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S.I.: FORM, STRUCTURE AND HYLOMORPHISM

Circumnavigating the causal pairing problem with hylomorphism and the integrated information theory of consciousness

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Abstract
The causal pairing problem allegedly renders nonphysical minds causally impotent. This article demonstrates how a dualist view I call *neo-Thomistic hylomorphism* can circumnavigate the causal pairing problem. After explicating the problem and hylomorphism, I provide an account of causal pairing that appeals to a foundational tenet of hylomorphism. Subsequently, I suggest that a prominent view of consciousness in theoretical neuroscience—the integrated information theory—can learn from hylomorphism and likewise account for causal pairing.

Keywords Mental causation · Causal pairing problem · Hylomorphism · Integrated information theory

When Dennett (1978, p. 252) assessed the field of philosophy of mind in the second half of the twentieth century, his evaluation of dualism was rather unflattering:

> Since it is widely granted these days that dualism is not a serious view to contend with, but rather a cliff over which to push one's opponents, a capsule 'refutation' of dualism, to alert if not convince the uninitiated, is perhaps in order.

Dennett's (1978, p. 252) capsule refutation claims dualists have two bad options: accept epiphenomenalism or Cartesian interactionist dualism. Either way, dualism comes with an "exorbitant price," concluded Dennett (1978, p. 252). Aware that mental causation poses a challenge for dualism, many philosophers agreed.

However, by the end of the twentieth century it became clear that physicalism, too, must face its own troubles regarding mental causation (see Kim 1993, 2000). Two decades after Dennett's assessment, in 'A Return to Form in the Philosophy of Mind' John Haldane (1998, p. 257) noted an ironic shift in the field: "dualism has

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to be contended with." Motivated by reconsiderations of dualism, Kim (2005, p. 70) argued that dualism will only make matters worse when it comes to the problem of mental causation. According to Kim, mental causation is impossible for nonphysical minds because they cannot be causally paired with physical effects. This is dualism's causal pairing problem.

My aim in this article is to demonstrate how a dualist view I call *neo-Thomistic hylomorphism* can circumnavigate the causal pairing problem. To accomplish this objective, I will first explicate the causal pairing problem as articulated by Kim. Then neo-Thomistic hylomorphism will be presented in the second section. Section three focuses on how a foundational tenet of hylomorphism provides a way to account for causal pairing. Yet, other dualist might learn from this account and likewise pair nonphysical mental causes with physical effects. Therefore, in section four, one such example is given. I suggest that a prominent view of consciousness in theoretical neuroscience—the integrated information theory of consciousness (for brevity IIT)—can learn from hylomorphism and similarly account for causal pairing. The causal pairing problem arises for any dualist view that claims the mental is nonphysical and yet causes physical effects. Throughout this work I will often use the term 'dualism' broadly, referring to views that fall under the category of either property dualism or substance dualism.

1 Causal pairing problem

To begin with, let us distinguish and then clarify the causal pairing problem. It is often thought that dualism alone faces a problem regarding mental causation. However, in the first chapter of *Physicalism, Or Something Near Enough*, Kim (2005, p. 9) notes:

> What is new and surprising about the current problem of mental causation is the fact that it has arisen out of the very heart of physicalism. This means that giving up the Cartesian conception of minds as immaterial substances in favor of a materialist ontology does not make the problem go away. On the contrary, our basic physicalist commitments, as I will argue, can be seen as the source of our current difficulties.

In this chapter apparently written by a physicalist for physicalists, entitled 'Mental Causation and Consciousness: *Our* Two Mind–Body Problems,'[1] Kim goes on to discuss the causal exclusion problem and the difficulty of reducing phenomenal consciousness, or qualia. The latter is the well-known challenge of finding a place for consciousness in a purportedly purely physical world. The former, the exclusion problem, allegedly excludes the mental from having a genuine causal role given that physical properties do all the causal work in a physical world closed off from nonphysical causes.

[1] Italics original.

These two problems produce a conundrum. On the one hand, the apparent irreducibility of qualia tempts some physicalists to move toward non-reductive physicalism. But on the other hand, the exclusion problem shows that any card-carrying physicalist, who would agree with mind–body supervenience and the causal closure of the physical domain, must acknowledge that what is irreducible to fundamental physics must be epiphenomenal.[2] Therefore, Kim advocates for reductive physicalism. But by the end of *Physicalism, Or Something Near Enough* Kim himself cuts the causal cord and surrenders the nonphysical "mental residue"—that is, the qualia he finds irreducible—to epiphenomenalism.

Yet before arriving at his concluding position in the final chapter, Kim addresses an alternative route in chapter three, entitled 'The Rejection of Immaterial Minds: A Causal Argument.' At the outset, he acknowledges that the aforementioned predicament has apparently "injected new vigor" into nonphysicalist, dualist projects (2005, p. 70). So he considers whether dualism will provide any relief from the physicalist's problems regarding mental causation and consciousness. With respect to mental causation, he argues that dualism offers no help and makes matters worse (2005, p. 71). His assessment rests on the causal pairing problem (Kim 2005, Ch. 3; 2009).

As Kim (2000, p. 29) reminds us, "philosophical problems do not arise in a vacuum" but emerge from our philosophical commitments that apparently conflict with one another, while individually demanding our respect. Kim argues that the causal exclusion problem arises for physicalists given the doctrines of mind–body supervenience and the causal closure of the physical domain, which any good physicalist ought to adhere to (see Kim 1993, p. 209; 2005, pp. 13, 22; 2011, Ch. 7). As the exclusion problem arises for the physicalist given her physicalist commitments, a different problem arises for the dualist who has different commitments. A failure to recognize this may be why philosophers and neuroscientists interested in consciousness often gesture to "*the* problem of mental causation" which is often assumed to spell trouble only for dualists. But this misunderstanding evaporates when one sees that different commitments essential to different views of the mind lead to different problem*s* regarding mental causation.[3]

Dualists not committed to mind–body supervenience or causal closure, which physicalists are committed to, do not face the exclusion problem physicalists face. Given a denial of these tenets logically consistent with a dualist view, the exclusion problem doesn't arise.[4] Some physicalists might think a principle such as causal closure is an undeniable fact supported by modern science (cf. Papineau 2011). Yet substantive criticisms of the rationale for the principle have been given and some philosophers have argued there is reason to think it's false (see e.g. BonJour 2010; Lowe 2003, 2013; Plantinga 2007, 2008; Swinburne 2019).[5] However, the causal pairing problem arises precisely due to a denial of causal closure that mixes the

[2] For further discussion of the exclusion problem, supervenience, and closure, see Sect. 4.

[3] Another problem not discussed here is the lack of psychophysical laws related to Donald Davidson's anomalous monism (see Davidson 2001a, b; Glüer 2011, Ch. 6; Owen 2018b, Ch. 3).

