Towards a Neutral-Structuralist Theory of Consciousness and Selfhood

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Abstract: Recently, an information-theoretic structural realist theory of the self and consciousness has been put forward (Beni 2019). The theory is presented as a form of panpsychism. I argue against this interpretation and show that Beni's structuralist theory runs into the hard problem of consciousness, in a similar way as the Integrated Information theory of consciousness. Since both of these theories are structuralist and based on the notion of information, I propose to use a solution that has been employed for Integrated Information Theory, namely introducing the distinction between extrinsic and intrinsic structure and dynamics (intrinsic information and intrinsic structure). Making these metaphysical enhancements to Beni's structuralist theory of consciousness will give the theory a better chance of overcoming the hard problem. In terms of the metaphysics of consciousness, it takes us beyond physicalism. I then suggest that the information-theoretic structuralist theory of consciousness should, instead of panpsychism and physicalism, be combined with neutral monist ontology which is a better fit. These reworkings could lead to an improved naturalistic account of consciousness - the neutral-structuralist theory of consciousness and the self.
Keywords: information, ontic structural realism, panpsychism, neutral monism, consciousness, self

1. Introduction

A brave and riveting new metaphysical theory of consciousness and selfhood (Beni 2019) that bears the mark of structuralism is on the rise. The usual ontological suspects picked out by most of the philosophers of mind, when it comes to the question of the nature of self, are the substance (substantivalism) and the bundle[1]. There are also those that claim that there is no such thing as the self (Metzinger 2003) or that it is an illusion (Frankish 2016). Building on a rather familiar landscape of self(less) theoretical possibilities, Beni defends a realist theory of selfhood as an informationally regimented structure. He expounds an information-theoretic structural realist version of both the theory of consciousness and the self. One aspect of this structuralist account denies intrinsic properties, the other denies objects.

The crux of this paper will be to identify some of the problems that such a position faces and answer those problems while adhering to the spirit of structuralism. The overall plan is the following. In Sect. 2, I will explain the underpinnings of the structuralist theory - the framework of ontic structural realism. In Sect. 3, I unpack Beni`s structural realist theory of the self and consciousness. Sect. 4 analyzes his prefered metaphysics of consciousness and presents a problem for Beni`s panpsychist interpretation. Sect. 5 puts forward Mindt`s (2019, 2021) amendments to Integrated Information theory which include the addition of *intrinsic structure* and I suggest how the same can be applied to Beni`s theory in order to help it provide a better, more satisfying answer to the hard problem of consciousness. Neutral monist

[1] The phenomenal/minimal self theory, stemming from the Phenomenological tradition, has also garnered popularity in the past couple of decades. e.g. Zahavi`s (2014) minimal self.

ontology is discussed in Sect. 6. Information-theoretic structuralist theory can be improved if it is merged with neutral monism.

2. Ontic Structural Realism

The framework on which Beni bases his theory of consciousness/selfhood is the *Ontic Structural Realism (OSR)*. Structural realism is a successful theory of philosophy of science which posits that the structures described by scientific theories are real.[2] The emergence of this view was motivated by problems of pessimistic meta-induction and metaphysical underdetermination.[3] Structural realism comes in several flavours. *Epistemic Structural Realism* (ESR)[4] is the claim that all that we *know* is structure (there may be hidden entities realizing the structure but we know not of their nature). *Ontic Structural Realism* (OSR) is the claim that reality is fundamentally relational or structural - there are no objects or if there are any they are grounded in the structure (Ladyman et al. 2007; French 2014). OSR can be of the eliminativist and non-eliminativist kind. *Eliminativist Structural Realism* goes the furthest in its gung-ho charge on traditional metaphysics by professing: "All there is, is structure!"

Moderate or *non-eliminativist ontic structural realism* (Esfeld and Lam 2008) is not so extreme. Those who endorse it, like Esfeld, maintain that objects are characterized only by the relations in which they stand. In this version of OSR, there are both objects and relations, so it respects that relations require relata, but objects have no fundamental intrinsic properties[5] – objects only bear relations and relations account for identity conditions instead of intrinsic properties. [6]

As opposed to OSR, in traditional metaphysics, individual objects were considered substances and their individuality was understood as intrinsic and primitive, independent of

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[2] Ladyman (1998) and Worrall (1989). For an insight into recent debates on the scientific progress and different forms of scientific realism see Dellsén (2018), Niiniluoto (2019), Bird (2016).

[3] Ontic SR parts ways with traditional substantivalism and object-oriented metaphysics. SR emerged as an answer to pessimistic meta-induction and metaphysical underdetermination in physics. Beni (2019, 44) points out that the object-oriented version of scientific realism could not resolve these problems satisfactorily, but SR could. His claim is that a similar problem of the metaphysical underdetermination occurs in psychology pertaining to the nature of the self. Beni`s motivation for adopting SR is that it could resolve this problem concerning the self, as well. More on the problem of metaphysical underdetermination of the self in Footnote 10. I thank one of the reviewers of this journal for pressing me to say more about this point.

[4] The following is a garden-variety distinction made between different versions of structural realism. See Ladyman (2020).

