

# Physicalism and the Identity of Identity Theories

Samuel Z. Elgin

Key Words: Physicalism, Generalized Identities, Truth-Maker Semantics, Multiple Realizability

## Abstract

It is often said that there are two varieties of identity theory. Type-identity theorists interpret physicalism as the claim that every property is identical to a physical property, while token-identity theorists interpret it as the claim that every particular is identical to a physical particular. The aim of this paper is to undermine the distinction between the two. Drawing on recent work connecting generalized identity to truth-maker semantics, I demonstrate that these interpretations are logically equivalent. I then argue that each has the resources to resolve problems facing the other.

## 1 Introduction

The world is filled with many kinds of things. There are chairs, there are people, there are protons, there are wave functions, and there are planets. There are colors, there are thoughts, there are seemings, there are games, and there are social structures. Even a cursory glance at our surroundings reveals a wide assortment of things, and the world is populated by far more than our senses can observe. Nevertheless, everything is physical. There is nothing so distant in space or in time, nothing so large or so small, nothing so peculiar or so familiar, that it does not fall under the sweeping umbrella of physics. At the end of the day, there are atoms in a void and nothing more.

So says physicalism, anyway. But here a philosophical puzzle arises. If there are chairs, people, and the like, how could there be nothing more than atoms in a void? Chairs are made of many things, but no chair is an atom. It might be tempting to suggest that this straightforwardly falsifies physicalism. But if the presence of chairs subverts the letter of physicalism, it does not affect its motivation. Disembodied minds, if such things exist, are the kinds of things that ought to undermine physicalism—chairs are not. So, how ought we to understand what physicalism amounts to? Quite generally, how must the world relate to physics in order for physicalism to be true?

This is the interpretive question of physicalism. Over the years, philosophers have advanced many potential answers.<sup>1</sup> Some couch their theories in terms of supervenience (e.g.,

---

<sup>1</sup>There is even debate over the extent to which there is an interpretive question—see, e.g., Crane and

Lewis (1986); Kim (1993))—roughly the view that every possible change corresponds to a physical change. Others employ a notion of ground—a relation of metaphysical dependence (e.g., Rosen (2010); Schaffer (2017)). Still others prefer characterizations in terms of causal powers (e.g., Shoemaker (1994); Wilson (1999)). One alternative, which has largely fallen out of favor, is that physicalism ought to be understood in terms of identity. Physicalism concerns that which identical to the physical.

As standardly conceived, there are two varieties of identity theory. Type-identity theorists interpret physicalism as the claim that every property (or, perhaps, every type or kind) is identical to a physical property (or type or kind).<sup>2</sup> For example, the property of *being water* might be identical to the property of *being the chemical compound  $H_2O$* , and the property of *being in pain* might be identical to the property of *possessing firing C-fibers*. Token-identity theorists, in contrast, interpret physicalism as the claim that every particular (or, perhaps, every instance or token) is identical to a physical particular (or instance or token).<sup>3</sup> For example, it might be the case that the event of the defenestration of Prague is identical to a physical event.

I deny any distinction between type- and token-identity theories. The two seemingly distinct versions of identity theory are, I claim, one and the same. Recent developments on generalized identities—which can be interpreted as identity conditions for properties, propositions, and relations—provide the theoretical resources needed to precisify type-identity theory. These identity conditions entail that the formulations are logically equivalent. This equivalence, in turn, resolves canonical problems for identity theory. I do not argue that identity theory is preferable to all other formulations of physicalism. However, the dissolution of its obstacles renders it a leading contender.

I will proceed as follows. In section two, I briefly review the history of type- and token-identity theory, as well as the standard challenges these positions face. In section three, I discuss current developments on generalized identity and truth-maker semantics. I predominantly rely upon Elgin (forthcoming), which argues that sentences of the form ‘To be  $F$  is to be  $G$ ’ are true just in case the finely grained states of affairs that make something  $F$  are the states of affairs that make it  $G$ . In section four, I provide formulations of type- and token-identity theory, and demonstrate that they are logically equivalent, before arguing that each resolves problems facing the other. In section five, I discuss potential modifications and refinements that concern the modal scope of physicalism, before concluding in section six.

Before beginning, a brief note on how this approach aligns with others in the literature.

---

Mellor (1990). I will not do justice to this challenge, but endeavor to address the aspect most relevant to my claim.

<sup>2</sup>For the canonical defense of type-identity theory, see Smart (1959). For the purposes of this paper, I disregard the distinction between properties, types and kinds. I do not believe my claim turns on which of these we select.

<sup>3</sup>For the canonical defense of token-identity theory, see Davidson (1970). As with properties, types and kinds, I ignore any distinction between particulars, instances and tokens.

The strategy, broadly, is to apply metaphysical developments to the philosophy of science (and, since the mind poses the most serious threat to the truth of physicalism, to the philosophy of mind as well). I have no doubt that some philosophers prefer other tacks. Given this method's reliance on particular metaphysical views, it inherits problems that these views face; if the metaphysics falls, theories that depend on it fall as well. Even those without particular metaphysical objections might maintain that this strategy is misguided, either because they are skeptical of metaphysics generally or else because they maintain that metaphysics ought to remain neutral on as much as possible. The very fact that a metaphysical view has implications for the interpretation of physicalism may count against it.

I will not do justice to these methodological challenges here. I myself am not skeptical of metaphysics and assume for the purposes of this paper that it is a field in good standing. Nor am I particularly concerned by the fact that some philosophical positions have implications in other areas. If anything, I see it as a virtue rather than a vice. Theories may regularly, perhaps even systematically, force our hand on an array of philosophical debates. So long as they force our hand correctly, this seems no cost to me.

This paper is far from first to take this approach. A series of papers by Heil (1999, 2011); Heil and Robb (2003), for example, employs an 'ontologically serious' method.<sup>4</sup> They argue that philosophers err in remaining neutral about the ontological status of properties (and, indeed, in holding that they have been ontologically neutral). Some, they maintain, tacitly assume that each predicate corresponds to a unique property. The fact that the predicate 'red' differs from the predicate 'maroon' indicates that there are two properties—*being red* and *being maroon*. This assumption seems dubious. In the first place, it is a natural step from there being a multiplicity of properties to there being a layered conception of properties, such that *being red* is at a higher 'level' than *being maroon*. If, as they claim, this layered conception is unintelligible, sparser conceptions of properties are preferable. Additionally, an abundance of properties seems to imply that there is widespread causal overdetermination. If an object bears both the property *is red* and *is maroon*, it appears that all of the causal work performed by the fact that it is red is also performed by the fact that it is maroon.

The alternate conception of properties they advance is sparse. Some predicates correspond to properties, while many others do not. There are only enough properties to cover the causal base, so widespread overdetermination is not an issue. If an object bears the property *is maroon*, it does not also bear the property *is red*. Additionally, they argue that properties are both dispositional (i.e., correspond to how a thing is disposed to act) and categorical (i.e., are the way that an object is in itself), so the few properties they countenance perform extensive explanatory work. Further, they argue that while two objects can share very similar properties, two objects never share the same property (it is for this reason that properties can be said to be 'wholly present' in the objects that bear them; they

---

<sup>4</sup>For other metaphysically sensitive takes on this issue, see, e.g., Boyd (1980); Pereboom (2002).

are not located anywhere else), and so in some ways, their conception of properties resembles what others would call ‘tropes.’ Similarity, for them, is a primitive relation between properties, and two properties are identical just in case they are maximally similar and are instantiated at the same place. This conception of properties, they argue, has widespread implications for the philosophy of science and mind.<sup>5</sup> For example, multiple realizability (which will shortly be discussed at length) ought to be understood as a relation between properties and predicates rather than between different properties. For a predicate to be multiply realizable is for it to be satisfied by relevantly similar properties.