[4] Lowe (2000) argues for an emergent dualist position that's allegedly consistent with causal closure.

[5] See also Owen (2018b, Ch. 3).

nonphysical with the physical in a single causal chain (cf. Kim 2000, p. 37). Some dualists accept closure and therefore do not face the pairing problem. But, like non-reductive physicalists, they face the exclusion problem. In section four we will revisit the exclusion problem when considering philosophical commitments pertaining to IIT.

Given the problems confronting physicalists due to commitments essential to physicalism (see Kim 2001; Owen 2015), dualists should accept such tenets only on the basis of a good argument that doesn't presuppose physicalism. Arguably the best argument for causal closure, though it is not often presented as such, appeals to the very nature of causation that allegedly precludes nonphysical causes from producing physical effects (cf. Kim 2011, pp. 214–215; Tiehen 2015, section 7). In other words, the best argument for causal closure is Kim's argument for the causal pairing problem, which implies that the very nature of causation precludes nonphysical causes. And since his argument for the pairing problem doesn't assume causal closure and supervenience, two physicalist doctrines, the problem is far more potent. Simply put, the causal pairing problem is dualism's Annapurna.

Fundamental to the causal pairing problem is the idea that causation requires a pairing relation between a cause and its effect. But unfortunately for dualism there is no possible relation that could pair a nonphysical mind with an effect, argues Kim. After all, spatial relations are the only type of relation that could possibly pair causes with effects. Yet nonphysical minds (or nonphysical mental states) are not spatial, and thus cannot stand in spatial relations. And since spatial relations are the only type of causal pairing relations, nonphysical minds can't stand in causal pairing relations. Hence Kim (2005, p. 92) concludes that mental causation is impossible for nonphysical minds. This impossibility is due to the nature of nonphysical minds and the nature of causation; thus it can be called a metaphysical impossibility.[6]

To illustrate his fundamental point, Kim (2005, p. 76) provides a helpful example. It includes two individuals, Smith and Jones, who are psychologically synchronized. Whenever Smith wills to raise his hand, Jones wills to raise his hand as well, and vice versa. Accordingly, their hands always rise simultaneously. Given this sorry scenario, a question arises: Why is Smith's willing causally paired with his hand rising, not Jones's, and vice versa? If minds are spatial then they can stand in spatial relations to their bodies. And such spatial relations can serve as causal pairing relations between a mind and its body. But nonphysical minds are not spatial, and therefore they cannot stand in cause-effect pairing relations. Consequently, if dualism is true we cannot say why Smith's mind is causally paired with his body and not Jones's, and vice versa. Kim's argument for dualism's causal pairing problem can be formally presented as follows:

(1) For every case of causation there is a cause-effect pairing relation between cause and effect.
(2) All cause-effect pairing relations require spatial relations.

[6] Bailey et al. (2011, p. 350, footnote 3) likewise interpret Kim.

(3) An entity/event must be spatial to stand in any cause-effect pairing relation (from 2).
(4) Nonphysical minds are not spatial.
(5) Nonphysical minds cannot stand in any cause-effect pairing relation (from 3; 4).
(6) Therefore, mental causation is impossible for nonphysical minds (from 1; 5).

Hylomorphists might respond to this argument in various ways.[7] One response is to claim hylomorphism is no dualist view and therefore it doesn't face the causal pairing problem. Certainly, some versions of hylomorphism are not dualist views and therefore their adherents need not address the pairing problem. Rather, they face different problems regarding mental causation (see Jaworski 2016, forthcoming). For better or worse, the version of hylomorphism I find most plausible and present in the following section seems incapable of avoiding the dualist label without being disingenuous. That said, it presents a route of response (presented in section three) to Kim's argument that denies premise two based on a foundational tenet of hylomorphism.

2 Hylomorphism

"Cartesian dualism has clear and unassailable pride of place as the whipping post on which dualists are ritualistically flailed" (Oderberg 2005, p. 71). When it comes to critically analyzing dualism, Descartes's mind–body view is almost always at center stage, or at least a caricature of it. Following the lead of other hylomorphic dualists such as Oderberg (2005) and Moreland (2018), I will depart from such orthopraxy and focus on a non-Cartesian dualist view I call *neo-Thomistic hylomorphism*. I call the view 'Thomistic' assuming that it is most appropriate to accredit the foundational ideas to Aquinas, who relied on Aristotle. I call it *neo*-Thomistic since I do not wish to suggest it is identical to Aquinas's view.

Like Descartes, who thought matter is spatial, Aquinas (ST 1a 3.2sc) thought: "dimensive quantity is the first property of matter."[8] And referencing Augustine (De trinitate VI.6.8) as an epistemic authority, Aquinas points out that "the soul is said to be simple relative to the body 'because it is not spread out in bulk over the space of some area'" (ST 1a 75.1sc). Hence the rational human soul is "nonbodily" and not composed of matter (see Aquinas, ST 1a 75.2c; 75.5). Once again, it seems this immaterial, or nonphysical, soul lacks the spatial extension needed to be causally paired with physical effects. Yet, as will become apparent in due course, the Thomist can circumnavigate the causal pairing problem given the hylomorphic idea that the soul is the form of the body. But a prerequisite for this to become apparent is an adequate grasp of hylomorphism. Therefore in this section I provide a brief

[7] For responses that do not appeal to hylomorphism, see Audi (2011), Bailey et al. (2011), and Rodrigues (2014).

[8] When citing Aquinas, I use the following acronyms to reference his works: (ST) *Summa Theologiae*, (SCG) *Summa Contra Gentiles*, and (QDA) *Questions on the Soul*.

overview summarizing neo-Thomistic hylomorphism using key Aristotelian terms and concepts, which I then further explicate throughout the remainder of this second section.

2.1 Brief overview: neo-Thomistic hylomorphism

Fittingly, *hylomorphism* is a compound Greek word that conveys the idea of a composite of form and matter. The Greek word 'hyle' means *matter*, while the word 'morphe' means *form*. Put the two together and you get 'hylomorphism.' As the words 'hyle' and 'morphe' together amount to 'hylomorphism,' a real form and matter together constitute a concrete hylomorphic object. In the case of a material substance, a substantial form unites matter that is the physical material constituting the substance. The matter is united by the form that en-forms it.

According to neo-Thomistic hylomorphism, a complete human person is a single material substance naturally consisting of a substantial form that en-forms matter.[9] The human soul is the substantial form that en-forms matter constituting the body (Aquinas ST 1a 76.1c). As the form of the body, the soul grounds the body's unity and essence, and thus its existence (ST 1a 76.3c, 76.7c). The soul is united to its body via this grounding relation, which I call an *en-forming relation* (see Sect. 2.4). Put differently, the soul is united to its body as its form (ST 1a 76.1c, 76.6c, 76.7c). Therefore, contra Platonism, no accidental or contingent relation such as mover to moved is needed to unite soul and body (see Aquinas QDA 9c; Stump 2003, p. 194). On this view, human nature includes the body, a biological organism unified by a soul that is naturally the form of the body, grounding its unity and essential properties and powers.

