamics. But the latter claim supports only a conditional claim about physics: *if* structuralism about physics is true, then there is more to consciousness and to the rest of concrete reality than physics describes. Given the fundamental nature of their position, Russellian monists can, we argue, deny the antecedent without inconsistency. We also draw out two significant consequences of that result. One is that it provides a response to some recent objections to Russellian monism, by Alyssa Ney and Eric Hiddleston. The other consequence concerns a line of reasoning known as *the structure and dynamics argument*—reasoning that is thought to motivate Russellian monism. In David J. Chalmers's version, which is regarded as canonical, structuralism about physics is implied by a premise. If our main thesis is true, then that version is problematic, at least from the perspective of Russellian monists who take the argument to motivate their theory. However, we argue, the argument can be reformulated without relying on structuralism about physics.

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1 Introduction

According to Russellian monism, consciousness is constituted at least partly by quiddities: special intrinsic properties that underlie structural and dynamic properties described by fundamental physics.[1] This theory is often associated with a structuralist conception of physics. On that conception, physics describes the world only in terms of its spatiotemporal structure and dynamics (where *dynamics* is understood as changes within that structure) and says nothing about what, if anything, underlies or categorically grounds that structure and dynamics. For example, as it is sometimes put, physics describes what mass and charge *do*, e.g., how they dispose objects to move toward or away from each other, but not what mass and charge *are*. Indeed, Russellian monism is sometimes defined partly in terms of a commitment to such a structuralist conception of physics.[2]

However, we will argue that Russellian monism is best understood such that it does not entail structuralism about physics. That is our main thesis. What matters most to Russellian monism are three claims: that among what physics describes are structural properties; that there are non-structural quiddities that categorically ground those structural properties; and that phenomenal consciousness is constituted by those quiddities, perhaps when appropriately structured.[3] None of those claims, either individually or conjointly, requires structuralism about physics. Russellian monism *does* entail that there is more to consciousness, and to the rest of concrete reality, than spatiotemporal structure and dynamics. But the latter claim supports only a conditional claim about physics: *if* structuralism about physics is true, then there is more to consciousness, and to the rest of concrete reality, than physics describes. Russellian monists can, we will argue, deny the antecedent without inconsistency. Our thesis is not that Russellian monists should reject structuralism about physics, but rather that they need take no stand on that doctrine's truth or falsity.[4]

We will also draw out two significant consequences of our main thesis. One is that it provides a response to certain objections to Russellian monism: one by Alyssa Ney and one by Eric Hiddleston.[5] Both Ney and Hiddleston raise problems for structuralism about physics and object to Russellian monism on that basis. If our main thesis is true, then the Russellian monist can respond by rejecting their assumption

[1] Alter and Nagasawa (2012), Chalmers (2013), Alter and Pereboom (2019). This initial characterization of Russellian monism is rough but will suffice for present purposes. Two points should be noted, however. One concerns the relevant sense of "underlie". We understand that term as it is typically understood in the literature, as referring to *categorical grounding*: quiddities are said to categorically ground fundamental physical dispositions, in the way that a ball's roundness categorically grounds its propensity to roll down inclines. Also, in referring to fundamental physics, we will often omit the term "fundamental" and assume this is understood.

[2] Alter and Nagasawa (2012).

[3] Strictly speaking, our formulations of those claims exclude some options that a fully general characterization of Russellian monism should probably leave open, such as the possibility that the relationship between quiddities and structural properties is something other than categorical grounding (Alter and Nagasawa 2012, pp. 70–83). But our formulations are close enough for present purposes.

[4] We have stated this point very briefly elsewhere (Alter and Pereboom 2019).

[5] Ney (2015), Hiddleston (2019). Stoljar (2014, 2015) gives related objections.

that she is committed to structuralism about physics. The other consequence concerns a line of reasoning known as *the structure and dynamics argument*—reasoning that is thought to motivate Russellian monism.[6] In David J. Chalmers's version, which is regarded as canonical, structuralism about physics seems to be used as (or implied by) a premise.[7] If our main thesis is true, then that version is problematic, at least from the perspective of Russellian monists who take the argument to motivate their theory. We will contend, however, that the structure and dynamics argument can be reformulated without relying on structuralism about physics.

2 Main Thesis: Russellian Monism Does Not Entail Structuralism About Physics

In this section, we will argue that Russellian monism should be understood such that it does not entail structuralism about physics. How Russellian monism *should be* understood, what the real nature of that theory is, differs from how it *has in fact* been understood. The issue in question is not trivially verbal. At stake are the commitments of Russellian monism: what the theory does and does not require to achieve its explanatory goals. Further, our main thesis has substantive consequences not only for how Russellian monism should be understood but also for its plausibility. As we go on to argue, our main thesis undermines important objections that have been adduced against the theory.

Let us begin with structuralism about physics. On this view, physics describes the world only in terms of its spatiotemporal structure and dynamics.[8] That general thesis has been understood in different ways.[9] It is sometimes understood as a linguistic thesis, e.g., that all truths that descriptions in physics *express* are structural truths, where *structural* truths are truths about spatiotemporal structure and dynamics; sometimes as an epistemic thesis, e.g., that all we *know* about the world based on descriptions in physics are structural truths; and sometimes as a metaphysical thesis, e.g., that all entities physics posits *are* wholly structural and dynamic. Russellian monism has been associated with all three sorts of structuralist theses: linguistic, epistemic, and metaphysical.[10] We will argue that Russellian monists can consistently reject all three versions.

[6] Chalmers (2003), Stoljar (2006, 2015), Alter (2016).

[7] At least, this is how Chalmers's version from Chalmers (2003) has been understood (Alter 2016; Stoljar 2006, 2015).

