world as described by physics. One problem with this response, however, is that it blurs the distinction between phenomenalism and dualism (if consciousness is regarded as distinct from the potentials), as the world of potentials will begin to look quite indistinguishable from the physical world as the aforementioned dispositionalists see it. That is, physical objects will look like potentials for physical effects primarily, with some mental or perceptual effects in addition, rather than potentials for perceptions primarily.

3.5 Phenomenalism and the Arguments for and against Physicalism

Like substance dualism and subjective idealism, phenomenalism may posit subjects understood as mental substances in addition to perceptions, and is therefore also compatible with the unity arguments, but it can also be combined with the deflationary view of subjects.

In its responses to the arguments for physicalism, phenomenalism has more in common with dualism than subjective idealism. This is because it could, as already hinted at, be considered a kind of dualism, since it posits fundamental consciousness on the one hand, and fundamental potentials for perceptions that are not themselves mental on the other.

As an explanation of mind–brain correlations, this is no more parsimonious than dualism. It also leads to a conflict with physical causal closure basically identical to that of dualism (Pelczar 2019, pp. 18–19).[43] Given phenomenalism, the evidence for physical causal closure can be interpreted as evidence that changes in potentials are fully caused by other potentials, rather than by perceptions or other mental phenomena. It follows that the mental is affected by physical potentials, but either does not affect them in return (i.e., is epiphenomenal) or affects them in an overdetermining way. Phenomenalism thereby faces the same choice as dualism between epiphenomenalism, overdetermination and denying physical causal closure, and this choice seems as difficult given phenomenalism as given dualism. Therefore, phenomenalism does not clearly offer any unique advantages as a theory of consciousness.

4 Dual-Aspect Monism (or Panpsychism and Panprotopsychism)

Dual-aspect monism claims that reality consists of one fundamental kind of stuff, but that this stuff has two different aspects throughout, a physical aspect

[43] Pelczar (2019) points to this as a problem, but argues that phenomenalism, unlike dualism, still offers phenomenal properties non-causal relevance to the physical world in virtue of their close connection to physical potentials – but he later changed his mind and no longer regards this as real advantage (expressed in correspondence).

and a mental or protomental aspect – where the protomental is understood roughly as non-physical precursors to the fully mental.

Since everything has both aspects, dual-aspect monism implies *panpsychism*, the view that consciousness is everywhere (*pan* is Greek for "everything" and *psyche* for "mind" or "consciousness"), or alternatively, *panprotopsychism*, that protoconsciousness is everywhere (*proto* is Greek for "first" or "preceding"). This is to say that even non-living entities (that also, unlike, e.g., robots or AI, have no functional overlap with us), such as fundamental particles, have some fundamental form of consciousness or protoconsciousness. Complex consciousness, such as human and animal consciousness, is in turn taken to result from fundamental consciousness or protoconsciousness (or the particles possessing it) being put together in the right way.

Furthermore, the reason why everything (including particles) has both a physical and a (proto)mental aspect, according to dual-aspect monism, is that (proto)consciousness is the *intrinsic* nature of physical properties, which physics reveals as purely *structural* or *relational*. That is, according to dual-aspect monism, when we look at what physics tells us about reality, we see that it only tells us – to put it roughly – how reality is from the *outside*, or about the relations between things (such as causal relations and spatiotemporal relations).

But every outside needs an *inside*, or relations need relata (i.e., things that stand in the relations) with *intrinsic* properties (i.e., properties that characterize them as they are *in themselves*, independently of their relations).[44] And it turns out we do know the inside, or intrinsic properties, of one physical thing, namely ourselves: our own consciousness, or its phenomenal qualities, seem intrinsic. Phenomenal consciousness or protoconsciousness could therefore be the inside, or intrinsic properties, of everything physical.

Thus, dual-aspect monism can be more precisely defined as the view that (1) phenomenal properties are not physical, but rather either fundamental or constituted by protophenomenal properties, and (2) physical properties are relations between, or structures of, phenomenal or protophenomenal properties (from which it follows that everything physical is also mental or protomental).

Dual-aspect monism is also widely known as *Russellian monism*, after Bertrand Russell, who defended many of its central claims (1927, 1948), though it's unclear whether he fully endorsed it.[45] Other historical proponents

[44] These intrinsic properties are often referred to as *quiddities*.