The human soul is not a powerless abstract object tantamount to a "free-floating shape" (Pasnau 2012, p. 353). The soul is a powerful entity and due to human nature it depends on the body to manifest its powers (see ST 1a 76.5c). Like God and angels, the nature of human persons is rational but it is also sensory, like animals, according to Aquinas (see SCG II.46, 57; ST 1a 89.1c & 75.7 ad 3). Given this, and that he followed Aristotle's thought that the body is required for the soul to sense, Aquinas considered the body necessary for human persons to operate consistently with their nature and therefore essential to human nature (see SCG II.57, ST 1a 84.4c, 89.1c, 75.4c, 75.7 ad 3).

Since the body is an aspect of the soul, according to neo-Thomistic hylomorphism, an embodied soul has physical properties in a derivative sense.[10] Yet, a controversial element of the view is that the soul is a substance that is not reducible to the body it en-forms. In this way, the soul is a nonphysical substance even though it has physical properties that are the properties of the body it en-forms. Although this

[9] Regarding 'en-forming' and 'material substance' see Sect. 2.4.

[10] Compare to Moreland's (2015, p. 201) description of the body as a mode and Lowe's (2009, p. 68) description of non-Cartesian substance dualism.

dualist view suggests a controversial interpretation of Aquinas, I will not be defending it in this article on exegetical grounds since that is not my present aim.[11]

In this introduction I have employed key hylomorphic terms, which need elucidation if they are to be useful for contemporary philosophers of mind. These terms will now be explained using more contemporary metaphysical terminology. First *substance* will be briefly distinguished from *aggregate* and then the Aristotelian notion of a *form* will be discussed before we consider what I call an *en-forming relation*.

2.2 Key terms: substance versus aggregate

According to Aristotelian metaphysics, there are substances and aggregates. A tiger is a substance. A pile of logs is an aggregate. On the hylomorphic view I am advocating a human person is a substance, not an aggregate. Elsewhere I have provided an accessible explication of substances and aggregates, their differences, as well as their relevance to the integrated information theory (see Owen 2019, pp. 169–170). So here I will simply outline the differences.

There are three important differences between substances and aggregates. First, substances are more ontologically fundamental than aggregates since aggregates are composed of substances whereas substances are not composed of further substances (Inman 2018, pp. 102–106). Second, the parts of a substance (if it has parts) only have existence as a part of the whole substance, whereas the parts of an aggregate have existence that is independent of the whole aggregate. Thus the parts of substances cannot exist apart from the whole substance they are a part of, whereas the parts of an aggregate can exist apart from the aggregate they are a part of.

Third, and most importantly, substances have an internal unity aggregates lack (cf. Marmodoro and Page 2016, pp. 6–7). This is because *one single form* called a 'substantial form' grounds the existence and essence of a substance and all its parts. By contrast, the parts of an aggregate are themselves substances, each having *their own individual substantial forms* that ground their own individual existence as the kind of substance they are. So an aggregate depends on the substantial forms that ground the existence of its parts, which are substances, as well as the form that modifies the parts in a way that unites the parts into one aggregate. Such a form is not a substantial form that internally unifies a substance, but rather an accidental form. This brings us to forms.

2.3 Key terms: accidental forms versus substantial forms

As alluded to above, according to Aristotelianism there are accidental forms and substantial forms. If an accidental form is what comes to mind when one considers

[11] For relevant commentary on this issue in other works, see Feser (2009, pp. 162–163), Pasnau (2002b, p. xvii), Madden (2013, Ch. 8), and Stump (2003, pp. 212–216). See also Aquinas (ST 1a 75.2sc) and Pasnau's (2002a, p. 225) commentary.

the hylomorphist's claim that the soul is the form of the body, misunderstanding will abound, since the soul is a substantial form.

Examples of accidental forms, which modify already existing entities, are the whiteness of a bench, the temperature of a body of water, and the firmness of a mango. Notice these forms do not ground the essence or existence of what they modify. The bench could become pink and still exist as a bench. The water could change its temperature without ceasing to exist as water. The mango could become softer as it ripens while continuing to be and continuing to be a mango. Each entity could exist as what it is without the specified accidental form, as accidental forms do not ground the essence or existence of what they modify. In contrast, a substantial form grounds the existence of the substance it en-forms.

According to Aquinas, a substantial form grounds the existence and essence of the whole substance it en-forms, including each of its parts (see ST 1a 76.8c; Brown 2005, Ch. 4; Marmodoro and Page 2016). Since the one substantial form of a substance grounds the existence and essence of all its parts, the substantial form internally unifies the substance. All the parts share the same substantial form which grounds their existence and essence. Speaking of the unity a substance has due to its one substantial form, Aquinas writes: "For nothing is unconditionally one except through the one form which that thing has existence, because a thing's being existent and its being one thing come from the same source" (ST 1a 76.3c). And since the substantial form grounds the whole substance including its parts, the substantial form is ultimately what grounds what essential properties and powers (or, capacities) the substance and its parts have and develop. Since the soul is a substantial form, it will be helpful to further explicate the relation a substantial form stands in to the matter it en-forms, which is central to my account of causal pairing.

2.4 Key terms: en-forming relation

As mentioned above, according to Aquinas, the human *soul* is immaterial, or non-physical. However, a complete human *person* is a material substance—hence the human body. A material substance consists of a substantial form that en-forms matter. I use the phrase 'en-forming relation' in reference to the relation the substantial form and the matter of a material substance stand in. This section discusses the nature of this relation.

When a substantial form en-forms matter, the form and matter stand in an en-forming relation. This relation, on my view, is an explanatory relation that is *not* causal.[12] Rather, this non-causal explanatory relation is a grounding relation.[13] The type of explanation grounding provides is distinct from scientific explanation or

[12] Some would say it is causal because while it is not efficient causation it is formal causation. Aristotle claimed in *Physics* "…things are called causes in many ways…" (195a 4). Hence his four causes. However, today there's a "…modern general conceptual commitment that only efficient causes are causes" (Marmodoro 2014, p. 221). Assuming such a commitment, an en-forming relation is not causal since it is not a relation of efficient causation.

[13] The claim is that the en-forming relation is a grounding relation, not that all grounding is relational.

causal explanation; it provides metaphysical explanation (Fine 2012, p. 37).[14] To elucidate this type of explanation two examples will be given and then the concept of grounding will be applied to the en-forming relation.

For the first example, imagine a halfpipe that is decorated with graffiti at the Burnside skatepark in Portland. Suppose someone spray painted a white, red, and black image of a bloodshot eyeball onto its surface. Thus the halfpipe is colored. One could explain why it is colored by referring to the graffiti artist's actions and the cans of spray-paint used to produce the effect of the skatepark feature being covered in white, red, and black paint. Such a causal explanation would be what most people are interested in.