[8] The physics in question might be ideal or non-ideal versions of either fundamental or non-fundamental physics. This does not matter much for present purposes. If our argument is sound, then Russellian monists can consistently reject structuralism about physics no matter which version of physics the structuralist's view concerns.

[9] Ney (2015, pp. 350–52), Stoljar (2014, 2015).

[10] For example, Chalmers (1996) and Alter and Nagasawa (2012) associate Russellian monism with linguistic structuralism, Stoljar (2014) associates Russellian monism with epistemic structuralism, Hiddleston (2019) associates Russellian monism with metaphysical structuralism, and Ney (2015) associates Russellian monism with all three versions.

The term "structuralism" is sometimes associated with a more general view also known as structural realism, which itself comes in metaphysical and epistemic varieties, known as *ontic structural realism* and *epistemic structural realism*.[11] But structuralism about physics, as we use that phrase, should not be confused with structural realism. In particular, note that ontic structural realism, as it is usually understood, entails that there are no Russellian quiddities. In effect, structural realism combines structuralism about physics with a "That's all" claim. If "structuralism about physics" referred to structural realism, then our main thesis would need no argument. Not only does Russellian monism not entail ontic structural realism (so understood): the two theories are plainly incompatible.

"Spatiotemporal structure and dynamics" has also been understood in different ways, two of which are prominent in the literature on Russellian monism. Here is Chalmers's characterization of a structural property, from an influential paper on Russellian monism: "a structural property is one that can be fully characterized using structural concepts alone, which I take to include logical, mathematical, and nomic concepts, perhaps along with spatiotemporal concepts…"[12] Non-structural properties, and quiddities in particular, would correlatively be understood as not being fully characterizable using such concepts alone. The notion of a structural property is often understood in a different way: as explicable by the notion of a relational or extrinsic property. However, as has often been pointed out, some non-relational or intrinsic properties, such as shape and size, are paradigmatically structural. As Derk Pereboom explains, Leibniz inspires a fix.[13] The shape of a ball, its roundness, is an intrinsic and non-relational property of it. Roundness concerns extension, and Leibniz argues that there is a respect in which the extension of a thing is extrinsic:

> Nor do I think that extension can be conceived in itself, but I consider it an analyzable and relative concept, for it can be resolved into plurality, continuity, and coexistence or the existence of parts at one and the same time.[14]

This suggests the following distinction: where A fully grounds B just in case A necessitates B and B exists in virtue of A,

> P is an *absolutely intrinsic* property of X just in case P is an intrinsic property of X, and P is not fully grounded in extrinsic properties of parts of X.

> P is a *relatively intrinsic* property of X just in case P is an intrinsic property of X, and P is fully grounded in extrinsic properties of parts of X.

Then, structural properties of X are either extrinsic or relatively intrinsic properties of X, while non-structural properties, or quiddities, of X are absolutely

[11] Ladyman (2016).

[12] Chalmers (2013, p. 256). For more on structure, see Stoljar (2006, 2014, 2015), Alter (2016), Pereboom (2011, 2014, 2015, 2016). Again, *dynamics* can be understood simply as changes within the spatiotemporal structure that physics describes. Regarding spatiotemporality, see Pooley (2013).

[13] Pereboom (2011, 2015, 2016).

[14] Letter to DeVolder (April 1699), Leibniz (1965, Vol. II, pp. 169–70, 1969, p. 516).

intrinsic properties of X.[15] For our purposes, either Chalmers's or Pereboom's characterization of a structural property will suffice, and we will appeal to each where appropriate.

Let us now turn to Russellian monism and its commitments. Torin Alter and Yujin Nagasawa begin "What is Russellian monism?" with the following description of the theory:

> Russellian monism is a view about phenomenal consciousness, the physical world, and the relationship between them. On this view, the phenomenal and the physical are deeply intertwined—more so, at least, than traditional interactionist dualism allows. But there is no attempt to reduce the phenomenal to the physical, at least not in the manner of traditional versions of physicalism (or materialism). Instead, on Russellian monism phenomenal consciousness fills a gap in the picture of nature painted by physics. For example, on one well-known version of the view, phenomenal properties are the categorical bases of fundamental physical properties, such as mass and charge, which are dispositional.[16]

That initial description does not expressly assert or plainly imply that Russellian monism entails structuralism about physics. But the description mentions "a gap in the picture of nature painted by physics." And later in the article, Alter and Nagasawa describe structuralism about physics as a "main component" of Russellian monism—a claim they repeat in their introduction to *Consciousness in the Physical World: Perspectives on Russellian Monism*.[17] Several others similarly assert or imply that Russellian monism carries a commitment to structuralism about physics (or to something in the vicinity).[18]

This is understandable. Russellian monists typically trace their view to Bertrand Russell's *The Analysis of Matter*, where he develops a structuralist conception of physics (hence the "Russellian" part of the theory's name).[19] Moreover, Russellian monism is motivated partly by the idea that descriptions of the world that physics provides are incomplete—that there is, as Alter and Nagasawa write, "a gap in the picture of nature painted by physics."[20] Nevertheless, Russellian monism should not be understood as entailing structuralism about physics. Consider the linguistic structuralist thesis, which says that all truths that descriptions in physics express are structural. Suppose physics—perhaps a future or idealized version—describes not only a structural and dynamic system but underlying quiddities as well. Suppose

[15] Pereboom (2015, cf., 2011).
[16] Alter and Nagasawa (2012, pp. 67–68).
[17] Alter and Nagasawa (2012, p. 70), Alter and Nagasawa (2015, p. 3).
[18] For example, see Stoljar (2014, pp. 27–28), Goff (2015), Kind (2015), Ney (2015, p. 347), Pereboom (2015, p. 301), cf. Chalmers (1996, pp. 153–55), Rosenberg (2004).
[19] Russell (1927a). See Chalmers (1997), where "Russellian monism" was introduced.
[20] Alter and Nagasawa (2012, p. 67).

that a future physics indeed directly describes the non-structural intrinsic natures of these underlying quiddities.[21] Should we conclude that Russellian monism is false?