I do not aim to definitively undermine this view here. I am generally sympathetic to its approach (if not to its details), and it is but one particularly notable example of a wide number of related theories I lack the space to adequately address.<sup>6</sup> However, I note two points of disagreement. In the first case, while my approach is *metaphysically* serious, it is not *ontologically* serious in Heil and Robb’s sense. That is to say, much of their theory rests on which properties really exist, and so their view is unavailable to nominalists who deny the existence of properties in general. In contrast, my approach is compatible with nominalism. Additionally, while their putative identity conditions for properties arguably accommodates some intuitive cases, they are not specified in a logically precise manner. By appealing directly to a primitive relation of maximal similarity, it is difficult to determine when some identity claims entail others. Determining that properties are identical requires determining that they are maximally similar, and how are we to determine when this primitive relation of maximal similarity obtains? In contrast, the approach I prefer allows for greater precision—indeed, with such precision that one can prove substantive implications about the logic of property identity. As I shall argue, these implications have philosophical implications concerning the interpretation of physicalism, so there is a compelling reason to adopt this approach.<sup>7</sup> But before detailing my own account, some background on identity theory.

---

<sup>5</sup>For an application of this view to the interpretation of physicalism, see Schroer (2010).

<sup>6</sup>By his own admission, Heil’s view relies on controversial assumptions. At one point, he states, “It will be difficult to find common ground here, difficult to occupy an uncontroversial perspective from which to assess competing theses. I am going to offer what strike me as plausible comments on the ontology of powers, but I admit that a philosopher with a theory can respond to what I have to say with a shrug” (Heil, 2011, pg. 40). I have a theory and am happy to supply the shrug.

<sup>7</sup>There are more banal reasons to be suspicious of their account of property identity. Many maintain that propositions are 0-ary properties—i.e., that while ‘is next to’ is a binary property and ‘is next to Jill’ is a unary property, ‘Jack is next to Jill’ is a 0-ary property. It is not at all obvious how to extend Heil and Robb’s account to propositions, as it crucially relies upon them being located at the objects that bear them. Indeed, the identity conditions for properties are partially determined by the location of the objects that bear them. How, in this case, are we to understand identity conditions for 0-ary properties, which are not borne by anything?

## 2 Identity Theories and Their Discontents

Why endorse identity theory? An example may illustrate. Consider an instance of fire. Fire occurs when a substance rapidly oxidizes. The properties typically associated with fire—in particular, the abundance of heat and light—result from this physical process. But what, from a philosophical perspective, is the relation between *this* fire and *that* chemical process? It is natural to suggest that the fire does not merely supervene upon that reaction, nor does it merely depend upon the reaction, but it *simply is* that reaction. The fire is identical to the carrying out of that physical process. Identity theorists model all macroscopic phenomena similarly; they simply are physical occurrences.

Identity theory respects the parsimony implicit in physicalism. The claim that everything is identical to the physical amounts to the denial of the non-physical. The conviction that the physical is all that exists promises a simple and unified conception of reality. And if we were to posit just one kind of thing, the physical seems a promising candidate. After all, the macroscopic objects we observe are all, presumably, composed of purely physical parts.

Ontological parsimony is coupled with a complementary notion of reduction. When identity theory held its strongest sway, some argued that metaphysical reductions are identities.<sup>8</sup> The contention that phenomenon *a* reduces to phenomenon *b* amounts to the claim that *a* and *b* are identical. And so, in claiming that everything is identical to the physical, physicalists allowed for everything to reduce to the physical.<sup>9</sup>

Another motivation arose from the oddity of ‘nomological danglers.’<sup>10</sup> Unlike the laws of the special sciences (if such things exist), the laws of physics appear to hold without exception. But how could the laws of physics apply to the non-physical? If the mind were not identical to a physical entity (for example), in what sense could the laws of physics be said to apply to it? In claiming that everything is physical, identity theory accommodates the universal scope of the laws of physics.

Despite its initial appeal, identity theory fell from favor. This fall took different forms for different versions of identity theory. Multiple realizability precipitated the fall of type-identity theory, while the unity of phenomenal experience threatened token-identity theory. Let us take these problems in turn.

Multiple realizability concerns the ability of properties to be realized by diverse physical configurations.<sup>11</sup> Perhaps the property of *being a heart* is defined in terms of the function

---

<sup>8</sup>For example, see Moore (1952); Carnap (1947). This view remains viable; see Correia (2017).

<sup>9</sup>One potential example of scientific reduction is the reduction of thermodynamics to statistical mechanics. The flow of heat is both identical to and reducible to statistical variations of particle movement. Indeed, some philosophers remain optimistic for reductions not only to physics in general but to statistical mechanics in particular (e.g., Albert (2003)).

<sup>10</sup>See Smart (1959). However, for a contemporary philosopher who embraces the possibility of nomological danglers, see Cartwright (1999).

<sup>11</sup>As with the interpretation of physicalism, the interpretation of the multiple realizability objection remains contentious. See Heil (1999); Gillett (2003); Polger (2004); Morris (Forthcoming) for some recent

hearts perform (say, the function of pumping blood throughout a body) rather than a particular kind of matter. Carbon in one configuration may constitute a heart in many cases, but an artificial heart composed of metal and plastic counts as well. And perhaps the property of *being in pain* is associated with firing C-fibers in humans, but it seems possible for the same phenomenology to be realized by different neurological structures in other creatures. If the properties of *being a heart* or *being in pain* are not identical to particular physical configurations, then not all properties are identical to physical properties. Type-identity theorists thus seem committed to the claim that physicalism is false. But surely the presence of hearts and pains ought to pose no greater threat to the physicalist than the presence of chairs. So, the multiple realizability objection maintains, type-identity theory is a poor interpretation of physicalism.

Of course, it may be possible to identify the properties of *being a heart* or *being in pain* with the disjunctions of their realizations. Perhaps the property of *being a heart* is identical to the property of *being either carbon shaped thus and so, or plastic and metal shaped thus and so, etc.* So long as each disjunct specifies a physical configuration, physicalism remains true. The problem with this response is that these identifications are explanatorily impoverished.<sup>12</sup> One learns nothing about the nature of the pain in learning a lengthy disjunction. Because a functional definition is much more informative, it is much more plausible. Relatedly, some philosophers have argued that identity claims are not the kind of thing that are apt for explanation.<sup>13</sup> While it might make sense to ask why one ought to believe that Hesperus is Phosphorus, there is nothing that explains why Hesperus is Phosphorus; it is a brute fact. But if there is no explanation for why identity claims obtain, it is unclear how these very claims could perform the explanatory work typically associated with reduction.<sup>14</sup>

One potential response came to be seen as untenable. Early identity theorists held that identity is a contingent relation.<sup>15</sup> Although *being in pain* is actually identical to *having firing C-fibers*, pain might have been identical to another neurological configuration. Type-identity theorists thus hoped to accommodate the possibility of different realizations of pain by appealing to different states that pain might have been identical to. And if identity holds contingently, perhaps there is an explanation for why it is identical to one thing in the actual world, and identical to different things in other possible situations.