[5] There are relational/extrinsic (structural) and nonrelational/intrinsic properties (and these can be categorical or fundamentally dispositional) (e.g. Seager 2006). According to Jeagwon Kim (1982) intrinsic property is to be understood as the property that belongs to an object that does not coexist with any contingent object distinct from itself (lonely or unaccompanied object). Lewis defines an intrinsic property as property "which things have in virtue of the way they themselves are". Things have an extrinsic property "in virtue of their relations or lack of relations to other things" (Lewis 1986, 61). In Lewis and Langton`s (1998) it is argued that "intrinsic" properties are logically independent of both loneliness and accompaniment. Francescotti (1999, 608) considers that F is an intrinsic property $=_{df}$ necessarily, for any item x, if x has F, then there are internal properties $I_1,...,I_n$ had by x, such that x's having F consists in x's having $I_1,...,I_n$." More on intrinsicality in Footnote 20.

[6] The master argument for intrinsic properties given by Esfeld and Lam goes as: „(1) Relations require relata, that is, objects that stand in the relations. (2) These objects have to be something in themselves, that is, they necessarily have some intrinsic properties over and above the relations that they bear to one another—even if the relations do not supervene on the intrinsic properties and even if we cannot know the intrinsic properties" (Esfeld and Lam 2008: 29).

the external. To individuate objects, one could use an intrinsic property, haecceity (primitive thisness, individual essence) or a bare substratum.[7]

Esfeld and Deckert (2018) defend moderate OSR and assert that it is a "misconception" to understand ontic structural realism as a position that goes against object-oriented metaphysics. Ontic structural realism is a stance that goes against the *property-oriented metaphysics* that was dominant in philosophy since Aristotle. There really is "no need to admit physical properties at all". There are objects in a thin sense, "standing in the relations is all there is to these objects—the relations are their essence (cf. the moderate ontic structural realism set out in Esfeld (2004), Esfeld and Lam (2008, 2011))" (Esfeld and Deckert 2018, 7). Objects understood in this are not objects in the proper sense, they possess no thisness and have no bare substratum.[8]

I go to length to explain these forms of OSR both for introductory purposes and to get a better grip on how to situate Beni`s account. His theory comes close to the *non-eliminativist* OSR, and this is something he himself acknowledges (Beni 2019, 63). More about his non-eliminativist version of OSR will be said in Section 3. What is important to note here is the following: from everything said it is clear that all these forms of Ontic SR dispense with intrinsic properties. I highlight this fact because it will be crucial for my arguments in coming sections (especially in Sect. 4).

Now, some philosophers (Ladyman et al. 2007) have pushed towards developing structuralist theories in domains other than physics: chemistry, biology, economics, and cognitive science. Beni`s *Structural Realist theory of the Self* (SRS) *and consciousness* is part of this tendency.

3. Structural Realist Theory of Consciousness and Selfhood

Traditional views on the metaphysics of the self were *the substance view* and *the bundle view*. In recent times, following the Phenomenological tradition, an additional view has been postulated - the *minimal self*. Now, Beni proposes a radically different *metaphysical* theory of the self based on the ontology of *structures*.[9]

If the self is a *bundle*, then the self is identical to or constituted by bundles of experience. A subject is individuated by experiences (identity conditions of persons are specified in terms of relations between mental states). Selves are collections of properties (Dainton 2008). In case the self is a kind of "minimal self", it is identical with the subjectivity of experience. Zahavi (2014) defends *experiential minimalism* in which the for-me-ness or first-personal giveness aspect of phenomenal consciousness is the minimal experiential self.

An *individual substance* is a self-individuating entity that metaphysically unifies and individuates properties as their bearer. If the experiencing subject is an individual substance

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[7] Speaking of consciousness and subjects of experience, there are many positions, including panpsychism, that are serious about consciousness and subjectivity, but which do not posit subjects as enduring substances, although they still have intrinsic properties. See Seager (2006), Dainton (2008), Mørch (2018).

[8] Problems for structural realism could arise from quiddities. Ungraspable quiddities would undermine *ontological* structural realism, while graspable quiddities would undermine both *ontological* and *conceptual* structural realism. Now, quiddities need not undermine *epistemological* structural realism, as long as the distribution of the quiddities is not knowable (Chalmers 2012, 422).

[9] Beni's view is radically different in the same way that OSR is radically different from traditional object-oriented ontology.

then it is a kind of metaphysical entity that acts as a bearer of experiential properties, upon which experiential properties are instantiated, and that is not itself a property. Hence, the instantiations of experiential properties in subjects are types of events, namely experiences (e.g. Lowe 1996; Nida-Rümelin 2017).

Beni argues against the bundle and the substance view, but it is also his intention to go beyond *eliminativism* and *pluralism* that are evident in contemporary understanding of the nature of the self. Metzinger's eliminativism propounds that there is no self, only a „self-model", a mere phenomenal image produced by neural representations and Gallagher's pluralist *pattern theory* (Gallagher 2013) in which there are „multiple co-existing and loosely related self-patterns", does not account for the dynamical relations between various self-patterns. Eliminativism and pattern theory do not provide a well-posed metaphysical alternative to substantivalism, Beni contends. All of these theories pull in different directions, to the effect that they distract from a unifying ontological account of the self.