[45] Russell clearly endorsed a view he called *neutral monism*, which was first proposed by Ernst Mach and William James. This view is somewhat difficult to interpret and categorize, but seems to incorporate elements from other views (such as subjective idealism, phenomenalism or panprotopsychism) combined with some unique additional features (see Stubenberg 2018 for a detailed overview of neutral monism in this sense and its various interpretations). But neutral monism can also be understood in a different sense that overlaps more or less exactly with dual-aspect

(of at least parts of the view) include, for example, G. W. Leibniz and Arthur Schopenhauer.[46] In the twentieth century, it was kept alive by philosophers such as Maxwell (1979), Sprigge (1983), Lockwood (1989), and to some extent Russell's collaborator Whitehead (1929) (by whom Russell's version may have been inspired) and his follower Hartshorne (1937), but it was not widely recognized as a distinct and interesting alternative to other non-physicalist theories. In the last few decades, however, it has become more widely recognized as such based on defenses by philosophers such as Chalmers (1995, 1996, 2003, 2013, 2016), Seager (1995, 2010), Stoljar (2001), Strawson (2006b, 2016), and Goff (2017).

Here, the view will be referred to mainly as dual-aspect (rather than Russellian) monism, partly because it's not uniquely associated with Russell, but mainly because this term is more directly descriptive. *Aspects* can be understood roughly as properties that appear or not depending on the point of view – the physical aspect being those properties that appear from the outside, third-person, or scientific point of view, whereas the mental or protomental being those properties that appear from the inside, first-person or introspective point of view. *Monism* is the view that there is one kind of stuff (or kind of things) – that the physical and (proto)mental are both aspects of.[47]

Monism is thus the opposite of substance dualism, and it should be noted that physicalism, subjective idealism and property dualism are also monist views. However, physicalism differs from dual-aspect monism in taking the one stuff

panprotopsychism, since protophenomenal properties are *neutral* in the sense of neither physical nor mental. Whether Russell fully endorsed neutral monism is this latter sense is not clear, but in his 1927 and 1948 he clearly suggests something very close. Also note that neutral monism in the former (Machian or Jamesian) sense will not be discussed further because of the interpretive difficulties, which make it hard to pinpoint any unique advantages it may have as a theory of consciousness.

[46] These philosophers are often classified as idealists, but their idealism is closer to the objective than the subjective kind (as distinguished in Section 3), or *pure* dual-aspect monism, to be discussed in Section 4.3. See also Skrbina (2005) for an overview of numerous other historical proponents of panpsychism (though not always the dual-aspect version).

[47] Dual-aspect monism should also be distinguished from the view held by Baruch Spinoza, which is often described as dual-aspect monism as well. Spinoza's endorses "thing monism," according to which reality consists in a single substance understood as one unified thing. Dual-aspect monism (as defined here) only implies "stuff monism" or "kind monism," according to which there may exist a number of different things, but only one fundamental *kind* of things, or kind of stuff they are all made of (though there can also be thing-monistic versions of the view, such as cosmopsychism, to be discussed later). Another difference is that while Spinoza also claims reality has two aspects (or *attributes*), thought and extension, it's not clear whether he intends "thought" to include phenomenal consciousness (Spinoza may thereby differ from Descartes, who also characterizes mental substances in terms of thinking, but explicitly (*Meditations*, II) takes thinking to include, e.g., imagining and sensing, which can be interpreted to involve phenomenal consciousness). It's also unclear whether Spinoza regards extension as purely structural.

or substance to have only physical properties throughout (and taking mental properties to be constituted by physical properties) and subjective idealism in taking it to only have mental properties throughout and taking physical properties to be observer-dependent and in that sense not fully real. Property dualism differs mainly in taking physical and mental properties to be causally related rather than as relations/relata or "inside/outside," or as sharply distinct rather than two complementary aspects (in addition, it typically takes only *some*, rather than all, things to have mental properties in addition to their physical ones).