Even at the time, this ought to have seemed implausible. Presumably, it is epistemically possible for creatures in the actual world to experience pain without having firing C-fibers. For all we know, creatures exist with different neurological structures who experience phenomenal pain. An appeal to different possible worlds with different identity relations is

---

discussions on the issue.

<sup>12</sup>See Fodor (1974) for the original discussion of this point, and Rosen (2015) for a related, more recent discussion.

<sup>13</sup>See, e.g., Lewis (1986); Dorr (2016). For a reply, see Fine (2016b).

<sup>14</sup>For a discussion of this point, see Morris (2011).

<sup>15</sup>For an appeal to contingent identity in this context, see Smart (1959).

unhelpful for this case, so the appeal to contingent identity ought to have seemed suspect.

As time passed, problems multiplied. Following advancements in the philosophy of language and modal logic, philosophers largely came to believe that identity holds necessarily (see Kripke (1980)).<sup>16</sup> If identity claims hold necessarily, and if *being in pain* is identical to *having firing C-fibers* in the actual world, then *being in pain* is necessarily identical to *having firing C-fibers*. There is no possible situation in which it is identical to anything else.

These developments not only undermined type-identity theory but formed the basis for modal conceptions of physicalism. Many began to understand physicalism in terms of supervenience.<sup>17</sup> They held that physicalism amounts to the claim that everything supervenes upon the physical; any two possible worlds that are physical duplicates are duplicates simpliciter.<sup>18</sup> While some have strayed from purely modal interpretations in recent years, type-identity theory remains unpopular.

A less prominent objection to type-identity theory concerns its commitment to properties. In order for it not to hold vacuously, there must be properties that are identical to one another. The commitment to properties renders the position unavailable to nominalists, who deny that properties exist. But physicalism ought to be available to those with a preference for desert landscapes. After all, its parsimony drove its initial appeal. Minimally, physicalism ought to be compatible with nominalism, if not to entail it outright. Type-identity theory wanders dangerously close to ontological extravagance that physicalists hope to avoid.

Token-identity theory avoids these concerns. On one version, physicalism amounts to the claim that every event is identical to a physical event.<sup>19</sup> This does not commit the identity theorist to abstract entities like properties, so it better respects physicalism's commitment to parsimony. Additionally, token-identity theory is well-equipped to accommodate multiple realizability concerns. There is no requirement that diverse realizations resemble one another, so long as all realizations are physical. The event of a human experiencing pain may be identical to the (physical) event of C-fibers firing, and the event of artificial intelligence experiencing pain may be identical to the (physical) event of its computer chips acting in a particular way.

---

<sup>16</sup>However, for a recent defense of contingent identities, see Kocurek (2018).

<sup>17</sup>It has sometimes been claimed that supervenience physicalism is 'minimal physicalism': a core set of commitments that all physicalists ought to agree upon (see Lewis (1983)). This has been disputed. On the one hand, there are plausible interpretations of physicalism that are arguably uncommitted to supervenience (see, e.g., Block (1980)). On the other, supervenience may be too weak to genuinely count as physicalism. Stoljar (2010), for example, presents the possibility of a 'polluted base.' Suppose that mental properties were necessarily connected to physical properties, but were emergent: they existed independently from physical properties and possessed their own distinctive causal powers. In this case, supervenience physicalism would be true, but, intuitively, physicalism would be false. After all, the mental exists semi-autonomously from the physical. For a response on behalf of supervenience physicalism, see Morris (2014).

<sup>18</sup>For a discussion of the way Kripke's insights affected the interpretation of physicalism, see Boyd (1980).

<sup>19</sup>See, again, Davidson (1970).

However, token-identity theory encounters problems that the type-identity theorist avoids. There is no guarantee, on token-identity theory, that similar physical configurations realize similar mental states.<sup>20</sup> Although many maintain that different physical configurations realize similar phenomenal states (because of the multiple realizability considerations already belabored), many also maintain that physicalism ought to guarantee that similar physical states realize similar phenomenal results. If one brain in a particular configuration realizes consciousness, then a qualitatively identical brain in a qualitatively identical configuration (and perhaps in a qualitatively identical situation) also ought to realize consciousness. Token-identity theory does not ensure this result. It merely requires that each particular is identical to a physical particular; it does not guarantee that similar physical particulars realize similar mental states.

Before proceeding, it is worth noting that philosophers have largely maintained that type- and token-identity theories are distinct interpretations. Fodor, for example, claims “Token physicalism is weaker than what might be called ‘type physicalism’ ” (Fodor, 1974, pg. 100). Similarly, Stoljar (2017) argues that type-identity theory, but not token-identity theory, entails that everything supervenes upon the physical, and Horgan (1984) argues that one kind of functionalism entails token-identity theory, while another does not. This putative distinction is a principle subject of the present discussion.

Identity theory once held promise, but it was waylaid by apparently insurmountable problems. Multiple realizability and ontological extravagance threaten type-identity theory, while token-identity theory cannot account for a unity physicalism ought to guarantee. So, these interpretations fell by the wayside and are often described as mere theoretical relics we did well to leave behind.

### 3 Generalized Identity and Truth-Maker Semantics

There has been sustained discussion of a targeted reading of sentences of the form ‘To be  $F$  is to be  $G$ ,’ which have come to bear the label ‘generalized identities,’ and which are often employed to express analyses.<sup>21</sup> Notable examples of these sentences include:

1. To be a moral agent is to be bound by the categorical imperative.
2. To be a bachelor is to be an unmarried male.
3. To be hydrogen is to be the chemical element with a single proton and a single electron.
4. To be prime is to be a natural number that is evenly divisible only by one and itself.
5. To be a square is to be an equilateral rectangle.

---

<sup>20</sup>For an early discussion of this point, see Fodor (1974).

<sup>21</sup>See Dorr 2016, Correia 2017, Correia and Skiles 2017, Rayo 2013.

On the target reading, the ‘is’ of generalized identities resembles the ‘is’ of identity in both its logical and modal profile. Sentences of this form are reflexive, transitive, and symmetric and, if they are true, then they are necessarily true, and it is necessary that all and only *F*s are *G*s.