The structural realist theory of the self does not endorse full-fledged realism about all aspects of the self. Beni asserts that his intention is to defend a modest version of realism about the basic structure of the self that can be specified in terms of embodied informational structures, or structures realised by mechanisms of information processing in the brain and environment. There is a diversity of scientific accounts of the self, and Beni has been the first to point out that there is a *metaphysical underdetermination of the self*. This underdetermination is what motivates him to seek out a structuralist theory of the self.[10] So, this is to be a philosophical theory of selfhood based on what our best theories of contemporary cognitive sciences tell us about the self.

Beni introduces his elegant theory as a *non-eliminativist* version of OSR. This view gives priority to basic structures which means he does not want to dispense with objects altogether, but to retain an ontologically thin notion of individual objects (Beni 2019, 63). What remains is a thin notion of individual objects, „weakly discernible individual selves" and thin notions of „non-structural features of the self can be identified in virtue of the specific location that they occupy in the infrastructure of the selfhood" (Beni 2019: 123).[11]

Beni wants to admit some non-structural elements in his theory. What does it mean to have such elements?[12] They still get their identity from their location in the structure:

> "According to SRS, the self is the infrastructure that subsumes various

[10] The problem of metaphysical underdetermination is encountered in the field of the philosophy of physics. The metaphysical underdetermination comes from quantum statistics cases which result in incompatible metaphysical consequences (French 2018). A solution for this problem is to show that there is a common structure that underpins the individualistic and the non-individualistic notion of objects. This is where the Ontic SR comes into play (Beni 2019, 110). Beni finds similarities between the state of underdetermination in physics and the state of underdetermination in the neuroscientific accounts of the self. Therefore, an analogous threat pertains to the philosophy of self (a form of metaphysical underdetermination "breaks out" in this field anew). This underdetermination is caused by the heterogeneity of neuroscientific theories of consciousness, like the Integrated Information Theory, the resting-state-based theory, and the FEP-based theory of consciousness. For a detailed exposition of this problem, see Beni (2019, Sect. 2.2.2; Sect. 3.8).

[11] The sense of agency, the sense of ownership, and mineness.

[12] One could envisage an argument against structuralism claiming that selves are the only real objects we know about. Nida-Rümelin (2017), for example, would argue that we have pre-reflective self-awareness, an awareness of one-self as an experiencing subject - we are aware of ourselves as unifying simultaneous and subsequent experiences. She defends the view that the self is an unchanging experiencing subject, a special kind of substance that has a non-descriptive individual nature.

self-patterns. Self-patterns or various aspects of the self are featuring in the infrastructure of the self. Aspects and features of the self (i.e., self-patterns) could be identified mainly by virtue of their location within the infrastructure of the self" (Beni 2019, 127).

Beni subscribes to information-theoretic structural realism (ITSR) of Ladyman et al. (2007). According to these authors, structures are to be characterised in terms of *real patterns* (Dennett 1989, 38-42; Ladyman et al. 2007, 252; Mindt 2019, 120-4). Real patterns were defined by Dennett (1991, 1989) as patterns that are objective and exist out there, to be detected by our observations of the natural world, although there is always an intentional stance to these observables. Ladyman et al. follow by claiming that real patterns are "the last word in ontology, and there is nothing more to the existence of a structure than what it takes for it to be a real pattern" (Ladyman et al. 2007, 178). Some real patterns behave like objects and some behave like events and processes.

So, when it comes to structural realist theory of the self/consciousness, Beni finds it more natural to specify the underlying structures of the self in information-theoretic terms. SRS is specific form of informational structural realism that grounds the informational structures in a cognitive system that can be coupled with the environment.

In addition, he tries to employ various accounts of consciousness, e.g. the Integrated Information Theory of consciousness (IIT, Tononi et al. 2016)[13], resting-state-based theory (Northoff 2018), and free-energy-based theory (FEP, Friston 2010), and goes on to show how they could be unified by invoking a structural realist strategy. Beni argues that in order to overcome the problem of metaphysical underdetermination of consciousness we should find the *underpinning structure* of consciousness. Beni thus offers a structural realist account of the phenomenal aspects of the self and consciousness, even intentionality.

4. Metaphysics of Consciousness

The adequacy and plausibility of a theory of consciousness becomes especially problematic when one tries to explain phenomenality in structuralist terms. This is the reason why I think that the dreaded and, perhaps, intractable *hard problem of consciousness* opens up for Beni. Chalmers (1995) has distinguished the easy problems and the hard problem. The easy problems of consciousness (like the focus of attention, the deliberate control of behaviour, the difference between wakefulness and sleep) are problems about the performance of *functions*. The hard problem is not about functions. "But how and why do physical processes give rise to experience? Why do not these processes take place `in the dark`, without any accompanying states of experience? This is the central mystery of consciousness" (Chalmers 2003, 103-4). "How can technicolour phenomenology arise from