No. Russellian monism is a theory in the metaphysics of mind, not in the philosophy of physics. So, why must Russellian monism require that physics describes the world in some highly specific way, namely, in exclusively structural terms? Why can't Russellian monists allow that physics also describes the world partly in non-structural terms, i.e., that some descriptions in physics concern not just structure but non-structural information about quiddities? Even if linguistic structuralism is false, the Russellian monist's quiddities fill "a gap in the picture of nature painted by physics," just as they do if linguistic structuralism is true. The only difference is that the gap results from considering only the structural truths physics describes and ignoring the quiddistic truths that we are hypothetically supposing physics describes, rather than from considering *all* truths physics describes.

Similar reasoning applies to the epistemic version of structuralism about physics. Suppose epistemic structuralism is false. Not all truths we now know and will know about the world, based on descriptions in current and future physics, are structural: some such descriptions teach us non-structural truths too. This supposition too has no clear implications for Russellian monism's truth or falsity. Here it might be useful to consider a prominent variety of Russellian monism known as Russellian physicalism, on which quiddities are non-structural *physical* properties.[22] On Russellian physicalism, current, future, or ideal physical knowledge includes knowledge of not only structural truths but of non-structural, quiddistic truths as well. That position not only fails to entail epistemic structuralism about physics: it might entail the *denial* of epistemic structuralism about physics (assuming the quiddistic truths included in physical knowledge are truths in physics). Here we mention Russellian physicalism for purposes of illustration only. The point holds generally: rejecting epistemic structuralism about physics does not require rejecting physicalist or non-physicalist Russellian monism.

Finally, consider metaphysical structuralism about physics. Here the compatibility of Russellian monism with the rejection of structuralism about physics is perhaps clearest. On prominent varieties of Russellian monism, quiddities are not distinct from the properties described by physics, such as mass and charge. Instead, mass and charge *are* quiddities, which have dispositions that physics describes. Those varieties of Russellian monism not only fail to entail metaphysical structuralism about physics: again, they might entail its denial. To be sure, certain Russellian monists might have principled reasons for committing to linguistic structuralism about physics—reasons deriving from their own particular variety of the theory. For example, we can imagine a dualist who sees the world as deeply divided into two fundamental realms, the physical and the mental, such that (1) the only non-structural truths are

[21] Some argue that quiddities, if they exist, would be scientifically detectable (Hawthorne 2002). However, see McClelland (2013).

[22] Stoljar (2001), Pereboom (2011), Chalmers (2013), Coleman (2015), Montero (2015). Russellian monism comes in physicalist, dualist, idealist, and neutral monist varieties, depending on how quiddities and the structural features they underlie are understood (Alter and Nagasawa 2012, pp. 81–83).

mental in character and (2) ideal physics concerns only physical, non-mental phenomena. Perhaps such a dualist could nonetheless be a Russellian monist (despite the usual connotation of "monism").[23] That is, perhaps she could accept the distinctively Russellian monist doctrines that quiddities both categorically ground structural properties physics describes and constitute consciousness. But in that case, her commitment to structuralism about physics would derive not from the *Russellian monist* part of her theory but rather from the *dualist* part.

On reflection, the fact that Russellian monism does not entail structuralism about physics is not surprising. Again, what matters most to Russellian monism are that among what physics describes are structural properties, that there are non-structural quiddities that categorically ground those structural properties, and that phenomenal consciousness is constituted by those quiddities, perhaps when appropriately structured. Russellian monism requires no further contentious claims about physics. In particular, the claim that physics is limited to the structural components of reality—either in the sorts of truths it expresses, the knowledge it provides, or the nature of the entities it posits—is, from the Russellian monist's perspective, optional. That is true whether the physics in question is ideal or non-ideal, fundamental or non-fundamental.

Consider also the theoretical benefits that proponents of Russellian monism typically claim their view has. One such benefit concerns anti-materialist arguments such as the conceivability argument.[24] The conceivability argument is often formulated in terms of a *zombie world*: a physical and functional duplicate of the actual world but without consciousness.[25] It is first claimed that a zombie world is ideally conceivable, which means roughly that such a world cannot be ruled out by a priori reasoning.[26] It is then argued that the ideal conceivability of such a world entails its metaphysical possibility. Finally, it is argued that the metaphysical possibility of such a world entails that physicalism is false. Russellian monism is said to provide a distinctive, plausible response to that sort of argument, which runs roughly as follows. What the conceivability argument shows is that structure alone does not metaphysically necessitate the nature or even the existence of consciousness. That is significant, at least insofar as it indicates that the facts about consciousness entail the existence of something other than structure. That result jibes well with Russellian monism, on which there are, in addition to structure, quiddities. In particular, that result does not threaten Russellian physicalism, on which the class of physical truths includes not only structural truths but quiddistic truths as well. Russellian physicalists usually reject the premise that a zombie world is ideally conceivable, partly on the basis of how little we know about quiddities. If zombie worlds seem conceivable to us, they argue, then that is because we are ignorant of relevant quiddistic truths, such as truths about how quiddities constitute familiar phenomenality. If we knew those truths, they argue, then we would recognize that no world that duplicates *all*

[23] Alter and Nagasawa (2012, p. 69, fn. 6).
[24] Chalmers (2003, p. 266), Alter and Nagasawa (2012, pp. 83–86).
[25] Chalmers (1996, 2010).
[26] Chalmers (2002).

of the actual world's physical features—both the structural and the non-structural ones—could fail to contain consciousness.[27]