Some may suspect the ‘is’ of generalized identities literally is the ‘is’ of identity. Perhaps ‘To be *F* is to be *G*’ is strictly synonymous with ‘To be the property of *being F* is to be the property of *being G*.’ If so, an account of generalized identity yields identity conditions for properties, propositions and relations. For the purposes of this paper, I do not object to this proposal. However, several discussions of generalized identities are uncommitted to this claim.<sup>22</sup> There is linguistic evidence that ‘to be *F*’ is not synonymous with ‘to be the property of *being F*’ in at least some contexts. The sentence ‘I hope to be an accomplished philosopher’ is perfectly true, but the sentence ‘I hope to be the property of *being an accomplished philosopher*’ is presumably false; I do not hope to be a property. More importantly for the present discussion, some desire for accounts of generalized identities to be compatible with nominalism: the denial that properties and relations exist. Some thus take the ‘is’ of generalized identities to resemble, but not to strictly be, the ‘is’ of identity, because they deny that the phrase ‘to be *F*’ denotes. Philosophers who prefer the nominalized interpretation of ‘To be *F* is to be *G*’ typically do not take themselves to provide a theory of predicates. A theory of generalized identity remains a theory of what it is to be *F*—it is not a view about how predicates in natural language function.

Others may dismiss a reading of ‘To be *F* is to be *G*’ that is reflexive and symmetric, perhaps maintaining that if a sentence of this form is true, then *G* is more metaphysically fundamental than *F* is. I do not dispute that an irreflexive and asymmetric reading exists, but maintain that there is also a reading that resembles an identity. On this reading, ‘To be *F* is to be *F*’ is manifestly true; what else could *F* possibly be? Interest in one reading need not diminish the import of another. Additionally, several philosophers have advanced accounts of the irreflexive and asymmetric reading in terms of the reflexive and symmetric one (e.g., Correia (2017)), so the reflexive and symmetric reading ought not be abandoned prematurely.

For our purposes, the relevance generalized identity is apparent. Type-identity theorists interpret physicalism in terms of the identity of properties. Generalized identities, which can be interpreted as identity conditions for properties, specify the conditions in which a property is identical to a physical property, so they directly bear on the topic at hand. Quite recently, Correia (2017) and Elgin (forthcoming) have suggested that generalized identities ought to be accounted for by truth-maker semantics. I rely on this contention here, so let us turn our attention to this proposal.

Truth-maker semantics identifies the meanings of sentences with finely-grained states of affairs that are exactly responsible for their truth-values. For example, the state of grass being green may verify ‘Grass is green,’ and the state of it raining outside may verify ‘It

---

<sup>22</sup>E.g., Dorr (2016); Correia (2017).

is raining outside.’ Unlike other approaches, truth-maker semantics requires that verifiers be relevant to the sentences that they verify and that they be entirely relevant; no part of them is irrelevant to the truth of such a sentence.<sup>23</sup> So the state of Republicans controlling both the Senate and the House of Representatives does not verify ‘ $1 + 1 = 2$ ,’ although it entails that the sentence is true. It does not even verify ‘Republicans control the Senate,’ because a part of that state concerns the House of Representatives—not the Senate. I do not assume that sentences have a unique verifier and a unique falsifier. The sentence ‘Either Frege formalized first-order logic or Gödel proved that arithmetic is incomplete’ presumably has (at least) two verifiers: the state of Frege having formalized first-order logic and the state of Gödel having proven that arithmetic is incomplete.

I will spare the reader excessive formalisms and direct those interested in the details to Fine (2016a), Elgin (forthcoming). The following abridgement should suffice. Negation swaps a sentence’s verifiers for its falsifiers. So if the state of the United States being a democracy verifies ‘The United States is a democracy,’ then it falsifies ‘The United States is not a democracy.’ Verifiers of conjunctions are fusions of verifiers of their conjuncts. So, a verifier of ‘Gorillas are endangered and ants are not’ is the fusion of a verifier of ‘Gorillas are endangered’ with a verifier of ‘Ants are not endangered.’ Verifiers of disjunctions are verifiers of a disjunct. So, a verifier of ‘Either Sarah is tall or Anne is tall’ is either a verifier of ‘Sarah is tall’ or a verifier of ‘Anne is tall.’

Two sentences are said to be *exactly equivalent* just in case their verifiers and falsifiers are identical. Exact equivalence differs both from syntactic identity and from classical equivalence. ‘ $A \wedge B$ ’ is exactly equivalent to ‘ $B \wedge A$ ,’ and ‘ $\neg\neg A$ ’ is exactly equivalent to ‘ $A$ .’ However, ‘ $A$ ’ is typically not exactly equivalent to ‘ $A \wedge (B \vee \neg B)$ ,’ although the sentences are classically equivalent. A verifier of the first sentence is a verifier of ‘ $A$ ,’ while a verifier of the second is either the fusion of a verifier of ‘ $A$ ’ with a verifier of ‘ $B$ ’ or else the fusion of verifier of ‘ $A$ ’ with a falsifier of ‘ $B$ .’

This approach standardly does not restrict states to those that actually obtain, nor even to those that could possibly obtain. The state of Hillary Clinton being president is a state that does not obtain, while the state of a particular square being round is a state that could not possibly obtain. For the purposes of this paper, I foresee few uses for impossible states; we may restrict our attention to those that are possible.<sup>24</sup> However, I do foresee uses for non-actual states, and so I countenance states that, although possible, do not actually obtain.

Here, I rely heavily on the notion of a *physical state*—so heavily that the reader is owed

---

<sup>23</sup>Note that this approach commits us to the claim that states have proper parts; they are the kinds of things that are capable of mereological composition. This is an assumption I embrace. The state of a ball being both red and round, for example, might be the composite of the state of the ball being red with the state of it being round.

<sup>24</sup>There are plausibly distinct notions of possibility (see Fine (2002).) As I mention in section 5, I take the most relevant notion of possibility to be *nomological possibility*. The states I am concerned with are states that are physically possible.

a characterization of what a physical state is. I will not provide a reductive account of a physical state, but offer some clarification.<sup>25</sup> A physical state, as I use the term, is a kind of state as employed by truth-maker semantics. It is an aspect of the world that is capable of verifying and falsifying sentences. The state of an electron being in spin up is plausibly a physical state, and plausibly verifies ‘The electron is in spin up;’ the state of a disembodied Cartesian mind being conscious is not plausibly a physical state, but does plausibly verify ‘There exists a conscious mind.’

I assume that physical states are closed under composition. Any composite of two or more physical states is itself a physical state. If the state of *this* electron being in spin up is a physical state, and if the state of *that* electron being in spin down is a physical state, then the state of *this* electron being in spin up and *that* electron being in spin down is also a physical state.

Relatedly, I assume that physical states are closed under parthood. Every part of a physical state is itself a physical state. If the state of two samples of uranium decaying is a physical state, and the state of one of these samples decaying is a part of this state, then the state of one of these samples decaying is itself a physical state. Interestingly, this allows for (somewhat substantive) necessary and sufficient conditions on what it takes to be a physical state. A state is a physical state just in case all of its parts are physical states. For mereologically simple states (i.e., those that lack proper parts), this holds vacuously; a state is a physical state just in case it is a physical state.<sup>26</sup> The condition gets its teeth from states with proper parts; it entails that every proper part of a physical state is itself a physical state. It is my hope that these brief remarks and an intuitive grasp render the notion of a physical state sufficiently clear for the present discussion.

Additionally, I employ the notion of an  $F$  being a *physical*  $F$ .<sup>27</sup> I maintain that there is a connection between the notion of a physical state and the notion of a physical  $F$ . It is in virtue of this connection that both are worthy of the moniker ‘physical.’ In particular, I assume that the following principle obtains:

**Linking Principle:**

$F$  is physical just in case, for any object  $a$ , all of the verifiers (and falsifiers) of ‘ $Fa$ ’ are physical states.