But a non-causal metaphysical explanation could also be given for why the halfpipe is colored given that it is dressed in white, red, and black paint. The metaphysical explanation is that the halfpipe is white, red, and black and white, red, and black are colors, and therefore the halfpipe is colored. Put differently, the halfpipe is colored in virtue of being white, red, and black. The reality that (*a*) the halfpipe is white, red, and black grounds (*b*) the reality that it is colored.

It is important to notice several things about the grounding of *b* in *a*. First, there is *asymmetry*. It is the case that *a* grounds *b*, but *b* does not ground *a*. After all, *b* does not explain *a*, since *b* could be true and *a* could be false. The halfpipe could have been painted different colors and *b* would be true in that case as well. Second, related to this asymmetry is *dependency*; *b* depends upon *a* but not vice versa. Third, notice that *a* is *explanatorily prior* to *b*. We can assume that *a* and *b* became actual simultaneously, and therefore *a* is not temporally prior to *b* which we could assume if *a* provided the causal explanation of *b*. So the sense of priority that's relevant is not causal but rather explanatory. It is not that *a* is temporally prior to *b*, it's explanatorily prior. Given that *a* is true, *b* is true. The former explains the latter. This notion of non-causal priority is fundamental to grounding (see Correia and Schnieder 2012, p. 1).

Now, let's entertain a second example involving David Beckham, assuming he is at present a football player on the Manchester United football team. If we wanted to explain why Beckham is a Manchester United football player, we might give several different kinds of explanations. We could appeal to the lucrative salary he was offered to play for Manchester United and the psychological influence that had on him, which led to his decision to sign with Manchester United. We might call this an economic or psychological explanation. We also might give a physical explanation, such as he is wearing a Manchester United jersey and he is passing the ball to other Manchester United players.

Yet, a metaphysical explanation could also be given. Such as, Manchester United is a football team consisting of a set of twenty football players and Beckham is a member of this set. In other words, Beckham is a Manchester United football player

[14] Some argue grounding is a type of causation (see, e.g. Wilson 2017). If so, my account of causal pairing below appeals to a more fundamental type of causation to pair cause and effect in cases of a less fundamental type of causation. One might call the former metaphysical causation and the latter efficient mental causation.

in virtue of being a member of a set that the Manchester United football team consists of. The reality that Beckham is a member of the set constituting the Manchester United team grounds the reality that Beckham is a Manchester United football player. Notice that this does not give us a causal explanation of why Beckham is a Manchester United player. It gives us a metaphysical explanation in terms of grounding.

Suppose further that we wanted to know why Beckham is a professional football player. Once again we could give a metaphysical explanation in terms of grounding. That is, Manchester United is a professional football team and Beckham is a Manchester United player and therefore he is a professional football player. So the reality that (*A*) Beckham is a member of the set of players that Manchester United consists of grounds (*B*) the reality that he is a Manchester United player, which grounds (*C*) the reality that he is a professional football player. Here the fact that grounding can be transitive becomes relevant (see Correia and Schnieder 2012, p. 8). In this example, *A* grounds *B* and *B* grounds *C*, so *A* grounds *C*.

In sum, the type of explanation grounding provides is distinct from scientific and causal explanation. Grounding provides metaphysical explanation. Furthermore, grounding is asymmetric, it involves asymmetric dependence where what is grounded depends on what grounds it, and what grounds is explanatorily prior to what is grounded. And in some cases grounding is transitive.

There is much more that can be said about grounding and there are issues that different proponents of grounding might disagree on. One issue, for example, is how grounding relates to modality. If *x* grounds *y*, is *y* necessary in every possible world that includes *x*? Or, is it possible for *x* to exist without *y* even though *x* grounds *y*? Different proponents of grounding have different views about whether or not grounding includes necessity (cf. Audi 2012; Chudnoff 2011). Another topic of disagreement is whether or not grounding is analyzable in non-grounding terms or whether it is primitive and unanalyzable. Most proponents of grounding, but not all, think grounding is primitive and unanalyzable (Bliss and Trogdon 2016, section 2; Correia and Schnieder 2012, p. 13). The claims I'm defending do not require any particular position on these issues.[15]

Having introduced grounding, let us return to en-forming. The en-forming relation between a substantial form and the matter it en-forms is a grounding relation. Suppose substantial form *x* stands in an en-forming relation to *y*, then *x* grounds *y* because en-forming is grounding. The non-causal en-forming relation between a substantial form and matter is an instance of grounding. The form grounds the existence of the matter it en-forms.

Aristotelian metaphysics includes the concept of 'prime matter,' which is matter that's not en-formed and therefore doesn't exist. Matter, on the other hand, does

[15] In Sect. 3.1 it's claimed that a person's body necessitates their soul en-forming it since the particular soul grounds the existence of the body it is the form of. This is a claim about the en-forming relation applied in this work to causal pairing, not all possible grounding relations. The necessity is also in the opposite direction of the debated necessity discussed in this section; the body necessitates the soul that grounds its existence as its substantial form.

exist and it exists in virtue of being en-formed, but it never exists as undifferentiated matter. It exists as matter of a particular type of material object. In the case of a material substance, the material entity that consists of the en-formed matter is a unified entity of a particular kind. In Aristotelian terms, the material entity is a unified entity with a particular essence. And this unified material entity exists in virtue of being en-formed by a substantial form. That is, the substantial form grounds the material entity's existence. And the form grounds the material entity's existence in virtue of the substantial form grounding the unity and essence of the matter that the material entity consists of. So there's a transitivity of grounding as follows. The substantial form grounds the unity and essence of the matter, and therefore it grounds the existence of the unified material entity of a particular kind.

According to the fundamental principle of a hylomorphic human ontology, the soul en-forms the body. The human soul stands in an en-forming relation to the matter it en-forms. The en-formed matter is the body. In light of our foregoing discussion, we can also describe this en-forming relation the soul stands in to the body in terms of grounding. In short, the soul grounds the body. That is, the soul grounds the existence of the body. This is in virtue of the soul grounding the body's unity and essence. Allow 'S' to stand for Socrates's soul and 'B' to stand for his body, which is a unified entity that's a particular kind of thing, i.e. a human body. S *en-forms* B means S *grounds the existence of* B. And S grounds the existence of B because S grounds B's unity and essence. Having now explicated the en-forming relation, I will apply it to causal pairing.

3 En-forming causal pairing

This section presents a hylomorphic account of causal pairing that circumnavigates the causal pairing problem.[16] Briefly stated, the proposed account says a person's soul is causally paired with her body via the en-forming relation her soul stands in to her body. Given this, the hylomorphist can justifiably deny Kim's second premise, which entails his third, while agreeing with his first and fourth premises (see Sect. 1).