[13] Integrated Information Theory (Tononi et al., 2016) is a neuroscientific theory about the nature of consciousness. According to IIT, consciousness is the result of the process of information integration in a system, and the quantity of consciousness (that integrated information) is quantified by value of Φ. Adherents of IIT take consciousness seriously and put forward certain axioms and postulates concerning it. Five axioms are the essential phenomenological properties of consciousness and include: *Existence, Composition, Information, Integration and Exclusion*. On the merits of IIT and criticism of the notion of information in Integrated Information, see Mindt (2017). Mindt argues that IIT is unable to properly answer the hard problem of consciousness in its present form. It falls victim to the structure and dynamics argument. More on this in Section 5.

soggy grey matter?", as famously exclaimed by Colin McGinn (1989, 349).[14] The hard problem comes from human phenomenology - there is something it is like to feel the warm touch of the partner`s hand on your face (or to have the phenomenality of bodily sensation, feeling and thought). So, it is posited that consciousness is characterized by a special kind of *phenomenal properties* (or *qualia;* Chalmers 2003).

Chalmers argues that reductive explanations concern only structure and function but do not explain conscious experience that accompanies it (2010, Chapter 1).

Beni does not pose the hard problem of consciousness explicitly in his book.[15] Let us inquire some more what is the metaphysics behind his theory of consciousness. On one occasion he confesses that he is "advocating a limited form of panpsychism" (Beni 2019, 197), a kind of *pancomputationalism-cum-panpsychism*[16], where all information processing (to some extent) involves phenomenal experience. He claims that this view seems to follow from his information-theoretic account of the structure of the self. His panpsychism is also in line with IIT, Beni contends.[17] This view of Beni`s, although important for his theory, would need some more unpacking. Unfortunately, he does not dwell much on it, and his panpsychist view is not explicated in detail. What seems to be problematic is that Beni's is an ontic structuralist theory, and this does not form a fertile ground for a panpsychist ontology.

Panpsychism is the view that phenomenality/consciousness is fundamental and pervades the physical universe. Everything has a modicum of consciousness or properties that are similar to conscious (proto-conscious). Modern panpsychism comes as a promising position that could overcome the deficiencies and problems of both physicalism and dualism, and that could constitute a more plausible answer to the hard problem of consciousness (e.g. Strawson 2008; Mørch 2014; Roelofs 2014; Chalmers 2015; Alter and Nagasawa 2015; Bruntrup and Jaskolla 2016; Goff 2017; Seager 2019).[18]

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[14] Cf. Strawson`s (2008) "the hard part of the mind-body problem" and Levine`s (1983) "explanatory gap".

[15] In his account, Beni uses IIT and free-energy-based theory as structural theories of consciousness. If free-energy-based theory is also conceived as structuralist it would be hard to see how it is panpsychist, and Beni does claim that Friston's theory supports panpsychism (Beni 2019, 183-4). In a more recent work, Beni (2021a) posed the hard problem of consciousness for FEP and pushed for the critique of the so-called *Markovian monism*, in that it is not a viable metaphysical theory of consciousness or a good answer to the hard problem. In another paper, he used the scientific literature around the Free Energy Principle to reconstruct two well-known arguments for panpsychism - the argument from continuity and the argument from intrinsic nature (Beni 2021b).

[16] Perhaps, what Beni means by "panpsychism" (and "pancomputationalism-cum-panpsychism") is the following: where there is information processing, there is phenomenal experience/consciousness. Whenever there is life, there is consciousnes experience. In that case, Beni would subscribe to the *mind-life continuity* thesis. There are some clues to this in Beni (2021b).

[17] Orthodox interpretation of IIT is panpsychist, but since IIT was formulated this interpretation has been highly controversial. McQueen (2019) argues that orthodox interpretations of its own ontological and epistemological basis should be rejected for an interpretation-neutral formulation. Cf. Mørch (2018).

[18] There are several forms of panpsychism. *Constitutive panpsychism*, where macroexperience is (wholly or partially) grounded in microexperience and *emergent panpsychism* in which macroexperience is emergent from microexperience (Roelofs 2015). *Russellian panpsychism* is the thesis that quiddities are the fundamental categorical bases of relational physical properties. *Panprotopsychism* is the thesis that fundamental physical entities are of the proto-conscious kind (Chalmers 2015, 252-9). Mørch (2014) presents emergentist version of panpsychism. In addition, there is the *cosmopsychist* view, that cosmos itself instantiates experiential properties (see Bruntrup and Jaskolla 2016). Constitutive panpsychism seems to suffer from difficult new problems, so-called *combination* problems (cf. Coleman 2013; Chalmers 2016; Goff 2017, Chapter 7 and 8) that relate to issues surrounding emergence of macroconsciousness from microconsciousness. Analogous hard problem of combination poses the question how macrosubjects (o-subjects) come from microsubjects (the subject summing

Can there be a structuralist version of panpsychism? How could panpsychism and Ontic Structural Realism (even of the moderate kind) be compatible? Ontic SR is a form of *non-categoricalism* (Ladyman et al. 2007). Panpsychists usually argue against OSR, and for categoricalism (cf. Mørch 2018; Brüntrup 2011; Seager 2006)[19]. Panpsychism has the requirement of *intrinsicality* and structural realism does not - even the moderate version of structuralism (Esfeld and Lam 2008) clearly eliminates intrinsic properties.