4.1 The Background for Dual-Aspect Monism

According to dual-aspect monism, physics leaves a gap in its description of reality, not just because it appears to leave out consciousness (by leaving an epistemic gap to it), but because it only tells us about the *structure* of reality, or equivalently, about the *relations* between things (as structures can be understood as sets of relations). These relations may include spatiotemporal relations (i.e., distances, temporal order, and so on), causal relations (i.e., which things affect each other and how), and mathematical and logical relations. Or, as it's also often put, physics only tells us about *dispositions*, or what things would *do* in given circumstances.[48]

For example, physics tells us that fundamental particles have properties such as mass and charge. But charge is just to attract particles with the opposite charge and repel particles with the same charge. And mass is just to resist acceleration, attract other things gravitationally, and so on. In other words, mass and charge are just ways of behaving or relating to other things. Or consider extension, which Descartes regarded as the essential property of the physical. As was pointed out by Leibniz, to be extended is just to occupy an area, and to occupy an area is simply to resist or prevent other things from entering, and therefore a mere behavior as well (Blackburn 1990).

More generally, it can also be observed how fundamental physics is formulated purely in terms of mathematics (such as Schrödinger's equation or Newton's equations), and mathematics can be regarded as a language that describes relations only – for example, all we know about the number 2 is

[48] Dispositions could be understood as pure relations between the behavior disposed towards and the circumstances or stimuli that trigger it (roughly on the format "will do X given circumstance Y"). If so, the claim that physics only describes dispositions is compatible with the claim that physics only describes relations – though not equivalent, since the latter claim allows that some relations may not be purely dispositional, such as spatiotemporal relations. A different understanding of dispositions, and an objection to dual-aspect monism on this basis, will be discussed in Section 4.4.2.

how it relates to other numbers and mathematical objects (e.g., that it's larger than 1, smaller then 3, half of 4, and so on) (see, e.g., Shapiro 1997; Gowers 2002). It follows that physics also describes relations only.

Dual-aspect monism then claims that there must be something that stands in these relations, or performs the behavior, something that also has intrinsic or categorical properties. Intrinsic properties are here understood as properties that characterize things as they are in themselves, or independently of their relations to other things, as well as to themselves and to or between their own parts (if any),[49] and categorical properties are properties that are not merely dispositional, or that characterize how things *are* as opposed to merely what they *do*.[50]

In other words, the structure described by physics must be realized or implemented by something that is itself not purely structural – roughly in the same way a piece of software (which can be understood as a pure set of logical relations) cannot exist, at least not concretely and physically, unless there is some hardware that implements it (and the "hardware" doesn't just consist in further software, as in a virtual machine). Or, as physicist Stephen Hawking has put it, in a passage much cited by dual-aspect monists[51]: "even if there is only one possible unified theory, it is just a set of rules and equations. What is it that breathes fire into the equations and makes a universe for them to describe?" (Hawking 1988, p. 174).

If physics doesn't tell us about this "fire" or "hardware," understood as the intrinsic realizers of the mathematical structure described by physics, it's hard to see what it could be. Some have concluded that the intrinsic properties of the physical must therefore be forever unknowable (Langton 1998; Lewis 2009).[52] Dual-aspect monists have pointed out, however, that consciousness, or its phenomenal qualities, seem intrinsic: we know something about how they are *in themselve*s, beyond their relations to anything else (such as their causes and effects), namely *what they are like* or their qualities. Indeed, it's precisely for this reason that phenomenal consciousness seems to go beyond mere functioning: a function is roughly equal to a disposition or set of relations (between causes and effects, or inputs and outputs), but phenomenal consciousness involves qualities that seem to go beyond this.

This suggests the possibility that consciousness is what realizes physical structure, or that the relations described by physics are relations between

[49] See Pereboom (2015) for a discussion of this versus other notions of the intrinsic.

[50] Intrinsic and categorical properties can be regarded as roughly equivalent (or the latter as a subspecies of the former), in the same way their counterparts of relational and dispositional properties can (see footnote 48).

[51] Hawking himself did not endorse dual-aspect monism in other respects.

[52] Langton also interprets Immanuel Kant's claim that things in themselves are unknowable to this effect.

phenomenal experiences. Most of these experiences would not be experiences of humans, animals or other complex entities or systems, but rather of simple entities such as particles. These experiences can be assumed to be extremely simple, or as simple compared to ours as their physical structure is.

Alternatively, one might regard the realizers as merely protoconscious. Protophenomenal properties are, to define them more precisely, intrinsic properties that are neither physical nor phenomenal, but are able to constitute (or, alternatively, causally produce) phenomenal properties when put together in the right way.