Recall that the causal pairing problem says that if dualism is true mental causation is metaphysically impossible. This impossibility is said to arise because nonphysical minds, or souls, are nonspatial. Such nonspatiality is critical because spatial relations are allegedly the only relations that could possibly pair mental causes with effects. Thus nonphysical, nonspatial minds cannot stand in causal pairing relations. Hence they are disqualified from all causal work, including mental causation. That is the problem. And it hinges on Kim's second premise—all cause-effect pairing relations require spatial relations—which is true if, and only if, spatial relations are the *only* relations that can pair causes with effects.

[16] Moreland (2018, p. 113) briefly suggests this type of account without developing it; however Moreland's view of the form-matter relationship differs from mine (see Owen 2018a, section 5).

The Cartesian dualist might be inclined to think that a causal pairing relation can be explained by appealing to a relation of mind–body unity. However, according to Kim's reading of Descartes, Cartesian dualism says a person's mind is united to her body via a causal relation (2005, p. 77). In other words, a mind–body relation of unity is explained by a mind–body causal pairing relation. Given that, if Cartesians try to explain a causal pairing relation between one's mind and body by appealing to mind–body unity, they will rely on the very pairing relation that they are attempting to explain.[17] As Kim (2005, p. 77) points out, such an explanation "presupposes mental causation." Consequently, Cartesians can't appeal to mind–body unity to explain causal pairing. For mind–body unity itself is supposedly explained by causal pairing. Since the causal pairing relation is explanatorily prior to the relation of mind–body unity, the latter cannot be appealed to in order to explain the former. Hence the problem for Cartesian dualism, as Kim depicts it.

Neo-Thomistic hylomorphism provides a very different account of mind–body unity. According to Aquinas (ST 1a 76.3c), Plato thought the soul is united to the body as mover to moved. This Platonic view is much like Kim's description of the Cartesian account of mind–body unity. Aquinas (ST 1a 76.1c, 76.6c, 76.7c) explicitly rejected Plato's account (cf. Stump 2003, p. 200) and postulated that the soul is "immediately united to its body as form to matter" (ST 1a 76.7c). Simply put, the soul is united to its body as its form (ST 1a 76.6 ad 3).

The mind, or soul, is *not* united to the body via a causal relation. Rather, the body is en-formed matter, and the form that en-forms that matter is the soul. Therefore the soul stands in an en-forming relation to the matter of the body. The soul is the form of the body. As such the soul grounds the existence of the body as a unified biological organism of a particular kind (i.e. a human body). The soul, qua form, grounds the unity and essence of the body. Without the soul en-forming the body, the body would not exist.

Let us use Kim's character examples Smith and Jones to illustrate the form-matter en-forming relation as it pertains to human persons. According to neo-Thomistic hylomorphism, Smith's soul en-forms his body. This means that Smith's body is a unified entity and has the essential properties and powers it has due to the form that en-forms it—i.e. Smith's human soul. The existence of Smith's body depends on Smith's soul en-forming it. If the matter of Smith's body were not en-formed by Smith's human soul, his human body would not exist. Likewise, Jones's body exists as a unified whole that is his human body since his soul en-forms it. The existence of each person's body is grounded by the human soul that en-forms it. Consequently each person's soul is united to their body as the form of their body.

The critical point for our purposes is: each human soul stands in an en-forming relation to the matter of the body it en-forms. According to this hylomorphic view, the en-forming relation is the most fundamental relation the soul stands in to the body. Moreover, the soul is the form of the body before it is the cause of bodily movements. But let me be clear that I am not speaking here of temporal priority, since that is not my concern. The en-forming relation is explanatorily prior to any causal relation the soul

[17] The Cartesian might alternatively claim the causal pairing relation is fundamental, needing no explanation.

stands in to the body that it en-forms. Given that, we might deduce that no causal relation would be temporally prior to the en-forming relation either. Nonetheless, what's imperative is that the soul stands in an en-forming relation to the body *explanatorily* prior to any causal relation.

Recall that in Kim's (2005, p. 76) thought experiment involving Smith and Jones these two unfortunate individuals are psychologically synchronized. Whenever Smith wills to raise his hand Jones wills to raise his hand too, consequently their hands rise simultaneously. This prompts Kim's (2005, p. 76) vital question: "So why is it not the case that Smith's volition causes Jones's hand to go up, and that Jones's volition causes Smith's hand to go up?" Put differently, why is Smith's soul, and thus his volition, causally paired with the rising of his hand, not Jones's? The hylomorphist has an answer: Smith's soul en-forms Smith's body, not Jones's; therefore Smith's soul is causally paired with his body, not Jones's. On this view, the fact that Smith's soul en-forms Smith's body explains why his volition is causally paired with his hand going up. Basically, his soul is causally paired with his body since his soul en-forms his body. On the other hand, Jones's soul en-forms Jones's body, therefore his soul is causally paired with his body.

It is perfectly fitting that a particular body that's en-formed by a particular soul would be causally paired with the soul that en-forms it. Indeed it would be extremely odd if Donald Trump's soul en-formed his body but was causally paired with Theresa May's body that's en-formed by May's soul. To the contrary, if Trump's soul en-forms Trump's body, we would expect his soul to be causally paired with his body. Hence this hylomorphic explanation easily avoids being ad hoc. The hylomorphist is explaining causal pairing by appealing to the en-forming relation that's absolutely fundamental to a hylomorphic human ontology.

Another benefit of the proposed hylomorphic account is that it avoids circularity. It doesn't presuppose a causal pairing relation that allegedly accounts for mind–body unity in an attempt to explain a causal pairing relation, as Cartesians are accused of doing. For the en-forming relation that the soul stands in to the body is explanatorily prior to causal pairing relations. In the explanatory chain, Smith's soul is united to his body as its form before the question of why his soul is causally paired with his body arises. The very existence of a person's body depends on that person's soul, which grounds the unity of the individual's body as well as its nature. Given that, it is fitting for a person's soul to be causally paired with the person's body.

To summarize, Kim's second and third premises claim that only spatial relations can pair causes with effects and thus entities must be spatial to stand in causal pairing relations. To the contrary, I have argued that another relation is capable of pairing causes with effects—an en-forming relation. The hylomorphist can account for causal pairing by appealing to the en-forming relation a soul stands in to the matter of the body it en-forms. But some might wonder if this merely delays the problem.

3.1 Pairing problem reduxed?

An objection to the proposed hylomorphic account of causal pairing is that it simply pushes the causal pairing problem back one level of inquiry. According to this objection, the account explains why one's soul is causally paired with her body, but

we are then left wondering why one's soul en-forms her body. We started with a causal pairing problem; we are left with an en-forming pairing problem. That is the claim of this objection that charges my account with reduxing, or pushing back, the problem.