In the literature, intrinsicality and categorically are used almost synonymously, (intrinsic and categorical nature). Still, these are not the same. Intrinsic properties are properties that are constitutively independent of the properties of other things and categorical properties are understood as ones that are independent of other properties, including "circumstances and manifestations" (Mørch 2018, 5).[20] Categoricalism can be viewed as the position that dispositions require categorical grounds or realizers. Categorical properties are also seen as non-dispositional properties. Dispositionalism is compatible with intrinsicalism because powers can also be intrinsic - irreducible powers can exist unmanifested (Molnar 2008).[21]

Perhaps, panpsychism should be avoided because it is admitting too many entities as sentient. To his credit, Beni does expound a "limited form of panpsychism". Integrated Information theory had the corollary that even very simple objects, like photodiodes, are conscioussness and this was the source of criticism towards panpsychist interpreting IIT.[22] However, it could be that this is a problem just for IIT, though not for all of panpsychism. On the other hand, IIT could give a more precise answer to the question how much consciousness

problem). Cosmopsychism has the decomposition/decombination problem. In previous work, I tackled the torny problem of subject-summing (Nešić 2017) and an emergentist panpsychist interpretation of IIT (Nešić 2018).

[19] This is how Mørch defines OSR: "Ontic structural realism is the view that all physical properties are purely structural or relational, but that relations do not need relata with non-relational properties; rather, physical relations can subsist on their own, or at least prior to their relata such that the relata are constituted by their position in a relational structure and would have no reality outside of it" (Mørch 2018, 4). The alternative to OSR (in which structures are fundamental) is *dispositionalism*, where dispositions or powers are fundamental, non-reducible to structural or categorical properties. Dispositionalism can answer the question what distinguishes physical from mathematical structure - physical structure is realized by powers.

[20] I discussed what intrinsic properties are in Footnote 4. Russell (1927) holded that physical events have an intrinsic character beyond the structuralism of physics. In structuralist views of physics, which eliminate intrinsic properties, "all the things in the world will merely be each others' washing" (1927, 325). Recently, many views (inspired by Russell`s positions) under the umbrella term *Russellian monism* have appeared claiming that "matter has intrinsic properties that both constitute consciousness and serve as categorical bases for the dispositional properties described in physics" (Alter, Nagasawa 2015, 1). Chalmers` (2010) type-F monism is also a form of Russellian Monism or panprotopsychism.

[21] The same assertion can be found in Esfeld and Deckert (2018, 54) about dispositions as intrinsic properties and that is why they are not admitted in structural realism. It is also the reason why Esfeld and Deckert say we don`t even need to admit physical properties, just relations. Endorsing dispositionalism goes beyond structuralism, amounts to something more than ontic structural realism. Chakravartty goes through all the ontological alternatives of object ontologies, between substance realism and eliminativism (thick and thin): substances, bundles, dispositions (*dispositional essentialism*: there is a generally *intrinsic* potential for relations, causal powers investigated by the sciences are generally intrinsic properties). He defends *semi-realism* (Chakravartty 2007) incorporating the *bundle view* through a dispositionalist account (French 2014, chapter 7 entertains the possibility of "bringing back the bundle").

[22] Is every living creature also conscious? What creatures are endowed or imbued with consciousness? Consider Godfrey-Smith (2016) for discussion. Mindt (2021, 9-10) is cautious when discussing the relationship between life and consciousness.

there is in a physical system.[23]

Given that panpsychism is bound with intrinsicality, Beni's endorsement of panpsychism is incompatible with his commitment to Ontic SR. Epistemic SR would not be a problem for a panpsychist, panpsychism is comfortably compatible with Epistemic Structural Realism. Still, adopting Epistemic SR is not available to Beni, given his explicit commitments to Ontic SR (this was shown in Sections 2 and 3).[24] To have a full-fledged panpsychist theory, Beni would need to give up his allegiance to OSR, something that is the very core of his structuralist theory of the self and consciousness. I do not think Beni is ready to make this move and I will argue that a different metaphysical theory of consciousness is a better match for Beni`s structuralism.

What options are open to Beni, instead of panpsychism? There is a tension, a conflict, between Ontic SR and panpsychism that comes from intrinsicality. If we deny intrinsicality, as ontic structuralists do, then our selection of compatible metaphysical theories of consciousness becomes limited. Could this structuralist theory be understood as a form of physicalism? The hard problem of consciousness rears its ugly head again. It should also be pointed out that this hangs on how one understands what the physical is and what physicalism demands.

Physicalism seems to be a prevalent metaphysical theory of consciousness, but how should we define it?[25] What makes a process or a thing *physical*? One could use the well-known definition by Stoljar, the one that both Chalmers (2003) and Mindt (2021) take into account, and that is the *theory-based conception of physical*, saying that physical is whatever are the entities (processes, properties) that a physical theory posits.[26] Mindt considers Lewis` (1983) definition of a metaphysical view of physicalism, that there is "nothing over and above the physical" (2021, 2). Finally, when we speak of the physical, we are describing structural and dynamical processes/properties. Chalmers (2010, 120) says about structure and dynamics: "This result is a description of the world in terms of its underlying spatiotemporal and formal structure, and dynamic evolution over this structure." These are not just properties of spatiotemporal entities but also dynamical, causal features and are associated with third-person observation. Mindt (2021, 3) finds that a more appropriate description of these would be to call them *extrinsic features* of a system.