That response does not depend on structuralism about physics. Suppose again that linguistic structuralism is false, so that physics describes some non-structural properties. On that supposition, not only would the Russellian monist's response to the conceivability argument be no less convincing, but it would gain plausibility from an independent source, namely, from a view about the properties physics describes. If some properties physics describes are not wholly structural, then a world that duplicates all structural features of the actual world might nonetheless differ from the actual world in certain physical respects.[28] Or suppose again that epistemic structuralism is false, so that physical descriptions facilitate knowledge of not just structural truths but non-structural truths as well. That supposition would not threaten the Russellian monist's response to the conceivability argument. On the contrary, the supposition would seem to make it all the more plausible that, as Russellian physicalists often argue, if we initially believe a zombie world is ideally conceivable this is because we fail to consider that a zombie world would (by definition) have to duplicate not just the structural aspects of the actual physical world but the non-structural aspects as well.[29] And the Russellian monism's response to the conceivability argument clearly does not rely on metaphysical structuralism about physics. On the contrary, the typical Russellian physicalist response implies that among the properties physics posits are quiddities, which is incompatible with metaphysical structuralism. Thus, the Russellian monist's response to the conceivability argument in no way depends on structuralism about physics.

Similar considerations apply to the other main benefits of Russellian monism that proponents of the theory tend to emphasize. To take one more example, the theory is said to offer an elegant, unified solution to two distinct philosophical problems.[30] One of those problems is how to provide a metaphysical foundation for the spatiotemporal structure physics describes. The other is how to integrate consciousness into nature. When considered from the perspective of a Russellian monist, these two problems seem made for each other. The requisite foundation of spatiotemporal

[27] Stoljar (2001), Pereboom (2011). The Russellian monist's response to the conceivability argument has been developed in other ways as well. See Chalmers (2003, p. 266), Alter and Nagasawa, pp. 83–86. None of these ways assume structuralism about physics.

[28] That is one key component of the Russellian physicalist's response to the conceivability argument, but there are others. For example, the Russellian physicalist specifies that the relevant non-structural features are consciousness-constituting quiddities. So, merely rejecting linguistic structuralism about physics would not enable those who are not Russellian monists to give the same response to the conceivability argument that Russellian physicalists give.

[29] Some Russellian physicalists could be read as appealing to epistemic structuralism about physics in order to help motivate the quiddistic-ignorance premise on which they base their rejection of the ideal conceivability of zombie worlds (Stoljar 2001). Even so, such an appeal is not needed. At present (December, 2020), we know next to nothing about how physical quiddities constitute familiar phenomenality, if they do. That is so even if, contrary to epistemic structuralism about physics, physics eventually reveals such quiddistic information.

[30] Lockwood (1989, 1992), Chalmers (1996, 2013, p. 254), Rosenberg (2004), Goff (2017), cf. Russell (1927a, b, p. 116).

structure is provided by quiddities. Because those same quiddities (perhaps if appropriately structured) constitute consciousness, consciousness thereby plays a distinctive role in physical causation—or at least components of consciousness play that role. Thus, the reasoning runs, both problems are solved at once. That reasoning does not depend on structuralism about physics any more than the Russellian monist's response to the conceivability argument does. To be sure, the supposition that structuralism about physics is false would affect how we *describe* the first of the two problems. We would have to be careful not to imply that the need to provide a foundation for spatiotemporal structure would arise even if all truths in physics are considered; the need might not arise if physics describes some non-structural truths. Instead, the problem would arise from considering only a subset of the truths in physics: the structural ones. But the problem is the same. Moreover, so is the Russellian monist's solution.

3 First Consequence, Concerning Objections to Russellian Monism

If our main thesis is true, then one cannot reasonably reject Russellian monism simply because one rejects structuralism about physics. But in effect, that is what some do. More precisely, some objections to Russellian monism are based on objections to either structuralism about physics or closely related doctrines. In this section, we will consider two such objections: one by Ney and one by Hiddleston.[31] We will argue that our main thesis provides the Russellian monist with responses to both.

3.1 Ney's Objection

Alyssa Ney, in "A Physicalist Critique of Russellian Monism," critically examines *Physical Structuralism*, the thesis that "Physics describes its most fundamental features only relationally."[32] She argues, in effect, that Russellian monism goes awry in relying on Physical Structuralism. Physical Structuralism is not identical to the thesis we have been calling structuralism about physics: the former limits physics to the relational, rather than to the structural, that is, to relational or extrinsic properties together with relatively intrinsic properties. But much of what we have said about structuralism about physics applies to Physical Structuralism, *mutatis mutandis*. In particular, considerations parallel to those we used above to establish our main thesis can be used to show that Russellian monism does not entail Physical Structuralism. For example, the supposition that physics describes its most fundamental features not only relationally but non-relationally as well is perfectly consistent with all three core Russellian monist doctrines: that there are structural

[31] Ney (2015), Hiddleston (2019). Some of Stoljar's objections to certain varieties of Russellian monism *seem* to assume that those varieties entail structuralism about physics (Stoljar 2014, pp. 28–31). If those objections do in fact depend on that assumption, then our main thesis provides a response to those objections too.

[32] Ney (2015, p. 346).

properties, which physics describes; that there are non-structural quiddities that categorically ground those structural properties; and that phenomenal consciousness is constituted by those quiddities, perhaps when appropriately structured. Physical Structuralism is optional for Russellian monists, just as structuralism about physics is. Indeed, all of the relevant relational properties are structural, but not all structural properties are relational (consider, again, the roundness of the ball, which is a non-relational or intrinsic property of it, but merely relatively intrinsic and fully characterizable using only mathematical and spatiotemporal concepts).[33] Therefore, if structuralism about physics is optional for Russellian monists, then *a fortiori* so is Physical Structuralism.