In response, there are multiple things to consider. To begin with, it is important to notice that the initial question differs from the follow-up question. At the outset, the question is: What explains why soul *X* is causally paired with body *Y*? My hylomorphic answer is that soul *X* is causally paired with body *Y* because *X* en-forms *Y*. Given this, a different question arises: What explains why soul *X* en-forms body *Y*? In light of my response to the causal pairing problem, this follow-up question arises. Notice, however, that the follow-up question is not the same as the initial question. The new question pertains to Aristotelian metaphysics generally, since all material substances consist of en-formed matter. The initial question, however, is germane to philosophy of mind. Since the two questions being asked at each level of inquiry are different questions that address different issues, it is not true that the initial question is simply being pushed back. Rather, a different question comes into view in light of my hylomorphic explanation of causal pairing.

One might retort that it's equally troubling that my account leads to a further question that differs from the initial one. However, the fact that my hylomorphic explanation does so isn't necessarily problematic either. For such is true of most good explanations. When explanans explain an explanandum we often wonder what explains the explanans. For example, when we discovered that oxygen gets to our working muscles because red blood cells carry oxygen to them, we did not stop asking follow-up questions. Rather, our inquiry moved forward to investigate further questions, such as: Why do red blood cells, rather than other cells, do such? Given this, the physiologist who discovered the initial fact about red blood cells actually progressed our inquiry, so it is no problem that the explanation raised further questions requiring further research. (Many consider that to be a theoretical virtue called *fertility*.) Likewise, if my explanation brings to the fore a new question, that's not necessarily a mark against it. Many good explanations lead to further questions.

Yet, the question 'what explains why soul *X* en-forms body *Y*' can evoke a misleading caricature of the human person as a mereological aggregate consisting of two self-existing parts that are somehow united (cf. Marmodoro 2013, pp. 5–6). Such a caricature is *not* consistent with the hylomorphic view I'm proposing. The body, on this view, is not an entity in and of itself that is then united to the soul that is its form. There are not two individual substances being united into one mereological whole. Rather, there is one material substance consisting of matter that is en-formed by the soul. The en-formed matter is the body, which depends on its soul to exist. The thought of any particular body existing without its particular soul en-forming it is like the idea of the original statue David existing without its shape. Theresa May's body would not exist apart from her soul en-forming it. Theresa May's body existing with Donald Trump's soul en-forming it, is a metaphysical impossibility. In this respect, the en-forming relation is an asymmetric necessary relation, in that a particular body's very existence necessitates it being en-formed

by the particular soul that en-forms it.[18] For her soul is what grounds its existence as what it is—namely, Theresa May's body. So it is not metaphysically possible for her body to be en-formed by a different substantial form and to be her body.

At this point, zombies might make one worry, assuming they are possible. After all, doesn't hylomorphism rule out the possibility that there could be a physical duplicate of May's body that is devoid of consciousness, since her body must be en-formed by her soul that's the bearer of her consciousness? It's true that hylomorphism rules out the possibility that her body could exist apart from her soul, but it does not rule out the possibility of another physical entity with neurophysiological processes resembling those in May's body that's nevertheless devoid of consciousness. However, given it is not en-formed by her soul, such an entity would not be May's body but rather something else—namely, a zombie. And if a zombie were a unified material substance, rather than a mereological aggregate of functioning parts, it would have its own substantial form.

To recap, the hylomorphist can account for causal pairing via the en-forming relation, which is a grounding relation. According to this account, Smith's soul is causally paired with Smith's body rather than Jones's body since Smith's soul en-forms Smith's body, which would not exist without Smith's soul en-forming it. It is possible that other dualists views might similarly account for causal pairing. The following section provides one possible example.

4 IIT & mental causation

A leading theory in theoretical neuroscience called the integrated information theory of consciousness (for brevity IIT) significantly diverges from contemporary paradigmatic ways of thinking about consciousness. Metaphysically, it conflicts with ontological reductionism (Tononi 2017b, p. 630). Epistemically, rather than starting with the brain and asking how consciousness emerges from it, IIT is based on five starting self-evident axioms about the nature of consciousness and infers from these axioms five postulates about the nature of the physical substrate of consciousness (for brevity PSC) (Fallon 2016, section 1.a.i; Tononi et al. 2016, p. 450; Tononi and Koch 2015, p. 5). According to IIT, the PSC exemplifies a structure in the central nervous system that exhibits maximal intrinsic cause-effect power (Tononi et al. 2016, p. 450). This intrinsic causal power is the integrated information that is consciousness, according to the theory. In this section I will first summarize IIT's axioms and corresponding postulates. Then mental causation with respect to IIT will be considered, and I'll suggest how IIT might learn from the above hylomorphic account of causal pairing in order to likewise circumnavigate the pairing problem.

The first axiom of IIT, called *intrinsic existence*, says consciousness exists and is intrinsic to the subject of the conscious experience who has direct epistemic access

[18] This is only a statement about the en-forming relation, which is a grounding relation, that leaves open the possibility that other types of grounding relations do not include such necessity (see Sect. 2.4).

to it.[19] Based on this axiom it is postulated that the PSC must exist and produce intrinsic causal effects upon itself. The second axiom, *composition*, says conscious experience is structured in that it has distinguishing features. Given this, IIT postulates that the constituent elements of the PSC must themselves, or together with other elements, have causal power upon the system. The axiom of *information* says that consciousness is specific in that each experience is distinguished from other conscious experiences due to its distinct phenomenological features. It is postulated from this that the PSC exhibits a cause-effect structure of a specific form that makes it distinct from other possible structures. According to the fourth axiom, *integration*, a conscious experience is a unified whole irreducible to the phenomenal distinctions within it. Thus IIT postulates the cause-effect structure exemplified by the PSC must be unitary and irreducible to non-interdependent causal subsystems. The final axiom, *exclusion*, claims a conscious experience is definite in content, spatial perception, and temporal duration. Thus IIT postulates the cause-effect structure exemplified by the PSC will also be definite, including no more and no less than a set of elements exhibiting causal power on the whole.

The intrinsic causal power that is integrated information which consciousness is identical to, according to IIT, is called *Phi* and represented Φ. Yet, it is the maximal Phi (represented Φ^{max}) in a system that is said to be consciousness. Hedda Hassel Mørch (2019) has recently addressed an objection to IIT rooted in the alleged intrinsicality problem, which amounts to consciousness being intrinsic and the Φ^{max} consciousness is identical to being extrinsic. Mørch suggests the problem can be avoided by denying reductionism. But is the IIT theorist supposed to reject physicalism in favor of dualism? According to Mørch (2019, p. 141), that would not be ideal:

> …most importantly because dualism faces a serious objection from *the problem of mental causation* (Kim 1989; Papineau 2001). According to this problem, there is good reason to hold that the physical world is causally closed: that every physical event (that has a cause) has a sufficient physical cause – including human actions and other apparently mentally caused events. This suggests that, if consciousness were non-physical, it would be epiphenomenal: unable to causally affect the physical world (except as a redundant overdeterminer, a hypothesis that is usually ruled out as ad hoc).[20]

Mørch (2019, p. 157) goes on to provide an alternative to dualism that nevertheless denies reductionism, a version of emergent Russellian monism she calls the fusion view. However, the concern cited by Mørch in the above quote to motivate preference for her monist alternative seems misguided.