I consider the hard problem to be devastating for physicalism. This brings us to Mindt`s suggestions on how to deal with the hard problem with *intrinsic structure*.

5. Intrinsic Structure

Is there a way for Beni to answer the hard problem of consciousness while staying firmly on the structuralist ground? I will suggest that we can find a possible solution to this predicament by examining how Mindt (2021) has defended IIT from the challenge of the structure and dynamics argument. Like IIT, Beni`s theory is an information-theoretic account

[23] For example, what is the difference in levels of consciousness in a newborn baby, an animal like a bat or in vegetative patients with just „islands" of brain activity.

[24] Goff (2021) is explicit about his commitment to Epistemic SR, for example. I thank one of the reviewers of this journal for bringing this point to my attention and urging me to state this explicitly.

[25] Physicalism and materialism are usually taken to be synonimous.

[26] The theory-based conception: "A property is physical iff it is the sort of property that physical theory tells us about." Stoljar (2017).

of consciousness. If it provides a purely structural (and dynamical) notion of information, it would seem that it does not have the means to overcome the hard problem.

It has been indicated by Mindt (2021) that the crux of the hard problem of consciousness is the *structure and dynamics* (S&D) argument (Chalmers 1996, 2003). Chalmers' structure and dynamics argument, in a nutshell, is claiming that consciousness cannot be fully explained by physical truths because they concern only structure and dynamics (Chalmers 2003; Alter 2016) and this is to be considered an argument against physicalism/materialism.[27] Physical descriptions characterize the world in terms of structure and dynamics, that is, descriptions that are analyzable in formal, spatiotemporal (logical and the mathematical) and nomic terms (laws and causation), structural and dynamical processes/properties. "Structure and dynamics" refers to "spatiotemporal and formal structure, and dynamic evolution over this structure" (Chalmers 2003, 258). This is regularly taken as a good description of the "physical" (due to Russell). When a certain system has consciousness, there is *something it is like* to be that system, there is some experience for it.

Mindt has proposed that we should add another class of properties - *intrinsic structure and dynamics*, and that a more nuanced picture is in need of being painted about structure and dynamics, then the one Chalmers is presupposing when applying the S&D argument. Mindt aims to dissolve the hard problem of consciousness, and he does so by showing that not all structure and dynamics are equal.

Mindt distinguishes different kinds of information that are pertinent for his argument: *syntactic information* (Shannon's entropic notion of information fits the bill), *semantic information*, and *intrinsic information* (Mindt 2021, 4). A successful information-theoretic explanation of consciousness (that overcomes the hard problem) should explain how all these types of information are related. What is the relation between syntactic and semantic information? Mindt adopts the complexity sciences` approach (an evolutionary story) to how meaning is generated. Kolchinsky and Wolpert (2018) define semantic information as "the information that a physical system has about its environment that is causally necessary for the system to maintain its own existence over time". They see information that accords to maintaining a state of non-equilibrium as meaningful, that is, as semantic information. Their approach is also in line with the free-energy principle (Friston 2010).

Mindt joins in and formulates how we should understand semantic information: "Those syntactic relationships which exist between an organism/system and its environment have value (i.e., have semantic content) if the syntactic information has the result of helping the system causally maintain its existence over time" (Mindt 2021, 5). We should look for properties that causally maintain the existence of a system over time. Mindt explicitly favours a non-standard notion of semantics as the "relationship between a system and its environment" (2021, 7), semantic information that does not have to be propositional or epistemic, one that is substrate-neutral. He deems himself a pluralist concerning the possible

[27] Argument`s principal claims are: "First: physical descriptions of the world characterize the world in terms of structure and dynamics. Secondly: from truths about structure and dynamics, one can deduce only further truths about structure and dynamics. And thirdly: truths about consciousness are not truths about structure and dynamics." (Chalmers 2003, 120). Alter (2016, 2) defends Chalmers` S&D argument and formulates it as: "1. All physical truths are purely structural. 2. From purely structural truths, one can deduce only further purely structural truths. 3. Some truths about consciousness are not purely structural. 4. Therefore, there are truths about consciousness that cannot be deduced from (i.e., are not a priori entailed by) the complete physical truth."

conceptions of semantic information, which capture different levels of explanation. Still, he argues this type of information is not enough for an adequate information-theoretic explanation of consciousness and experience, since this is meaning from an extrinsic point of view (*external perspective*).[28]