Dual-aspect panpsychism thereby turns physicalism on its head, by taking the physical to be realized by the mental, or at least protomental, or – in terms of the computationalist version of physicalism – by regarding the physical as software and consciousness as the hardware, rather than the other way around.[53]

4.2 Arguments for Dual-Aspect Monism

4.2.1 The Argument from the Intrinsic Nature of the Physical

So far, we have seen that dual-aspect monists make the following claims:

1. Physical properties are all structural (or relational, dispositional).
2. Structural properties have realizers with intrinsic (or non-relational categorical) properties.
3. Phenomenal or protophenomenal properties are intrinsic.

This suggests, but doesn't establish, that (proto)consciousness is the intrinsic realizer of physical structure, because there could be other kinds of intrinsic properties that can play this role, too. For example, one might think there are other intrinsic properties that are unknown to us, or that we can know or imagine other intrinsic properties besides consciousness.

The argument could be completed by adding two further claims. Firstly, that consciousness is the only intrinsic property we know, and that all other purported options (such as shape or physical colors) turn out to be relational on examination (e.g., shape is reducible to spatial relations, and physical colors are mere dispositions to cause phenomenal colors in observers, or similar). It is also arguably the only intrinsic property we can imagine. Panprotopsychists might add that protoconsciousness could be known or imagined on the basis of consciousness.

This still leaves the possibility of positing intrinsic properties that are completely unknowable and unimaginable. But why posit unknown properties when there are known ones, i.e., consciousness or protoconsciousness, able to do the

[53] For a more elaborate, accessible introduction to the background for dual-aspect monism, see Mørch (2021) or Goff (2019).

job? In other areas of inquiry, we usually posit unknown properties in our theories only when there are no suitable known ones (e.g., in the case of dark matter), and arguably, the same standard should be applied in this case.

To complete the argument, then, it can be added that:

4. Phenomenal or protophenomenal properties are the only intrinsic properties we know.
5. We should not posit unknown properties if there are known alternatives.

This gives the conclusion:

6. Physical properties have realizers with (proto)phenomenal properties.

4.2.2 The "Solving Two Problems at Once" Argument (or Dual-Aspect Monism and the Arguments for Physicalism)

The argument discussed in the previous subsection is not based on the problem of explaining consciousness, but only on the problem of explaining the intrinsic nature of the physical. Dual-aspect monism could be defended based on this kind of argument alone (Seager 2006; Adams 2007). But it is another argument, that *is* based on the problem of explaining consciousness, that is mainly responsible for the recent resurgence of interest in the view.

According to this argument, positing consciousness or protoconsciousness as the intrinsic nature of the physical also offers the best explanation of how consciousness fits into the physical world, because it avoids the main problems of both physicalism and dualism at once (Alter and Nagasawa 2012; Chalmers 2013). The main problem of physicalism is the epistemic gap. Since dual-aspect monism regards consciousness as non-physical, it is compatible with the epistemic gap – just like dualism. The main problem of dualism, on the other hand, is the argument from physical causal closure. In response to this, dual-aspect monism claims that, as the realizers of physical structure, consciousness gets an explanatory role compatible with physical causal closure (Stoljar 2001; Chalmers 2003, 2013; Alter and Nagasawa 2012).

The This latter response requires some elaboration. The response starts from distinguishing two different versions of the principle of physical causal closure, a narrow and a broad version (Stoljar 2001; Chalmers 2013). The narrow version claims that every physical effect has a *purely* physical cause, or cause with only physical (or physically constituted) properties. But according to dual-aspect monism, a purely physical cause would be a purely structural entity, and structures arguably cannot really exist without being realized by something with intrinsic properties – in the same way software cannot really exist without

hardware. If purely physical causes cannot even exist, they would not be sufficient to cause anything, so the narrow principle must be false.

The broad version claims every physical effect has a sufficient cause whose *structural* properties are all physical. Or put another way, that the only causal structure needed to explain physical effects is physical causal structure, where physical causal structure could be understood as causal relations that fall under physical laws. According to dual-aspect monism, the broad principle is what the scientific evidence for physical causal closure really supports, since this evidence mainly consists in the fact that all causal relations required to explain physical events examined so far fall under physical laws.

But the broad principle is compatible with dual-aspect monism, because it says nothing about whether the causal relations or structure also have intrinsic realizers, such as phenomenal or protophenomenal realizers. And if structure requires intrinsic realizers in order to exist, phenomenal or protophenomenal realizers would not be epiphenomenal or overdetermining, but rather have an essential explanatory role. This explanatory role may be described as causal, since by enabling the existence of physical causes (proto)consciousness would clearly be relevant to causation, but since this relevance would be different than that of physical properties, the role could also be described as constitutive or explanatory in a broader sense. Either way, consciousness will play a significant, non-redundant role as the realizer of physical processes, including our own physical behavior.