So, there is no valid inference from "Physical Structuralism is false" to "Russellian monism is false." Ney does not make that mistake, exactly. Her reasoning is subtler. Nevertheless, she assumes that Russellian monism entails Physical Structuralism. Indeed, she states this explicitly, e.g., when she summarizes her argument:

> It is sometimes hard to tell when philosophers of mind find Russellian Monism intriguing exactly which interpretation of the Physical Structuralism thesis they have in mind and how it is supposed to be motivated. *But Physical Structuralism in some form is an essential component of Russellian Monism*. I have distinguished four ways this thesis may be interpreted. None of them provide convincing motivation for seeing the physical characterization of the world as in need of supplementation by further metaphysics.[34]

Because Ney assumes that Russellian monism entails Physical Structuralism, our main thesis suggests a response to her objection. *Contra* Ney, Russellian monists need not see "the physical characterization of the world as in need of supplementation by further metaphysics." It is, they can argue, perfectly consistent with their view that the physical characterization of the world (by which we assume she means the characterization ideal physics would provide) is complete, that is, not in need of supplementation by further metaphysics. At least, they can accept the completeness of the physical characterization of the world if that characterization includes adequate descriptions of not only spatiotemporal structure and dynamics but also the quiddistic underpinnings of that structure and dynamics, and perhaps also of how quiddities constitute consciousness.[35]

To clarify how that response works, let us examine Ney's argument in more detail. She begins by distinguishing four ways to interpret Physical Structuralism. Then she considers each in turn, arguing that, for different reasons, none does the

[33] Ney herself makes a similar point in Ney (2007, on p. 50).

[34] Ney (2015, p. 367) (italics added).

[35] Whether a complete physical characterization of the world would have to include that last component, about how quiddities constitute consciousness, depends partly on what is meant by a "complete physical characterization" and partly on whether the Russellian monist view in question is reductionist. For example, suppose (1) that a characterization that necessitates all truths, including truths about consciousness, counts as complete and (2) that on the Russellian monist view in question consciousness consists wholly in structured quiddities. On those suppositions, a physical characterization might be complete even if makes no explicit mention of how quiddities constitute consciousness.

work that Russellian monists need Physical Structuralism to do, namely, to motivate their positing of consciousness-constituting quiddities. Finally, based on those arguments, she concludes that Russellian monism is insufficiently motivated.

For present purposes, it will suffice to consider Ney's discussion of only one of the four interpretations of Physical Structuralism she distinguishes: Semantic Physical Structuralism, which states, "Physics posits fundamental, intrinsic features, but the meaning of these concepts is given only via relational descriptions."[36] That thesis, she argues, fails to motivate the positing of consciousness-constituting quiddities for a simple reason: the thesis is false. Ney associates Semantic Physical Structuralism with David Lewis's holistic account of theoretical terms.[37] On that account, she writes, "even though mass and charge may be taken to be intrinsic properties, their meanings are given by the roles they play in an overall theory."[38] However, she points out, Lewis's holistic account alone does not entail Semantic Physical Structuralism:

> …it is not clear that Lewis's main point about the way theoretical terms are given meanings, that is, holistically in the context of overall theories, entails anything about their being understood merely as those features that objects have in virtue of which they bear certain relations to each other.[39]

The crucial question, Ney suggests, is this: "Must the description of causal relationships exhaust a feature's nomological role?"[40] In her view, Lewis's holistic account supports Semantic Physical Structuralism only if the answer to that question is "yes."

According to Ney, however, the correct answer is "no": descriptions of causal relationships need not exhaust the nomological role of mass and other basic physical features. She describes a way that a physical theory could use terms like "mass" and "charge" to specify non-relational, intrinsic features, as follows:

> When a physicist characterizes an object as having a mass, she does not merely connect this attribution with certain causes and effects, but also with a kind of mathematical representation. She may say that the object has a property, for example, that is adequately represented as one of the numbers on the positive part of the real number line, and one that is a scalar not a vector feature. And to characterize an object as having a charge, this is to characterize it intrinsically in some other way. For example, this is to say that the object has a

[36] Ney (2015, p. 350). Here are the other three: "*Psychological/Epistemological*: Physics may posit fundamental intrinsic features, but the only parts of any fundamental physical theory that we may know about are that theory's relational (extrinsic) features. *Descriptive*: (Current and likely any future) physics posits only relational (extrinsic) features as fundamental. It posits no fundamental, intrinsic features. *Normative*: A proper or ideal physical theory (or physics properly understood) is a theory that only posits relational (extrinsic) features, as fundamental. Ideal physics never posits fundamental, intrinsic features" (Ney 2015, p. 350).

[37] Lewis (1970, 2009).

[38] Ney (2015, p. 357).

[39] Ney (2015, p. 358).

[40] Ney (2015, p. 361).

> property that can be given a different kind of mathematical representation, say as a vector in a two-dimensional space. …We understand what the individual masses and charges are like in themselves in terms of what are the proper sorts of mathematical objects that may be used to represent them. Mass is distinguished from charge not just as a matter of how it affects objects that have it and how they behave with respect to other things. It is also distinguished by the kind of property it is, the kind of property that permits a particular kind of mathematical representation.[41]

Mathematical representations of the sort Ney mentions do occur in physics, and perhaps they do not concern only causal relationships. Perhaps physics includes non-relational descriptions, contrary to Semantic Physical Structuralism, at least on Ney's formulation of the latter.[42]

But one response Russellian monists would surely give is that Ney draws the wrong moral. Instead of rejecting Semantic Physical Structuralism, we should revise it to accommodate her counterexamples. Instead of referring to *relational* descriptions, the thesis ought to refer to *structural* descriptions: "Physics posits fundamental, intrinsic features, but the meaning of these concepts is given only via [structural] descriptions." Here *structural* descriptions may be characterized as those that are a priori equivalent to descriptions that employ only logical, mathematical, and nomic concepts, perhaps along with spatiotemporal concepts—a characterization suggested by how Chalmers characterizes a structural *property* (as we noted in Sect. 1). Ney's mathematically represented properties would then count as structural. Moreover, even if these properties are not relational but intrinsic, establishing that they are not structural requires showing that they are not merely relatively intrinsic on the model of shape properties such as roundness, but instead absolutely intrinsic. Thus these properties would not seem to provide clear counterexamples to that revised version of Semantic Physical Structuralism.