On top of all this, there is another significant step, from syntactic and semantic to *intrinsic/internal perspective*. So, not only meaning that is "extrinsically interpreted from the outside", but meaning intrinsically for the system. Some systems could have an internal perspective on their own processes, and this could mean that there would be something it is like to experience "the meaningful causal states that maintain that systems survival over time". Mindt argues that IIT can supply us with the notion of intrinsic information and intrinsic S&D. Integrated Information Theory is, unlike other theories, concerned with the aspect of *something it is like* for the system to have meaning and this is when we get to the intrinsic structural and dynamical features of a system from the inside, internally, as they are for the system (e.g. my consciousness of the semantic features of myself, or of any conscious system of itself). How is the system with intrinsic meaning different from the system with extrinsic meaning is the important question posed by IIT. And the answer is that it has the right *intrinsic cause–effect power* (Mindt 2021, 13). Some systems, when examined from an external perspective will exhibit only extrinsic S&D. These features are the target of Chalmers` attack and criticism (these do not account for the qualitative side of consciousness, *what-it-is-likeness*).[29]

Mindt's argument is that given a certain understanding of structural and dynamical properties, IIT fails to overcome the hard problem of consciousness (does not answer the hard problem). But if a more nuanced understanding of structure and dynamics is developed, IIT has a better chance of overcoming the problem. If two systems have semantic information, do both of them experience, and based on what difference does one have an internal perspective and the other does not? It is an advantage of Mindt's proposed picture of S&D that, building on its conceptual ground, one can answer these questions with natural investigation (Mindt 2021, 15). Now, this is all conditional on Mindt's suggestions being successful. Mindt does not claim that IIT is the best theory to capture the properties of systems that have internal S&D, just that it is the one on the right path toward the solution. In any case, work needs to be done to spell out in detail how intrinsic structure and intrinsic information help explain experience, without invoking traditional intrinsic properties.

Perhaps, adding internal perspective to yield intrinsic information will not contribute to a rich enough explanation of conscious experience for some. Still, it is my contention (and I think Mindt`s) that if we are looking for a naturalistic, information-theoretic explanation of experience, this particular proposition is going in the right direction and gives us a better chance of answering the hard problem.

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[28] Mindt (2021, 14) differentiates between *extrinsic* and *intrinsic* structure and dynamics (S&D), and between *external* and *internal* (meaningful S&D properties), depending on the perspective one takes on the target system. From the external perspective, there are meaningful and meaningless S&D properties of a system. *Intrinsic S&D* can be interpreted from an external perspective, connected to the semantic notion of information. There is also a meaningless (non-meaningful) variant of external S&D or *extrinsic* S&D.

[29] The extrinsic structural and dynamical properties merely indicate a system's syntactical features and are the same features Chalmers calls structural and dynamical in his characterization of physical explanations.

Under the orthodox understanding of structure and dynamics (from Chalmers` argument), a structuralist theory of consciousness, like IIT, cannot answer the hard problem. If a more nuanced picture of S&D, like the one Mindt proposes, is endorsed, IIT and any other structuralist theory, might not be susceptible to the structure and dynamics argument anymore. Still, and this is aknowleldged by Mindt, much more work needs to be done and the inclusion of these notions of structure and dynamics offers only a potential solution to the hard problem.

Mindt starts from IIT and the hard problem, and argues that different types of structure and dynamics can be distinguished, and this calls for something more than physicalism as a metaphysical theory of consciousness.[30] On the other hand, Beni, starting from the opposite end, has a structuralist theory of consciousness and selfhood, and he cannot defend a form of panpsychism in a structuralist framework, but can accept Mindt`s solutions of different S&D.

It is my suggestion that Beni should follow the trajectory of Mindt`s solutions and introduce these new ways of understanding structure and information into his account. Beni`s structuralist theory could incorporate the distinction between extrinsic and intrinsic structure and dynamics and related notions of intrinsic structure and intrinsic perspective. Beni's theory is amenable to these changes, and can accommodate the kinds of information postulated by Mindt, since Beni is already employing the free-energy framework, as well as the Integrated Information theory, from which the intrinsic perspective stems. Beni does not distinguish between different notions of information and has failed to perceive the importance of intrinsic perspective in IIT. Including a more detailed picture of various kinds of information would improve his theory. Beni needs to answer more clearly what distinguishes selves from other kinds of structures. The notions here introduced help us get to that, and to potentially develop answers to these problems.

Now, this means adopting an *expanded notion* of structure and dynamics, one which goes beyond the narrow conception of the physical and the natural world (extrinsic conception of structure and dynamics).[31] Making these distinctions helps us maintain the difference between physical and mental, and yet show how they are both *structures*. With these new notions in place, we could then make a clear division between what is physical, what is alive and what is conscious.

As I explained in Sect. 4, the metaphysical position of physicalism is based on physical theory and this means that we are describing the natural world with structural and dynamical processes/properties, what Mindt has called extrinsic features. Postulating intrinsic information and structure already goes beyond the "physical" and fully describing systems with just traditional concepts from physical sciences. The position which seems to be more adequate for the structuralist who wants to satisfy the requirements of the hard problem of

[30] Physicalism can also be viewed as positing intrinsic/categorical physical properties. This kind of physicalism is not an option for a structuralist theory. There are varieties of physicalism without instrinsicality - e.g. *Physical Structuralism* (Ney 2015).