---

<sup>25</sup>Many have advanced interpretations of physicalism without taking a stand on what it takes to be physical. Davidson (1970), for example, interprets physicalism as the claim that every event is identical to a physical event without detailing what it takes for an event to be physical. Chalmers (2001) argues that every truth is *a priori* knowable from the conjunction of the physical truths, indexical truths, phenomenal truths and a totality truth, without specifying what it takes for a truth to be a physical truth. Schaffer (2017) defends an interpretation according to which physicalism is the claim that chemical, biological and psychological entities are grounded in physical entities, without defining the notion of a physical entity.

<sup>26</sup>I operate with a notion of improper parthood rather than proper parthood, so every state is a part of itself.

<sup>27</sup>One might phrase this in terms of ‘physical predicates’—my hesitancy comes from my desire to not conflate a theory of predicates with a theory of to be  $F$ .

For example, ‘conscious’ is physical just in case every verifier and falsifier of ‘John is conscious’ is a physical state (and in case verifiers and falsifiers for correlate sentences with names other than ‘John’ are physical states). If there is a non-physical state of John being a disembodied Cartesian mind that verifies ‘John is conscious,’ then ‘conscious’ is not physical. Although it is tempting to treat the linking principle as an analysis of the notion of a physical predicate (and I am not entirely averse to that idea), I only assume that it provides necessary and sufficient conditions for what it takes for an  $F$  to be physical.

Elgin (forthcoming) argues that a sentence of the form ‘To be  $F$  is to be  $G$ ’ is true just in case that which makes something  $F$  is that which makes it  $G$ : i.e., if and only if for any name  $a$ , ‘ $F(a)$ ’ is exactly equivalent to ‘ $G(a)$ .’<sup>28</sup> ‘To be morally right is to maximize utility’ holds just in case for any  $a$ , the verifiers (and falsifiers) of ‘ $a$  is morally right’ are identical to the verifiers (and falsifiers) of ‘ $a$  maximizes utility,’ and ‘To be a bachelor is to be an unmarried male’ holds just in case for any name  $a$ , the verifiers (and falsifiers) of ‘ $a$  is a bachelor’ are identical to the verifiers (and falsifiers) of ‘ $a$  is an unmarried male.’

This account accommodates many of the logical and modal features of generalized identity. Because exact equivalence is an equivalence relation, sentences of the form ‘To be  $F$  is to be  $G$ ’ are transitive, symmetric, and reflexive. And because this account requires that these sentences be exactly equivalent in all possible situations, it follows that these sentences hold necessarily. There is a great deal more to say in defense of this proposal, but I will simply assume that it is correct for the remainder of this paper.

## 4 Three Formulations of Physicalism

In light of the previous discussion of generalized identity, the following is a natural interpretation of physicalism:

### **First Formulation of Physicalism:**

Physicalism is the claim that for any  $F$  there is a physical  $G$  such that to be  $F$  is to be  $G$ .

The first formulation strongly resembles type-identity theory. If ‘to be  $F$ ’ denotes ‘to be the property of *being F*,’ then the first formulation simply is type-identity theory; it interprets physicalism as the claim that every property is identical to a physical property. However, if ‘to be  $F$ ’ is not a denoting phrase (as suggested by Dorr (2016); Correia (2017)), then the first formulation merely resembles type-identity theory without its ontological commitments; it does not reify properties.

Because the first formulation so closely resembles type-identity theory, it might seem to inherit the challenges type-identity theory faced. In particular, it appears susceptible to multiple-realizability concerns. If ‘heart’ is defined functionally, then there may be no

---

<sup>28</sup>For related accounts, see Correia (2017); Correia and Skiles (2017).

physical  $G$  such that to be a heart is to be  $G$ .<sup>29</sup> If there is no such  $G$ , then the presence of hearts objectionably undermines the first formulation of physicalism. Whether or not the first formulation faces the charge of extravagance depends upon whether ‘to be  $F$ ’ is a denoting phrase. If ‘to be  $F$ ’ is synonymous with ‘to be the property of being  $F$ ,’ then the first formulation is committed to the existence of properties. If, however, generalized identities merely resemble identity claims without their ontological commitments, then the first formulation is uncommitted to the existence of properties. The charge of extravagance can thus be avoided.

Still, multiple realizability may be troubling enough. Let us consider a formulation better suited for these concerns:

### **Second Formulation of Physicalism**

Physicalism is the claim that for any  $F$  and every  $a$ , every verifier and falsifier of ‘ $Fa$ ’ is a physical state.

The second formulation is well-suited for multiple realizability. There is no requirement that the verifiers of ‘ $Fa$ ’ resemble one another, so long as they are all physical states. The state of Alfred possessing firing C-fibers might verify ‘Alfred is in pain,’ but the state of Alfred possessing another neurological structure might do so as well. Unlike the first formulation, it is unclear whether the second formulation counts as identity theory. Reference is made both to  $F$ s (which correspond to types) and to states (which correspond to tokens).<sup>30</sup> However, it is notable that the second formulation is equivalent to the first.

Suppose that the first formulation is true, and select an arbitrary  $F$  and an arbitrary  $a$ . According to the first formulation, there exists a physical  $G$  such that to be  $F$  is to be  $G$ . Because  $G$  is physical, the linking principle entails that all verifiers of ‘ $Ga$ ’ are physical states.<sup>31</sup> The present account of generalized identities requires that ‘ $Fa$ ’ have identical verifiers to ‘ $Ga$ ,’ so all of the verifiers of ‘ $Fa$ ’ are physical states. And because both  $F$  and  $a$  were chosen arbitrarily, for every  $F$  and every object  $a$ , every verifier of ‘ $Fa$ ’ is a physical state. Therefore, the second formulation is true.

Suppose, instead, that the second formulation is true, and select an arbitrary  $F$ . According to the second formulation, for every object  $a$ , ‘ $Fa$ ’ has purely physical verifiers. Given the linking principle, this entails that  $F$  is physical. Because generalized identity

---

<sup>29</sup>A brief aside: the first formulation clarifies what it is for a predicate to be defined functionally. A predicate  $F$  is defined in functional terms just in case there is a predicate  $G$  that specifies the performance of a certain function such that ‘To be  $F$  is to be  $G$ ’ is true. For example, if a heart is defined in functional terms, it may be that ‘To be a heart is to perform the function of pumping blood throughout the body’ is true.

<sup>30</sup>The first argument that a state of affairs counts as a token that I am aware of occurs in Heil (2011). As I discuss below, the second formulation may most closely resemble what Morris (2018) calls ‘truth-maker physicalism.’

<sup>31</sup>For the sake of brevity, I omit mention of falsifiers, but what I say about verifiers strictly applies to falsifiers as well.

possesses the logical profiles of identity, it follows that to be  $F$  is to be  $F$ . So there exists a physical  $G$  (in particular,  $F$ ) such that to be  $F$  is to be  $G$ .<sup>32</sup> Because the selection of  $F$  was arbitrary, for any  $F$  there is a physical  $G$  such that to be  $F$  is to be  $G$ . Therefore, the first formulation is true.