Notice that what is referenced is "*the* problem" of mental causation, which is purportedly dualism's problem. But there is not just one problem of mental causation (see Sect. 1). Kim makes this clear in a chapter entitled 'The Many Problems of Mental Causation' in which he presents three problems but focuses on

[19] My summary is informed by Tononi et al. (2016, pp. 450–452), Tononi (2017a, pp. 243–248), and Tononi and Koch (2015, pp. 6–7).

[20] Italics original.

the causal exclusion problem, which he finds unique because "it strikes at the very heart of physicalism" (2000, p. 30). According to Kim, the problem "arises for anyone with the kind of broadly physicalist outlook that many philosophers, including myself, find compelling or, at least, plausible and attractive" (2000, p. 30). After all, a central commitment of physicalism—causal closure—prompts the problem. Hence, Kim (1993, pp. 192–193) writes:

> As we saw, Cartesian interactionism involves violation of the causal closure of the physical, and that was one cause of its downfall. I shall argue that non-reductive physicalism, and its more generalized companion, emergentism, are vulnerable to similar difficulties; in particular, it will be seen that the physical causal closure remains very much a problem within the stratified ontology of non-reductivism. Non-reductive physicalism, like Cartesianism, founders on the rocks of mental causation.

Two central problems in philosophy of mind hinge on causal closure. Again, the causal pairing problem arises given a dualist denial of causal closure that mixes physical and nonphysical causes in one causal chain (cf. Kim 1993, pp. 189–190). On the other hand, the exclusion problem arises for physicalism due to its embrace of causal closure, as Kim (2011, p. 214) highlights via his "exclusion argument."

Some physicalist have thought mind–body supervenience can save mental causation. Yet, Kim's (2011, p. 217) "supervenience argument" forcefully suggests it makes matters worse. He describes supervenience as follows:

> When a mental property, M, is instantiated by something x at t, that is in virtue of the fact that x instantiates, at t, a physical property, P, such that anything that has P at any time necessarily has M at the same time (Kim 2011, p. 218).

Supervenience is thought by many philosophers to entail that any mental property is determined by and depends on its physical base property, which underscores the ontological priority of the physical vis-à-vis the mental (Kim 2011, p. 12). Accordingly, "every mental state is anchored in a physical-neural base on which it supervenes" (Kim 2011, p. 218). Assuming supervenience and causal closure, it seems every mental event depends on a physical event that has a purely physical causal history devoid of any nonphysical cause. Consequently, any mental property that's not physical is excluded from having causal power. The mental that's irreducible becomes epiphenomenal.

Kim's supervenience/exclusion argument is oft debated, and the issues need not be settled here. For our purposes, the upshot is that even foundational tenets of physicalism present the nonreductivist with a predicament (Kim 2005, p. 22). Whether or not Kim is ultimately correct, the exclusion problem cannot be ignored. Like the pairing problem, the exclusion problem must be dealt with by those who hold the commitments that apparently prompt the problem. So whether nonreductivists embrace dualism or cling to physicalism, mental causation will challenge them in the form of one problem or another.

There are several routes for navigating this maze of mental causation. There's *Route 1*: embrace reductive physicalism. This route avoids the exclusion problem and the pairing problem, but the major difficulty along this route is reducing consciousness (see Chalmers 1995, 1996). Recall that Kim prefers Route 1, but what he found irreducible (i.e. qualia) he ultimately surrendered to epiphenomenalism. Another option is *Route 2*: reject reductionism and embrace non-reductive physicalism which is committed to causal closure and supervenience. The risk of this route is that the causal exclusion problem threatens to render irreducible consciousness epiphenomenal. Lastly, there's *Route 3*: embrace dualism and reject physicalism along with its essential tenets of causal closure and supervenience. Of course, along this route travelers must face the pairing problem.

Which route is most promising for IIT? Route 1 is a poor option for multiple reasons. For one, a reductive physicalist version of IIT would seem especially vulnerable to epistemologically motivated objections to reductive physicalism. For example, one might object that if we have direct epistemic access to our consciousness but we do not have direct epistemic access to the physical substrate of consciousness, then consciousness is not its physical substrate since what is true of the former is not true of the latter. IIT's epistemic methodology seems to concede what this type of objection needs. For the starting axioms are allegedly self-evident, as we have direct epistemic access to our consciousness, but the postulates about the PSC form a hypothesis that is not self-evident and requires empirical verification. Secondly, after making a distinction between methodological and ontological reductionism, the architect of IIT, Giulio Tononi (2017b, pp. 630–632) has shown that IIT's existence criterion conflicts with ontological reductionism, which he argues is itself incoherent. Additionally, Tononi (2017a, p. 250) has clarified that his theory says consciousness is identical to a conceptual structure that has maximal intrinsic causal power, and although this structure is manifested in the PSC, it is not identical to the constituent elements of the PSC. This is what makes multiple realizability possible on IIT. While consciousness relies on matter, per IIT, it's not reducible to matter (see Tononi 2012, p. 239). So Route 1 does not look promising for IIT, which can be understood as a version of property dualism (see Koch 2012, pp. 152 and 132).

At first blush, Route 2 appears like a better option for IIT advocates who wish to deny reductionism while nevertheless remaining faithful to physicalism, by at least adhering to the minimal doctrines of closure and supervenience. However, in so far as any position is genuinely consistent with causal closure, the exclusion problem is not easily evaded. And given that IIT is a theory of consciousness including qualia, it cannot afford to surrender that which is irreducible qualia to epiphenomenalism, as Kim did. For the existence criterion of IIT requires that consciousness be causally potent, otherwise it cannot be said to exist (Tononi 2017b, p. 622). Ultimately, if IIT takes Route 2, I am unoptimistic about its chances of evading the exclusion problem (cf. Baxendale and Mindt 2018).[21] That said, I'll henceforth focus on Route 3, which I think is most promising for IIT.

[21] While I don't like IIT's chances with the exclusion problem, a (non-Thomistic) version of hylomorphism which Jaworski (2016) advocates might provide help. However, I doubt his approach to mental causation ultimately maintains causal closure (cf. Jaworski 2016, pp. 280–281).