[31] On the metaphysical implication of intrinsic structure see Mindt (2021, 16-17). I side with Mindt that at this point physicalism is to be abandoned and neutral monism embraced. I thank one of the anonymous reviewers for pushing me to further develop my position.

consciousness is *neutral monism*[32], as it was hinted earlier on. Neutral monism is the most natural metaphysical interpretation of a fundamental structure that could be intrinsic. Together with neutral monism, information-theoretic structuralist theory has a better chance at overcoming the hard problem.

6. Neutral-Structuralism

Neutral monistic ontology holds that what we understand as physical and mental entities are ultimately of the same kind (ultimate reality is of one kind). If we allow the difference between the mental and the physical to exist, this would still be compatible with neutral monism, because such diverse entities could be derivative of the ultimate neutral entities. Although, neutral monism seems like an elegant solution to some of the most pressing metaphysical problems (like the hard problem) of consciousness, this position is not bereft of its own difficulties. The open questions for any neutral monist are what is the nature of these neutral entities and what is the relationship between the ultimate neutral and the derived matter/mind entities.

Traditionally, Mach (1886), James (1912) and Russell (1927) are considered to be the main proponents of neutral monism. Russell, for example, speaks of the *common ancestor* of mind and matter:

> "The stuff of which the world of our experience is composed is, in my belief, neither mind nor matter, but something more primitive than either. Both mind and matter seem to be composite, and the stuff of which they are compounded lies in a sense between the two, in a sense above them both, like a common ancestor" (Russell 1921, 2).

There have been some examples of coupling informational and structural ontologies (Ladyman et al. 2007, Floridi 2011), but rarely have they been put together with neutral monism with (Sayre 1976; Mindt 2019, 2021). Sayre (1976) advocates a different type of neutral monism from Russell`s (1927). Mindt claims that Sayre, in his version of information-theoretic neutral monism, attempts to accomplish something that Russell did not succeed. Mindt (2019, 115) follows Sayre in criticizing Russell`s own neutral monism in that its characterization of the neutral element (neutral "sensibilia") was "useless for any practical purposes" and would have to be rendered back into physical and mental terms. Sayre puts forward an ontological claim that the ultimate nature of reality consists of informational states. Like Sayre, Mindt argues that the fundamental neutral element is information, applicable to both domains, the physical and the mental. Mindt is committed to the "Neither View" of neutrality, meaning that he views the fundamental entities as neither physical nor mental, but a third category of entities.[33]

Ladyman et al. (2007) expound information-theoretic structural realism (and Beni incorporates it in his theory, as I indicated before) in which it is contended that our scientific investigations take place across a number of scales and reveal the structural features of reality. These are all ontologically real patterns that exist out there in the world. Now, the

[32] Mindt (2019, 2021) argues that if the intrinsicality/categoricality is denied, then structuralism and neutrality follow.

[33] There are several proposals on how to understand neutrality in neutral monism, and The Neither View is one option. See Stubenberg (2018).

problem could be that ITSR gives us a "weak unification" metaphysically given the empirical evidence (Mindt 2019, 122; Ladyman et al. 2007, 290), and this makes for a limitation over which Mindt wants to push the information-theoretic ontology, by coupling it with an *information-theoretic neutral monism*, claiming that neutral entities are the fundamental furniture of reality. He argues abductively that the "basic furniture of reality is information-theoretic, understood as neutral and structural" (Mindt 2019, 123). The position that he ends up defending is *information-theoretic neutral-structuralism* (ITNS).

We come to the dilemma that if we cannot understand the ultimate nature of the universe, then why posit neutral information as fundamental? Mindt asserts that there are "strong utilitarian reasons" to adopt ITNS, instead of just inertly staying with physicalism. We should favour ITNS because this theory accommodates consciousness into the natural framework, promises to close the gap between the physical and the mental, and is closely connected to what is revealed to us in the structure of our scientific theories (Mindt 2019, 124).

Since Beni is adamant to get to grips with the issues of consciousness and selfhood and builds a naturalistic theory of consciousness with structuralist tools, it is my proposition that he should follow Mindt`s suggestions and argue that the fundamental furniture of reality is informational, structural and *neutral*, that is, to embrace a version of neutral-structuralism.

7. Conclusion

I endeavoured to build on Beni`s information-theoretic structuralist theory of consciousness/self with some help from a similar ontological framework that was elucidated by Mindt. Both Beni and Mindt adopt the information-theoretic explanation of consciousness, with conceptual tools of Integrated Information Theory.

I expressed scepticism about panpsychism being compatible with structuralism and I argued that Beni`s theory would benefit from the application of the solutions proposed to amend Integrated Information Theory, namely that it is possible to distinguish different types of structures. The improved structuralist theory would go beyond the narrow physicalist view of nature. In addition, ideas about the extrinsic and intrinsic structure and dynamics could also provide much-needed progress on how to answer the fundamental problems of neutral monism - what is the nature of ultimate neutral entities and how they relate to entities we know as physical and mental.

It was argued that the position of neutral monism is well-suited for the central commitments of structuralism and that the structuralist theory of consciousness/self should be combined with neutral monist ontology. This could lead to a more viable naturalistic account of consciousness, one that has greater plausibility and ameliorates the pressure of the hard problem - the neutral-structuralist theory of consciousness and selfhood. Still, these tentative suggestions would have to be thoroughly developed in future work.

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