The first formulation is equivalent to the second. However, as previously noted, it is unclear whether the second formulation counts as identity theory. So, let us consider a third:

### **Third Formulation of Physicalism**

Physicalism is the claim that every state is identical to a physical state.

The third formulation is clearly an instance of token-identity theory, where the relevant tokens are states. Just as Davidson (1970) interpreted physicalism in terms of the identity of particular events, this interpretation is given in terms of the identity of particular states. It requires that the state of it raining be identical to a physical state and that the state of nitrogen being abundant in the Earth's atmosphere be identical to a physical state.

It is straightforward to establish that the third formulation entails the second. Given that every state is a physical state, for an arbitrary  $F$  and an arbitrary  $a$ , all of the verifiers of ' $Fa$ ' are physical states. After all, this set of verifiers is a subset of the set of states.

It is less straightforward to establish that the second formulation entails the third. One method is to insist that every state verifies some predicative sentence or other: to equip our language with sufficiently many predicates that every state  $s$  verifies ' $Fa$ ' for some  $F$  and  $a$ . Let us suppose that we have such a language, assume that the second formulation obtains and select an arbitrary state  $s$ . Because our language is so richly endowed, there exists a predicate  $F$  and an object  $a$  such that  $s$  verifies ' $Fa$ .' The second formulation requires that all verifiers of ' $Fa$ ' be physical states, so it follows that  $s$  is a physical state. Because the selection of  $s$  was arbitrary, every state is identical to a physical state. Therefore, the third formulation is true.

There is room for doubt about the tenability of this method. Consider a situation in which, due to some defect of natural language, no sentence was verified; nothing made any of our assertions true. In this case, it is reasonable to suppose that there is a state of no sentence being verified. It is difficult to see how such a state could verify any sentence. After all, if it were to verify a sentence, it would no longer obtain, because it would no longer be the case that no sentence was verified. So, perhaps there are (or at least could be) states that, in principle, cannot verify sentences. If so, the method of expanding our language so that every state verifies some claim or other is doomed to failure.

However, we need not adopt such a rich language in order to derive the third formulation from the second. Let us consider an  $F$  that an object bears just in case the entire history

---

<sup>32</sup>The reflexivity of generalized identities serves only to guarantee that there exists some  $G$  or other such that to be  $F$  is to be  $G$ . Any  $G$  such that to be  $F$  is to be  $G$  is physical, since all verifiers of ' $Ga$ ' are physical verifiers according to the second formulation.

of the world is precisely as it is. For any  $a$ , ' $Fa$ ' holds just in case the history of the world unfolded exactly as it did; if and only if Caesar crossed the Rubicon, the southern states seceded from the United States in 1861, Einstein discovered that  $E = MC^2$ , etc.<sup>33</sup> Such an  $F$  is not restricted to past events; the truth of ' $Fa$ ' also requires that the future unfolds precisely as it will. I assume that (at least) one verifier of ' $Fa$ ' is a state that contains every state as a part.<sup>34</sup> Suppose that the second formulation is true, and select an arbitrary name  $a$ . The second formulation requires that all verifiers of ' $Fa$ ' be physical states. At least one of these states—call it state  $s$ —contains every state as a part. State  $s$  is a physical state and, from the developments in 3.1, every part of a physical state is itself a physical state, so every state is identical to a physical state. Therefore, the third formulation is true.

The second formulation of physicalism is equivalent to the third. And, as previously noted, it is also equivalent to the first. Therefore, the first formulation of physicalism (which is reasonably interpreted as type-identity theory) is equivalent to the third formulation (which can reasonably be interpreted as token-identity theory).

This result is independently significant. The distinction between type- and token-identity theories, once appropriately understood, is dissolved. It has further ramifications. The resources each formulation provides resolve problems facing the other. One problem—the charge of ontological extravagance—has already been discussed. Nominalists can (and do) account for generalized identity without reifying properties. It may be that to be a vixen is to be a fox even if there is no property of *being a vixen*. Such philosophers may embrace the first, second, and third formulations, because each is agnostic about the existence of properties.

Multiple realizability is also easy enough to accommodate. Perhaps some properties are functionally defined; perhaps to be a heart is to perform the function of pumping blood. In this case, however, physicalism merely requires that every verifier of the claim that something is a heart is a physical state. If so, then both 'heart' and 'perform the function of pumping blood' are physical predicates, and the first, second and third formulations of physicalism obtain.<sup>35</sup>

Perhaps the trickiest objection concerns the unity of phenomenal experience. Is there any guarantee that similar physical states yield similar phenomenal experiences? If there is any recourse, it arises from the first formulation. Let us suppose, for the sake of argument,

---

<sup>33</sup>This predicate is not new. It was discussed most prominently by Lewis (1983) in his account of laws of nature. Lewis, drawing on Mill (1947), argues that a sentence expresses a law of nature just in case it strikes the optimal balance of simplicity and strength, where simplicity is given by the length of the sentence and strength is given by descriptive power. A potential worry is that, on this conception, ' $Fa$ ' is a law of nature. After all, it is maximally strong (in that it describes the entire history of the world) and is remarkably simple (in that it is two characters long). Lewis avoids this concern by employing a language that only possesses terms for perfectly natural predicates. However, my use for  $F$  is differs from his.

<sup>34</sup>There may be issues arising from states that do not actually obtain. I discuss this in section five while addressing the modal scope of physicalism.

<sup>35</sup>Or, more accurately, are not undermined by the presence of hearts.

that there is an instance of ‘To be  $F$  is to be  $G$ ’ where  $F$  is mental and  $G$  is physical.<sup>36</sup> For the sake of argument, let us suppose that ‘To be in pain is to possess firing C-fibers’ is true. This requires that the verifiers of ‘ $a$  is in pain’ are identical to the verifiers of ‘ $a$  possesses firing C-fibers’ for any name ‘ $a$ .’ The states that verify ‘Jonathan possesses firing C-fibers’—for example, the state of Jonathan possessing firing C-fibers—also verify ‘Jonathan is in pain.’ Similarly, the states that verify ‘Timothy possesses firing C-fibers’—for example, the state of Timothy possessing firing C-fiber—also verify ‘Timothy is in pain.’ So, states concerning the firing of C-fibers are relevant to pains generally.

Identity theory thus accommodates multiple realizability, ontological minimalism and the unity of phenomenal experience. That type- and token-identity theories are identical has weighty payoffs that render it a viable interpretation. However, some may suspect that these payoffs come at a cost. In particular, Morris (2018) provides two arguments against interpreting physicalism in terms of truth-making.<sup>37</sup> If these arguments succeed, they could undermine the advantages of the present approach.

Morris’s paper is largely a response to Heil (2003, 2012); Cameron (2008, 2010). While neither Heil nor Cameron directly endorse an interpretation of physicalism in terms of truth-making, their discussion naturally lends itself to one. Morris’s first worry is, roughly, that it is unclear what explanatory work there is for truth-making to do. Suppose that every truth has a physical truth-maker. There is an open question as to why this counts as an interpretation of physicalism. It might be that truth-maker theorists appeal to supervenience; truth-makers necessitate that which they are truth-makers of, and so interpretations of physicalism in terms of truth-making guarantee that all truths supervene on the physical. Even if this is so, it is unclear why this is preferable to an approach that appeals directly to supervenience—one which bypasses any discussion of truth-making. Arguably, any defense of truth-maker interpretations will face a similar worry; in order to explain why such a view counts as physicalism, it must appeal to some other philosophical resource, and it is unclear why interpretations in terms of truth-making are preferable to those that appeal directly to this resource.