Route 3 involves embracing dualism, denying reductionism and disavowing causal closure and supervenience. The rejection of reductionism fits with IIT's rejection of ontological reductionism mentioned above. And with regards to supervenience, IIT and physicalism would be quite unequally yoked. For according to mind–body supervenience the physical is fundamental and determines the mental. Accordingly, wouldn't it be most fitting when studying consciousness to start with the brain rather than consciousness, given that the physical is fundamental and determines the mental? But it seems per IIT consciousness is a fundamental aspect of reality (see Koch 2019, Ch. 14). And IIT's method of inquiry starts with the nature of consciousness and then moves to inferences about the brain. IIT's epistemic methodology fits best with consciousness being fundamental and its physical substrate being determined by it, rather than vice versa. Therefore, denying causal closure probably prompts the biggest threat along Route 3. While this denial makes evading the causal exclusion problem possible, it elicits the causal pairing problem (see Sect. 1). Consequently, if the integrated information that is consciousness according to IIT is nonphysical yet causes physical effects, this triggers the problem of causally pairing nonphysical consciousness with physical effects.

However, IIT might be able to circumnavigate the pairing problem by looking to hylomorphism as its guide. There are multiple similarities between IIT and hylomorphism (see Owen 2019). But the one relevant to the causal pairing problem pertains to the relationship of a substantial form to matter (on hylomorphism) and the relationship of information to the PSC (on IIT). Giulio Tononi and Christof Koch have clarified that what is meant by 'information' on IIT is not the idea of passing content. "Instead, IIT refers to 'information' in its original sense, with its root *inform*, meaning 'to give form to'" (Koch and Tononi 2017; cf. Tononi 2017a, p. 248). Likewise, Koch points out: 'Information in the sense of integrated information theory reflects a much older Aristotelian usage, derived from the Latin *informare*, 'to give form to'" (2019, Ch. 14).

If this semantic similarity is indicative of a more substantive metaphysical similarity—i.e. information grounds the PSC as the soul grounds the body—IIT can account for causal pairing in a way that mirrors the hylomorphic account offered above (see Sect. 3). Recall that hylomorphism can account for causal pairing by appealing to the en-forming relation a soul stands in to the matter of the body it enforms, which is a grounding relation. If the relationship between integrated information, or consciousness, and its physical substrate reflects the en-forming relation in that it too is a grounding relation, then IIT has a way to account for causal pairing. Assuming that the information grounds the PSC, the grounding relation could do the pairing job. Why is Smith's conscious intention causally paired with the PSC in his central nervous system rather than Jones's? The IIT theorists could respond: Because Smith's consciousness grounds the existence of the PSC manifesting Φ^{max} in Smith's central nervous system, not Jones's.

Not only would the grounding relation between consciousness and the PSC provide a relation for causal pairing, it would also provide some warrant for IIT's epistemic starting point. Since IIT's line of reasoning moves in the opposite direction of the standard way of thinking about consciousness, it invites scrutiny (see Bayne 2018, p. 2). It's commonly thought in the science of consciousness that physical

facts about the brain should be the starting point, from which inferences about consciousness can be made. This standard approach is more reasonable assuming physicalism's mind–body supervenience, according to which the physical substrate is fundamental and determines consciousness. But if such supervenience is false and instead consciousness is ontological prior to its physical substrate which is grounded by consciousness, it makes sense to start with self-evident axioms about consciousness and then infer postulates about the PSC. Not surprisingly, Aquinas reasoned likewise, starting with the nature of the soul and then making inferences about the body and its "well ordered brain" needed for particular sensory capacities (see Aquinas, QDA 8c; ST 1a 76.5c; Owen 2019, section 4.2).

While IIT and hylomorphism share common ground, they are distinct views with important differences. Therefore, one might worry that the two views are inconsistent in ways that will not allow them to be combined in order to successfully handle the pairing problem. A specific concern pertains to the idea that on IIT a person ceases to exist when unconscious and then regains existence when they return to consciousness; hence Koch (2017) suggests he has "died"[22] many times, whenever he has gone to sleep, and returned upon reawakening.[23] And Tononi (2012, p. 239) suggests that at death consciousness ceases and likewise the soul. Given these inconsistencies with Aquinas's views about the persistence of human persons and the afterlife, a point of clarification is worthwhile.[24]

My proposal pertaining to how IIT can account for causal pairing does not require IIT to embrace hylomorphism. All that's needed is the mental-to-physical grounding relation. The en-forming relation of hylomorphism is a grounding relation in which the soul grounds the existence of the body it is the form of. This is one grounding relation, which is also sufficient to pair a nonphysical mental cause with physical effects. Yet, it seems that IIT can make a similar appeal to a grounding relation between consciousness and the PSC in order to pair a nonphysical mental cause with physical effects. All that's required is that IIT follow hylomorphism's example in this regard.[25]

[22] A charitable reading might take this as hyperbole used to grab the reader's attention. Perhaps support for this interpretation is found in Koch's (2012, p. 20) autobiographical recollection that he often slept soundly and the fact that one can only sleep if one exists. Moreover, IIT is strictly speaking a theory about consciousness, not human ontology. Thus when proponents of IIT share their opinions about human ontology, or the afterlife, such opinions are not necessarily essential to IIT. Not everything scientists say is a part of science or their scientific theories.

[23] I am indebted to an anonymous reviewer for bringing this concern to my attention.

[24] Aquinas thought the human soul persists after bodily death (see ST 1a 75.2c; 75.3c; 75.6c). Yet, one need not necessarily agree in order to embrace the neo-Thomistic hylomorphism outlined in Sect. 1, a view about human ontology, not the afterlife.

[25] While it's not necessary to deal with the pairing problem, one could potentially modify IIT and combine it with neo-Thomistic hylomorphism. Here the Mind–Body Powers model of neural correlates of consciousness (or NCC) informed by Aquinas's human ontology and Aristotelian causation could help (Owen 2018a). The model explains NCC by appealing to mental powers of the soul co-manifested with interdependent bodily partner-powers manifested in the nervous system. IIT theorists could say consciousness is a mental power on the Mind–Body Powers model, while the causal processes in the PSC

5 Conclusion

Dualism's Annapurna regarding mental causation is the causal pairing problem. But a version of dualism—Neo-Thomistic hylomorphism—can circumnavigate the problem by accounting for causal pairing via the en-forming relation fundamental to hylomorphism, which is a grounding relation. Other views might learn from hylomorphism and likewise account for causal pairing, as demonstrated in this article with reference to the integrated information theory of consciousness. Perhaps there are additional dualist views that could mimic the proposed hylomorphic account of causal pairing to their benefit.

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Footnote 25 (continued)
manifests the bodily partner-power. The model, together with the neo-Thomistic human ontology informing it, provides a way for IIT theorists to avoid the view mentioned above about a person going in and out of existence as they vacillate between being conscious and unconscious. The identity and continuity of the person would remain as it's grounded in the soul, which is the bearer of the power to be conscious whether or not it's manifested.

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