The broad version of the principle still rules out interactionist dualism, because interactionist dualism claims that some physical events (i.e., our behavior) require explanation in term of causal relations that do not fall under physical laws, but rather under fundamental psychophysical laws. In other words, interactionist dualism posits additional causal structure that is not physical, and which, unlike the structure posited by epiphenomenalist or overdetermination dualism, would be required to explain some physical events (i.e., behavior). The response therefore supports dual-aspect monism only, as opposed to non-physicalism more generally.

Dual-aspect monism can also respond to the other main arguments for physicalism, though in less original ways. The response to the argument from mind–brain correlations is roughly the same as that of subjective idealism, namely that as a monistic theory dual-aspect monism is as parsimonious as physicalism.[54] Second, its response to the argument from previous explanatory successes is mainly the same as that of dualism, namely that previously

[54] Or at least *almost* as parsimonious, if physical relations are regarded as fundamental as per the impure version of the view – this will be discussed in Section 4.3.

explained phenomena are functional or structural, whereas consciousness is not, and therefore one cannot generalize from the former to the latter.

In addition to the problems of physicalism and dualism, dual-aspect monism also avoids the problems of subjective idealism, since in taking the physical world as observer-independent and as having the exact structure described by physics, it can be regarded as a form of realism about the physical world – though this is more rarely emphasized (given the low popularity of subjective idealism compared to dualism and physicalism).[55]

4.2.3 The Argument from Non-emergence

In addition to the argument from the intrinsic nature of the physical and the argument from "solving two problems at once," there are two additional arguments especially worth noting.[56]

The first is the argument from non-emergence. This argument claims that consciousness cannot emerge from anything purely physical, or from putting together physical entities, such as particles, in the right way. But our own consciousness seems to emerge from particles in the brain. It follows that these particles cannot be purely physical but must rather have been fundamentally conscious or protoconscious all along. A stronger version of the argument claims that consciousness cannot emerge from anything *non-conscious*, or from putting together non-conscious entities in the right way. It follows that fundamental particles must be conscious, rather than merely protoconscious.

The weak version of the argument is discussed but ultimately rejected by Nagel (1979), even though he cannot say exactly how it goes wrong, because he regards the pan(proto)psychist conclusion as too implausible (he also briefly invokes a version of the combination problem, to be discussed below).[57] The strong version of the argument is both defended and endorsed by Strawson (2006b).

Both Nagel and Strawson claim that consciousness cannot be constituted by the physical, in view of the epistemic gap or closely related considerations. If it emerges from the physical, it must therefore be by something akin to causal production, or in accordance with a dualist psychophysical law.[58] Against this,

[55] Phenomenalism is usually ignored as well, but dual-aspect monism avoids both its problem of ungrounded dispositions (by grounding them in the (proto)mental) and the problems it shares with dualism.

[56] Other important arguments, that are nevertheless less central to the current debate and so will be skipped here, include the argument from continuity (James 1890, pp. 146–150; Goff 2014) and the argument from causation (Mørch 2018, 2019a) – though the latter will be briefly discussed as a possible response to the objection from pure dispositionalism in Section 4.4.2.

[57] Much later (2012), Nagel endorses a kind of panpsychism after all, but based on different arguments (which do not clearly fit the general picture of dual-aspect monism so will be set aside here).

[58] Nagel is explicit about this point; Strawson less so but can interpreted as implicitly endorsing it.

they both invoke considerations similar to those figuring in the interaction problem (Section 2.2), according to which such causal relations between the mental and the physical would be unintelligible and hence impossible. Nagel similarly claims that it's unintelligible how any physical process can necessitate consciousness (and that causation must involve necessitation, rather than effects merely "following" causes, as per the Humean view that, as noted, can also be invoked against the interaction problem). Strawson claims, also similarly, that the emergence of consciousness from the physical would be an instance of *brute* emergence, understood as emergence that is unintelligible in principle (or "unintelligible even to God," as he puts it), because there is simply nothing about the physical – if understood as completely devoid of consciousness – in virtue of which consciousness could emerge.