But suppose Ney is correct, and that her counterexamples do show that Semantic Physical Structuralism is false (and not merely imprecisely formulated). What would that entail for Russellian monism? As Ney sees the situation, Russellian monists have no recourse other than to embrace one of the other three interpretations of Physical Structuralism—none of which, she argues, suffice for the Russellian monist's purposes either. But Russellian monists have another option: they can give up Physical Structuralism altogether. Nothing in their theory requires them to agree that physics is limited in the way Physical Structuralism implies, on any reasonable interpretation of the latter. Russellian monists deny that the world can be fully characterized using only structural concepts (in Chalmers's sense). But that general anti-structuralist commitment does not entail any particular view about the limits (semantic or otherwise) of physics.

[41] Ney (2015, pp. 361–62).

[42] Stoljar (2015) makes essentially the same point using the example of shapes, which Ney (2015, p. 362) also mentions.

Ney's association of Physical Structuralism with Russellian monism is understandable, given how Russellian monism is often characterized. Sometimes when Russellian monists defend the general anti-structuralist thesis to which they are committed, they do in fact appeal to Physical Structuralism (or to something in the vicinity). But such appeals are ill-conceived. As we argued in Sect. 2, structuralism about physics plays no essential role in either Russellian monism's core doctrines or in the arguments typically adduced in favor of Russellian monism. The same is true about Physical Structuralism: it is also inessential to Russellian monism.

3.2 Hiddleston's Objection

Eric Hiddleston argues that Russellian monism depends on an implausible view about the nature of physical properties, and thus should be rejected. Russellian monism entails that "pure essences…individuate physical properties"[43]; but pure essences do not individuate physical properties; therefore, Russellian monism is false. We will argue, based on our main thesis, that Hiddleston's first premise is false: Russellian monism does not entail that "pure essences…individuate physical properties." The claim that pure essences individuate physical properties is a way of interpreting the thesis that all physical properties are structural. But as we have been arguing, Russellian monism should not be regarded as entailing any such thesis.

Let us begin by clarifying what this claim about the individuation of physical properties means. Regarding individuation, Hiddleston writes, "An individuative feature of x is a P such that necessarily, anything that has P is x."[44] In other words, an individuative feature of x is a modally *sufficient* condition for being x. Regarding essences, he writes, "I will treat an essential feature of x as a property P such that necessarily, if x exists, then x has P."[45] In other words, an essential feature of x is a modally *necessary* condition for being x. He does not expressly say what makes an essence (or an essential feature) *pure*. He introduces his pure/impure distinction in connection to "structural features," as follows:

> A pure structural feature is of the sort *bearing R to something*. An impure structural feature is of the sort *bearing R to B*. For example, 1 g has the pure feature: being an X such that for some Y, $X \leq Y$; 1 g bears the less-than relation to something. 1 g also has the impure feature: being an X such that $X \leq$ 2 g; 1 g bears the less-than relation to 2 g in particular.[46]

So, a *pure* essential feature of x is a modally necessary condition for being x that does not mention individual things and is structural. Putting all that together, the claim that "pure essences individuate physical properties" means: physical

[43] Hiddleston (2019, p. 89).
[44] Hiddleston (2019, p. 72).
[45] Hiddleston (2019, p. 72).
[46] Hiddleston (2019, p. 72).

properties have modally necessary-and-sufficient conditions that are structural and do not mention individuals.

However, Hiddleston argues, that claim is false: pure essences do not individuate physical properties. How he establishes that conclusion need not concern us here.[47] For present purposes, what matters is that he takes that conclusion to count against Russellian monism. That move is unwarranted, if our main thesis is true. The Russellian monist need not take a stand on the modally necessary-and-sufficient conditions for physical properties.[48] In particular, she can agree with Hiddleston that those conditions are not purely structural. The reason is that agreeing with Hiddleston on that point does not conflict with any of her central theses: that there are structural properties, which physics describes; that there are non-structural quiddities that categorically ground those structural properties; and that phenomenal consciousness is constituted by those quiddities, perhaps when appropriately structured. The Russellian monist is committed to the conditional claim that *if* pure essences individuate physical properties, then there is more to consciousness and to the rest of concrete reality than physical-property instantiations. But she can deny the antecedent. For similar reasons, the claim that pure essences individuate physical properties plays no essential role in the arguments typically use to support Russellian monism, such as the argument that this theory provides a distinctive, plausible response to the conceivability argument against physicalism.

Although Hiddleston's discussion of Russellian monism focuses largely on the claim that pure essences individuate physical properties, he summarizes his main objection a bit differently: many physical properties ("just about everything of scientific interest") are at once dispositional and categorical, and yet the Russellian monist is committed to denying that any physical properties fit that description.[49] But the main reason Hiddleston thinks the Russellian monist is so committed is that he takes her to be committed to the claim that pure essences individuate physical properties. We just argued that she is not committed to the latter claim. We also contend that she is not committed to the former. She is committed to the thesis that the world contains more than just structure. But that thesis is consistent with a variety of different views about the nature of physical properties, including the view Hiddleston defends on which such properties are at once dispositional and categorical. Indeed, although some Russellian monists reject that view, some are sympathetic to it.[50]

[47] Hiddleston's argument is sophisticated. It draws on arguments developed in Hawthorne (2001b) and involves the premise that, "it is readily conceivable, and surely possible, for there to be distinct properties that have symmetric structural and nomic roles" (Hiddleston 2019, p. 78).