This is a pressing concern for some versions of truth-maker physicalism, but I believe it inapplicable to mine.<sup>38</sup> After all, the interpretation I rely upon does not depend on

---

<sup>36</sup>Note that, on the current approach, this also requires  $F$  to be physical; I see no objection to  $F$  being both mental and physical.

<sup>37</sup>Heil (2000) presents an additional concern for truth-making views. An adequate reply requires delving further into technical details of truth-maker semantics than I have space to do. Roughly, Heil defends a notion of truth-making in which truth-makers do not necessitate the claims they are truth-makers of. For example, it may be that the presence of five coins in my pockets is a truth-maker for ‘there are exactly five coins in my pocket,’ despite the fact that the presence of five coins is compatible with the presence of six. Although I am sympathetic to view on which truth-makers necessitate the claims they are truth-makers of, it is readily possible to modify the present semantics to accommodate Heil’s point. As Fine (2017); Elgin (forthcoming) note, this is achieved by omitting totality states in verifiers of ‘ $\forall xFx$ .’

<sup>38</sup>Morris suggests that this worry need not apply to every version of truth-maker interpretations of physicalism when discussing a proposal by Schulte (2014).

truth-making alone—it can just as well be understood in terms of identity theory. It counts as an interpretation of physicalism precisely because both type- and token-identity theory count as physicalism; because everything is identical to the physical. Nevertheless, there remains theoretical work for truth-making to do, as conditions for generalized identity are given by truth-maker semantics. So while the interpretation of physicalism at issue could be stated without reference to truth-making, truth-making performs theoretical work.

Morris’s second worry concerns truth-making truth-making. Consider the claim “ $P$  is made true by  $p$ .” If every truth-maker is physical, then presumably what makes this sentence true is physical as well. But, he argues, truth-making is a relation between the world and language. Whatever a final physical theory will ultimately look like, it presumably will not include a relation between world and language. It is difficult to see how facts about fundamental physics would characterize such a relation—it may even be a brute necessary connection. So, characterizations in terms of truth-making may self-undermine.

I suspect that Morris’s conception of truth-making differs from mine. His argument crucially rests on understanding a theory of truth-making as, primarily, a world-language relation. This is not without reason; it is precisely what many truth-maker theorists have meant. However, the account of generalized identity advanced by those like Elgin (forthcoming); Correia and Skiles (2017) is not a theory of predicates. While realists may interpret such accounts as providing identity conditions for properties (so that the relation at issue is one between states of affairs and properties), those who do not nevertheless deny that their accounts provide a theory of predicates. An account of generalized identity is not a view about how natural language predicates function; it is a theory of what it takes to be  $F$ . And if a theory does not primarily concern a world-language relation, there is no reason to suspect that scruples about such a relation threaten that theory.

In any case, it is worth recalling that one of the interpretations of physicalism—the third formulation—makes no mention of truth-making at all. It is the claim that every state of affairs is a physical state of affairs; it makes no mention (either implicitly or explicitly) of predicates, or of a relation of what it is that makes sentences true. Because it does not interpret physicalism in terms of truth-making, there is no reason to think concerns about truth-makers for truth-makers apply to this interpretation. It does not mention a world-language relation, so concerns about such a relation do not threaten that account. And because the first and second formulations are equivalent to one that evades Morris’s worry, they do not face such concerns either. However, issues about truth-making aside, there remains an unresolved issue concerns the modal scope of physicalism.

## 5 The Modal Scope of Physicalism

Some approaches to truth-maker semantics allow for impossible states. There may be a state of there being two even primes or a state of an object being both entirely red and entirely blue. And so, there seems to be no constraint against a state of a disembodied

Cartesian mind being conscious, even if such a state could not possibly obtain. Quite plausibly, the (impossible) state of a disembodied Cartesian mind being conscious verifies ‘Something is conscious,’ so the sentence has a non-physical verifier. But impossible states ought to pose no threat to physicalism; physicalism does not deny that there are impossible states of affairs in which the non-physical obtains.<sup>39</sup>

The obvious solution is to restrict the verifiers that are relevant to the truth of physicalism. There are two plausible restrictions with differing modal force. The first is to restrict the account to states that actually obtain. Physicalism, the thought goes, concerns the way the world actually is. On this interpretation, physicalism is the claim that every *actual* state is a physical state.<sup>40</sup> Impossible states concerning disembodied Cartesian minds are irrelevant to the truth of physicalism.

But perhaps physicalism is more demanding. Consider a possible world  $w$  that is nearly identical to the actual world, except that it contains an additional ammonium atom in the rings of Saturn.<sup>41</sup> It would be odd if such a world contained radically different mental properties from the actual world. Why should the presence of a single ammonium atom make a considerable difference? However, this possibility is permitted by the actualist restriction—it takes no stand on what happens in nearby possible worlds.

Or consider the predicate ‘is either an electron or a non-physical Cartesian mind.’ If the only states relevant to the truth of physicalism are those that actually obtain, and if there are no non-physical Cartesian minds, then this predicate counts as a physical predicate. This may seem unintuitive—if it was very nearly the case that there was a non-physical Cartesian mind, shouldn’t the predicate not count as physical? Why should the status of predicates merely turn on what actually obtains?

A broader conception of physicalism accommodates these kinds of cases. Instead of restricting the relevant verifiers to those that actually obtain, this interpretation restricts verifiers to those that could obtain: those that are possible. On this interpretation, physicalism amounts to the claim that every possible state is a physical state.

Some maintain that there are several varieties of necessity (e.g., Fine (2002)). There may be a type of logical necessity—according to which the only impossible states are those that logically entail a contradiction—and a notion of metaphysical necessity—according to which a possible state occurs in at least one metaphysically possible world. For the present purposes, I suspect that the most useful type of necessity is *nomological necessity*. A state is nomologically possible if and only if it is compatible with the laws of physics.<sup>42</sup> Physicalism, then, demands that every *nomologically possible* verifier is a physical verifier. If the state of a disembodied Cartesian mind being conscious is nomologically impossible, then it is irrelevant to the truth of physicalism.

---

<sup>39</sup>Or, if it does, it presumably does so because it denies the existence of impossible states.

<sup>40</sup>This paraphrases the third formulation. On this restriction, the first formulation is unaltered, but exact equivalence is defined in terms of the identity of actual verifiers and falsifiers.

<sup>41</sup>See Kim (1993) for the first discussion of this example.

<sup>42</sup>For a precise definition of compatibility on the truth-maker approach, see Fine (2017).

This restriction accommodates world  $w$ . Because the state of an additional ammonium atom existing in the rings of Saturn is nomologically possible, it is relevant to the truth of physicalism. If this world allowed for non-physical verifiers, physicalism would be false.