Note that this argument supports panpsychism (given the strong version) or panprotopsychism (given the weak version) understood simply as the view that fundamental physical entities are conscious or protoconscious, but not necessarily the dual-aspect versions, according to which fundamental physical entities are conscious or protoconscious specifically *because* this is the intrinsic nature of their physical structure.[59] But the argument is still compatible with dual-aspect monism (and this is also the version of panpsychism Strawson endorses).

4.2.4 The Argument from the Integrated Information Theory

Another argument for panpsychism (in this case, panprotopsychism is not included) derives from the Integrated Information Theory (IIT), a neuroscientific theory of consciousness developed by Giulio Tononi (later joined by Christof Koch and others) (Tononi 2008; Tononi, Albantakis, and Oizumi 2014).

The central claim of the theory is that consciousness is correlated with *maximal integrated information*, or maximal Φ ("*phi*") for short, which is a structural property with a precise mathematical definition. In short, everything that has maximal integrated information is conscious, and the higher the integrated information the higher the level of consciousness.

[59] That is, pan(proto)psychists could in principle take (proto)mental and physical properties to be related in other ways. For example, one might endorse a dualist version of panpsychism, according to which the fundamental psychophysical laws dictate that all physical things have mental properties or are connected to mental substances, or a physicalist version, according to which consciousness is constituted by a ubiquitous physical property (such as energy, or integrated information, as will be discussed in the next subsection). Non-dual-aspect versions of pan(proto)psychism cannot be supported by the arguments from the intrinsic nature of the physical or "solving two problems at once," and have no clear advantages compared to non-pan (proto)psychist versions of dualism or physicalism, so there is little reason to endorse them.

Very roughly,[60] information (as IIT defines it, which is quite different from how it is otherwise defined) is as a measure of the extent to which a system causally constrains its own past or future state (i.e., how much can you tell about the next and previous state of the system by looking only at the system itself, ignoring external influences?), and *integration* is as a measure of the extent to which this information depends on the causal interconnections between the system's parts (i.e., by cutting the system in two, thus severing the connections between the two parts, how much information in the previous sense is lost?). Finally, a system has *maximal* integrated information or Φ if it has more integrated information than any overlapping system, that is, any of its own parts or any larger system it is itself a part of.

The brain contains very high levels of Φ, especially in those areas that (according to IIT's proponents) appear necessary for consciousness. But small amounts of Φ can also be found at the level of fundamental physics, for example, in protons and neutrons (Koch 2012). It follows that these particles have a small amount of consciousness – unless they are part of a larger system with even higher Φ (such as a brain, cell, or molecule) which would then be conscious instead. IIT thereby implies panpsychism, or at least something quite close.[61] As with the argument from non-emergence, this panpsychism need not be of the dual-aspect sort, but it can be.[62]

Still, IIT is a controversial theory, both in view of the empirical (i.e., experimental and observational) evidence and for various theoretical reasons (see, e.g., Aaronson 2014; Bayne 2018a). An argument for panpsychism based on it would therefore be hostage to the empirical evidence turning out in its favor, and perhaps some further clarification and defense of its theoretical foundations.

4.3 Versions of Dual-Aspect Monism

Dual-aspect monism comes in different versions. We have already distinguished the panpsychist from the panprotopsychist version. Panprotopsychism can be further subdivided into different types based on their specific accounts of the

[60] For a more elaborate non-technical introduction to IIT, see Mørch (2017b).

[61] Note that Tononi and Koch (2015) deny that IIT leads to panpsychism, but they understand panpsychism as the view that all thinkable things (including tables, chairs, and rocks) are conscious in the sense of having *unified* consciousness (or in other words, as implying universal combination as discussed in Section 4.4.1). Integrated Information Theory clearly implies panpsychism in the more restrictive sense that all things are either (1) conscious, (2) made of conscious parts, such as conscious particles, or (3) itself part of a larger conscious whole – or at least something quite close. The main reason why it is only close is that whereas some fundamental particles, such as quarks, are never found in isolation and will therefore always be part of systems with some Φ and therefore some consciousness, other particles, such as photons, can be found in isolation and might therefore have no Φ and no consciousness. However, IIT as it stands is not really defined to apply to fundamental physics and it might therefore be possible to interpret it implying that even isolated particles have some Φ.

[62] At least with certain modifications – see Mørch (2019b, 2019c) for some obstacles to combining IIT with dual-aspect panpsychism as IIT currently stands and ways to modify IIT to enable it after all.