[48] Hiddleston might take the class of *physical* properties to be wider than those described by physics. If he does, it is even clearer that the Russellian monist need not take a stand on the modally necessary-and-sufficient conditions for physical properties.

[49] Hiddleston (2019, pp. 65–66). Hiddleston claims that Russellian monism assumes not only that there are no such *physical* properties but that there are no such properties at all. But his argument does not seem to depend on the more general claim, about all properties rather than just about physical properties.

[50] Chalmers (2013) suggests that views in the vicinity of Hiddleston's, on which physical properties are at once dispositional and categorical, do not jibe with Russellian monism. Pereboom (2016) suggests the opposite, that such views do jibe with Russellian monism; cf. Coleman (2015).

3.3 Missing the Point?

One might try to defend Ney and Hiddleston by arguing that the foregoing objections miss the point. The defense would run as follows:

> Hiddleston and Ney make claims about what Russellian monism entails about *current* physics, not about what Russellian entails about how physics *must be* (and thus not about future or ideal physics). Moreover, it is not essential to their objections that Russellian monism is committed to structuralism about physics. The problem with Russellian monism concerns a different commitment. Russellian monism entails that current physics has what might be called a *physics-based* explanatory gap, which is about not consciousness but rather the entities physics posits: why is the structure physics describes the way it is, and why does it exist at all? Russellian monism is predicated on there being such a physics-based explanatory gap. After all, filling that gap is one of the main things Russellian quiddities are supposed to do. However, Hiddleston and Ney both argue (each in their own way) that there is no such physics-based gap. *That* is the real problem they are getting at. Thus, the objections concerning structuralism about physics miss the point.[51]

However, whatever Ney might have intended, her objection to Russellian monism is expressly directed at a specific version of (what we call) structuralism about physics. So it's not plausible that we have misconstrued what she actually says. The case of Hiddleston is not as clear, but our interpretation is at the very least a natural one. In any event, for the sake of argument, we will temporarily suppose that the objector's interpretation is correct. Does it follow that our objections are off the mark?

No. At best, a prominent *argument* for Russellian monism, rather than Russellian monism itself, presupposes that a physics-based explanatory gap exists: the argument that Russellian monism provides an elegant, unified solution to two distinct philosophical problems. So, showing that there is no such gap would not constitute an objection to Russellian monism per se. After all, as we have seen, there are other considerations favoring Russellian monism, which do not presuppose the existence of that sort of gap—considerations such as the plausible response Russellian monism provides to zombie-style conceivability arguments.

Further, the considerations Ney and Hiddleston adduce against Russellian monism do not go very far towards showing that there is no physics-based explanatory gap. Ney argues that physics posits non-relational properties that answer to certain non-relational/non-causal mathematical representations. Hiddleston argues that physics posits properties that entail the existence of certain individuals. Suppose they are both right. Both sorts of properties—the ones Ney claims physics posits and the ones Hiddleston claims physics posits—might still be structural properties in Chalmers's sense of "structural property". And if they are structural properties in that sense, then their existence does not threaten the claim that there exists a physics-based explanatory gap. Why are structural properties, including Ney's non-relational

[51] We thank an anonymous referee from *Erkenntnis* for suggesting this response.

properties and Hiddleston's individuals-involving properties, the way they are? Why do such properties exist at all? Those questions would be no less pressing supposing that physics includes the structural properties on which Ney and Hiddleston focus (the non-relational and individual-involving ones). From the Russellian monism's perspective, the latter properties do not *explain* the structure physics posits. Instead, they merely add more structure.[52]

Despite those problems, the attempted defense makes an important point.[53] One of the main arguments for Russellian monism, that it solves two problems at once, requires not only that the structural part of physics is incomplete but that it is incomplete in a specific way: it must have a quiddity-shaped hole, so to speak. That is, the incompleteness problem would have to be of a sort that Russellian quiddities could solve. Ney and Hiddleston might be gesturing at that point. Further, they could be interpreted as suggesting a general worry about the motivation for Russellian monism: could critics of Russellian monism accept that the structure physics describes requires explanation but reject the idea that anything like quiddities is needed to provide that explanation? That is a significant concern, but addressing it would take us too far afield.

4 Second Consequence, Concerning the Structure and Dynamics Argument

Let us turn to the structure and dynamics argument. Chalmers summarizes three of its core claims as follows:

> First: Physical descriptions of the world characterize the world in terms of structure and dynamics. Second: From truths about structure and dynamics, one can deduce only further truths about structure and dynamics. And third: Truths about consciousness are not truths about structure and dynamics.[54]

Those claims form an important part of Chalmers's critique of physicalism.[55] The claims are also thought to provide support for Russellian monism. Here is the basic idea. Taken together, they reveal a basic problem with all non-Russellian physicalist theories: all such theories imply that consciousness is nothing over and above spatiotemporal structure and dynamics, and that implication is implausible.[56] Russellian

[52] If the physical properties on which Ney and Hiddleston focus are *not* structural (in Chalmers's sense), and are instead quiddistic, then there might not be a *physics*-based explanatory gap. But in that case, the existence of such properties is even more clearly no threat to Russellian monism.

[53] We thank an anonymous referee from *Erkenntnis* for suggesting this point.

[54] Chalmers (2003, p. 258).

[55] In Chalmers (2003), Chalmers uses the three claims to criticize one specific form of physicalism, on which although there is an epistemic gap between the physical and the phenomenal, that gap is can in principle be closed. See, for example, Stoljar (2006). But elsewhere (e.g., Chalmers 1997), he appeals to considerations about structure and dynamics to challenge all non-Russellian versions of physicalism.