## 6 Conclusion

I have argued against the distinction between type- and token-identity theories, and demonstrated how this account resolves their canonical challenges. The identity interpretation of physicalism has advantages that I have failed to discuss. For example, other conceptions of physicalism rely on notions philosophers find suspect. Ground-based interpretations, for example, may be undermined by objections to grounding (e.g., Della Rocca (2014); Wilson (2014)). The notion of identity is remarkably uncontroversial. To the best of my knowledge, there are no philosophers who dispute that identity exists. However, it is my hope that the discussion I provided demonstrates that type-identity theory is identical to a version of token-identity theory, and how this resolves objections these views previously faced.

## References

- Albert, David. 2003. *Time and Chance*. Harvard University Press.
- Block, Ned. 1980. Troubles with Functionalism. In *Readings in the Philosophy of Psychology*, ed. Ned Block. Vol. 1 Harvard University Press.
- Boyd, Richard. 1980. Materialism Without Reductionism: What Physicalism Does Not Entail. In *Readings in the Philosophy of Psychology: Volume 1*, ed. Ned Block. Harvard University Press pp. 1–67.
- Cameron, Ross. 2008. “Truthmakers and Ontological Commitment: or How to Deal with Complex Objects and Mathematical Ontology Without Getting Into Trouble.” *Philosophical Studies* 140:1–18.
- Cameron, Ross. 2010. “How to have a Radically Minimal Ontology.” *Philosophical Studies* 151:249–64.
- Carnap, Rudolf. 1947. *Meaning and Necessity: a Study in Semantics and Modal Logic*. University of Chicago Press.
- Cartwright, Nancy. 1999. *The Dappled World*. Cambridge University Press.
- Chalmers, David & Jackson, Frank. 2001. “Conceptual Analysis and Reductive Explanation.” *The Philosophical Review* 110(3):315–61.
- Correia, Fabrice. 2017. “Real Definitions.” *Philosophical Issues* 27(1):52–73.
- Correia, Fabrice and Alexander Skiles. 2017. “Grounding, Essence and Identity.” *Philosophy and Phenomenological Research* .
- Crane, Tim and D. H. Mellor. 1990. “There is no Question of Physicalism.” *Mind* 99(394):185–206.
- Davidson, Donald. 1970. Mental Events. In *Essays on Actions and Events*, ed. L. & J. W. Swanson Foster. Clarendon Press pp. 207–24.
- Della Rocca, Michael. 2014. “Razing Structures to the Ground.” *Analytic Philosophy* 55(3):276–94.
- Dorr, Cian. 2016. “To Be F Is To Be G.” *Philosophical Perspectives* 30(1):39–134.
- Elgin, Samuel. forthcoming. “The Semantic Foundations of Philosophical Analysis.”
- Fine, Kit. 2002. Varieties of Necessity. In *Conceivability and Possibility*, ed. John Gendler, Tamar & Hawthorne. Oxford UP.

- Fine, Kit. 2016a. "Angelic Content." *Journal of Philosophical Logic* 45(2):199–226.
- Fine, Kit. 2016b. "Identity Criteria and Ground." *Philosophical Studies* 173:1–19.
- Fine, Kit. 2017. Truthmaker Semantics. In *Companion to the Philosophy of Language*, ed. B. Hale, C. Wright and A. Miller. Blackwell pp. 556–77.
- Fodor, J. 1974. "Special Sciences: Or the Disunity of Science as a Working Hypothesis." *Synthese* 28(2):97–115.
- Gillett, Carl. 2003. "The Metaphysics of Realization, Multiple Realization and the Special Sciences." *The Journal of Philosophy* 100:591–603.
- Heil, John. 1999. "Multiple Realizability." *American Philosophical Quarterly* 36(3):189–208.
- Heil, John. 2000. "Truthmaking and Entailment." *Logique & Analyse* 169-70:231–42.
- Heil, John. 2003. *From an Ontological Point of View*. Oxford University Press.
- Heil, John. 2011. "Powers and the Realization Relation." *The Monist* 94(1):34–53.
- Heil, John. 2012. *The Universe as we Find It*. Oxford University Press.
- Heil, John and David Robb. 2003. "Mental Properties." *American Philosophical Quarterly* 40(3):175–96.
- Horgan, Terence. 1984. "Functionalism and Token Physicalism." *Synthese* 59(3):321–38.
- Kim, Jaegwon. 1993. *Mind and Supervenience*. Cambridge University Press.
- Kocurek, Alex. 2018. "Counteridenticals." *The Philosophical Review* 127(3):323–69.
- Kripke, Saul A. 1980. *Naming and Necessity*. Harvard University Press.
- Lewis, David. 1983. "New Work for a Theory of Universals." *Australasian Journal of Philosophy* 64(4):343–77.
- Lewis, David. 1986. *On the Plurality of Worlds*. OUP Oxford.
- Mill, John Stuart. 1947. *A System of Logic*. Longmans, Green and Co.
- Moore, G. E. 1952. *The Philosophy of G.E. Moore*. Tudor Pub. Co pp. 660–667.
- Morris, Kevin. 2011. "Theoretical Identities as Explanata and Explananda." *American Philosophical Quarterly* 48(4):373–85.
- Morris, Kevin. 2014. "Supervenience Physicalism, Emergentism, and the Polluted Supervenience Base." *Erkenntnis* 79:351–65.

- Morris, Kevin. 2018. "Physicalism, Truthmaking and Levels of Reality: Prospects and Problems." *Topoi* 37:473–82.
- Morris, Kevin. Forthcoming. "Multiple Realization and Compositional Variation." *Synthese* .
- Pereboom, Derk. 2002. "Robust Nonreductive Materialism." *The Journal of Philosophy* 99(19):499–531.
- Polger, Thomas. 2004. *Natural Minds*. MIT Press.
- Rayo, Agustín. 2013. *The Construction of Logical Space*. OUP Oxford.
- Rosen, Gideon. 2010. Metaphysical Dependence: Grounding and Reduction. In *Modality: Metaphysics, Logic and Epistemology*, ed. A Hale, B & Hoffman. Oxford University Press.
- Rosen, Gideon. 2015. "Real Definition." *Analytic Philosophy* 56(3):189–209.
- Schaffer, Jonathan. 2017. "The Ground Between the Gaps." *Philosopher's Imprint* 17(11):1–26.
- Schroer, Robert. 2010. "How Far Can the Physical Sciences Reach?" *American Philosophical Quarterly* 47(3):253–66.
- Schulte, Peter. 2014. "Can truthmaker theorists claim ontological free lunches?" *European Journal of Philosophy* 22:249–68.
- Shoemaker, Sydney. 1994. *Physical Realization*. Oxford University Press.
- Smart, J. J. C. 1959. "Sensations and Brain Processes." *The Philosophical Review* 68(2):141–56.
- Stoljar, Daniel. 2010. *Physicalism*. Routledge.
- Stoljar, Daniel. 2017. "Physicalism." *Stanford Encyclopedia of Philosophy* pp. 1–67.
- Wilson, Jessica. 1999. "How Superduper Does a Physicalist Supervenience Need to Be?" *The Philosophical Quarterly* 49(194):33–52.
- Wilson, Jessica. 2014. "No Work for a Theory of Grounding." *Inquiry* 57(5-6):535–79.