[56] The structure and dynamics argument has been formulated in different, inequivalent ways (Alter 2016; Stoljar 2015). The differences do not matter too much for our purposes. But the following formulation would deliver the negative conclusion we just mentioned above: 1. There are phenomenal truths that cannot be deduced from structural truths. 2. If there are phenomenal truths about that cannot be deduced

monism provides a viable way to avoid that implication: consciousness is constituted at least partly by quiddities, which are non-structural by definition. Thus, the structure and dynamics argument is seen as motivating Russellian monism.[57]

We will not attempt to assess the structure and dynamics argument.[58] We merely wish to point out that our main thesis has implications for how it should be understood. Consider the first of Chalmers's three claims: "Physical descriptions of the world characterize the world in terms of structure and dynamics." In prominent discussions of the argument, this claim is rendered as a universal generalization. For example, Daniel Stoljar renders it as follows: "Every physical truth is a truth of a certain kind, i.e., one that 'characterizes the world in terms of structure and dynamics'."[59] Perhaps that is what Chalmers intended. Be that as it may, we can ask whether Stoljar's interpretation is optimal from the Russellian monist's viewpoint. We will now argue that it is not.

As Stoljar makes clear, the claim that every physical truth characterizes the world (solely) in terms of structure and dynamics is contentious.[60] Indeed, assuming the class of physical truths includes at least all truths expressed in physics, that contentious claim seems to entail a version of what we have been calling structuralism about physics: the linguistic version. Thus, our main thesis suggests that the Russellian monist need not accept the universal generalization Stoljar attributes to Chalmers. Suppose she rejects that universal generalization. Would doing so imply that she can no longer rely on the structure and dynamics argument to support her theory?

No, it would not. Chalmers's premise might instead be rendered as an existential claim: there is a subset of physical truths S that characterize the world solely in terms of structure and dynamics. The rest of the structure and dynamics argument can then proceed as before, except that references to physical truths would be understood as references to S (rather than to all physical truths). Revising the argument in that way is not problematic, at least for the purposes stated above. If the version whose first premise concerns *every* physical truth reveals a basic problem with all non-Russellian physicalist theories—a problem Russellian monism provides a viable way to avoid—then so does the revised version. The structure and dynamics argument primarily concerns the relationship between consciousness and spatiotemporal structure and dynamics. Insofar as the argument shows anything about physics or physical truths, this is because the truths in physics or physical truths more generally bear some significant relationship to spatiotemporal structure and dynamics. But proponents of the argument can be noncommittal regarding the exact nature of

Footnote 56 (continued)
from structural truths, then there are phenomenal truths that are over and above structural truths. 3. On all non-Russellian physicalist theories, there are no phenomenal truths that are over and above structural truths. 4. Therefore, all non-Russellian physicalist theories are false.

[57] Stoljar (2001, 2006, 2014, 2015), Chalmers (1996), Pereboom (2011), Alter (2016).

[58] See Stoljar (2006, 2014, 2015), Montero (2010), Pereboom (2011), Alter (2016).

[59] Stoljar (2015, p. 329). Cf. Alter (2016).

[60] Stoljar (2015). Some physicalists would clearly reject that claim (Papineau 2002, p. 22–23, fn. 5). At least, they would if the claim is that all physical truths characterize the world *solely* in terms of structure and dynamics, which we take to be implied (Alter 2016, p. 795).

that relationship. In particular, they need not exclude the possibility that some physical truths are non-structural.[61]

Admittedly, revising the structure and dynamics argument as we recommend complicates the relationship between the argument and the physicalist doctrine that all truths about consciousness are physical. But only slightly. Instead of challenging that physicalist doctrine, the revised argument challenges the doctrine that all truths about consciousness are structural. Although the latter doctrine is not associated with all physicalist theories, it is associated many, if not all, *non-Russellian* physicalist theories.[62]

5 Conclusion

Some take Russellian monism to entail structuralism about physics. We have argued that this is a mistake. Russellian monism is a theory in the metaphysics of mind. It is not a theory about the nature or limitations of physics. If structuralism about physics is true, then Russellian monism does entail that there is more to consciousness and to the rest of concrete reality than physics describes. But Russellian monists need take no stand on whether structuralism about physics is true.

That result, we have also argued, provides Russellian monists with a response to certain objections to Russellian monism, including those objections that depend on the assumption that Russellian monism entails either structuralism about physics or something in the vicinity. We described two such objections: one due to Ney, which assumes that Russellian monism entails Physical Structuralism; and another due to Hiddleston, which assumes that Russellian monism entails that physical properties have modally necessary-and-sufficient conditions that are structural and do not mention individuals. If our main thesis is true, we argued, then the Russellian monist can reject both of those assumptions.

Finally, we argued that detaching Russellian monism from structuralism about physics has implications for the structure and dynamics argument. The argument is sometimes understood as relying on (or at least entailing) structuralism about physics. However, we argued, the argument need not be so understood. Instead of construing the relevant premise as a claim about *all* physical truths (or all the truths physics describes), the premise can be construed as a claim about a subset of such truths. The latter construal need not compromise the argument's force or relevance, at least from the perspective of Russellian monists who wish to use the argument to support their view.

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[61] Here is another potential advantage of revising the structure and dynamics argument as we suggest. At least some of Stoljar's criticisms of the structure and dynamics argument (especially in Stoljar 2015) *seem* to depend on taking Chalmers's first claim to be a universal generalization, applying to all physical truths. If Stoljar's criticisms do in fact so depend, then they do not threaten the revised version.

[62] Chalmers (2003), Pereboom (2011), Brown (2017), Stoljar (2019).

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