

On Characterizing the Physical*

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1 Introduction

In previous work (Wilson forthcoming), I have endorsed an account of the physical according to which an entity is physical just in case it is (approximately accurately) treated by current or future (in the limit of inquiry, ideal) physics, and is not fundamentally mental. Call this account of the physical the physics-based NFM (“no fundamental mentality”) account. The physics-based NFM account avoids (a plausible reading of) Hempel’s (1979) dilemma, which aims to show that no physics-based account of the physical is adequate for formulating physicalism. Moreover (and relatedly), when the account is input into the schematic physicalist thesis that ‘all broadly scientific entities are nothing over and above physical entities’, it preserves the traditional incompatibility between both physicalism and pan- or proto-psychism (the view that some fundamental entities—e.g., subatomic particles—are fundamentally mental), and physicalism and emergentism (the view that some non-fundamental entities—e.g., brains—are fundamentally mental).

Here I want to consider two sorts of objections that may be addressed to the physics-based NFM account. First are objections to this account that may be raised by those who accept (or in any case do not challenge) the NFM constraint. Objections of this sort are directed at showing that some aspect of the physics-based NFM account is either unnecessary or unsatisfactory for avoiding Hempel’s dilemma while satisfying the constraint.

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Second is a sort of objection to the physics-based NFM account that is encoded in competing accounts of the physical that do not impose the NFM constraint—for example, the physics-based accounts provided in Poland 1994 and Dowell 2005, that impose constraints on the form, as opposed to the content, of future physics. Supposing that a physics-based account not imposing the constraint can avoid Hempel’s dilemma—as such an account can, albeit on a somewhat different reading from that motivating physics-based NFM accounts—and supposing that the account is sensitive to at least some of the historical concerns motivating physicalists—as such accounts are, albeit to different concerns from those to which physics-based NFM are sensitive—then why impose the NFM constraint? One response would be to say (as I previously did) that it is definitive of the physical that it is not fundamentally mental; but I now think such a claim overstates the case for the constraint—at least if it is understood as implicating that it is *a priori* that the physical is not fundamentally mental. I’ll rather argue that imposing the constraint makes better sense than not, because the primary historical and theoretical associations, and primary intended use for the concept of the physical—namely, providing a basis for characterizing the mind-body problem, and the range of positions associated with this problem—all require that the NFM constraint be imposed.

2 The Physics-based NFM account

Let me start by presenting the physics-based NFM account as motivated by two considerations: first, the transition from materialism to physicalism, and second, a specific reading of Hempel’s dilemma.

2.1 The transition from materialism to physicalism

As above, physicalism is schematically formulated as the view that all entities are nothing over and above physical entities. Physicalists widely disagree on the appropriate way or ways to fill in the “nothing over and above” clause; but widely agree that, as a first pass, the appropriate way to characterize the physical is by reference to fundamental physics. So, for example, Hellman and Thompson (1975) say:

A thesis that qualifies as ontological physicalism [...] asserts, roughly, that everything is exhausted—in a sense to be explained—by mathematical-physical entities, where these are specified as anything satisfying any predicate in a list of basic positive physical predicates of [the relevant object language] L . Such a list might include, e.g., ‘is a neutrino’, ‘is an electromagnetic field’, ‘is a four-dimensional manifold’, and ‘are related by a force obeying the equations (Einstein’s, say) listed’, etc. (pp. 553-4)¹

The appeal to physics as a means of characterizing the physical reflects traditional materialism’s evolution into physicalism. Materialism, schematically formulated, is the thesis that all entities are nothing over and above material entities, where the latter were understood as having certain definitive characteristics: being extended, impenetrable, conserved, such as (only) to deterministically interact, and so on. Such features coincided with those attributed to the paradigmatically material entities studied by (e.g., Newtonian) physics; but as is now familiar, contemporary physics indicates that these entities, and more specifically, their subatomic constituents, have few, if any, of these characteristics. Hence materialism evolved into physicalism, reflecting (so the story goes, as in Crane and Mellor 1990) a move from an *a priori* to an *a posteriori* approach to characterizing the entities intended to serve as an ontological basis for all broadly scientific entities.

2.2 Hempel’s dilemma and the NFM constraint

There is a dilemma faced by those using a physics-based account of the physical to formulate physicalism, first noted by Hempel, and elaborated by Chomsky (1968 and 1986), Hellman (1985), and Crane and Mellor 1990, among others. The dilemma concerns what physics is at issue in this account, and the first horn is clear enough: if one characterizes the physical by reference to current physics, then the resulting physicalism will surely be false, for current physics is surely both incomplete and at least partly inaccurate.

It’s not as clear what the worry concerning the second horn of Hempel’s dilemma is supposed to be.² On one reading of the worry, it is that a physicalism based on future or

¹See also Davidson 1970, Lewis 1983, Pettit 1995, Kirk 1996, Armstrong 1997, Melnyk 1997, Ravenscroft 1997, Papineau 2001, Loewer 2001, Witmer 2001,

²Here I’m not so concerned with Hempel exegesis (as a matter of fact, he clearly had the first reading in mind) as with the question of what the worry, if it is to be directed at a physics-based account with minimal integrity (that is, one that places some constraints on what could count as physics), could be.

ideal physics does not have a determinate content, since we don't know what entities future or ideal physics will treat. So, for example, Hellman (1985) says

[E]ither physicalist principles are based on current physics, in which case there is every reason to think they are false; or else they are not, in which case it is, at best, difficult to interpret them, since they are based on a “physics” that does not exist—yet we lack any general criterion of “physical object, property, or law” framed independently of existing physical theory.

On another reading, the real worry is that such a lack of determinate content threatens to render physicalism trivially true. So, for example, Crook and Gillett 2001 say:

[I]f one uses an ideal or future physics, then the resulting physicalism will be unacceptably vague or indeterminate. And the nature of this second horn has been further elaborated, for Chomsky has argued that using a future physics will result in a physicalism that is a trivial doctrine. (p. 334)

My own view is that neither of these readings represents a genuine “second horn” worry. For a start, it's incorrect to suppose that talk of future (ideal) physics is effectively lacking in determinate content. The appeal to physics in any physics-based account presupposes, at a minimum, that physics is a scientific theory, and moreover one treating of entities that are effectively fundamental.³ These characteristic features will attach to future (ideal) physics and provide a clear basis for its having at least some determinate content.⁴ These characteristic features will also prevent physicalism's being trivially true, for they indicate that future (ideal) physics will not treat of entities that are not effectively fundamental.⁵ Hence even if a future-physics-based account of the physical placed no restrictions on what features the effectively fundamental entities treated by future physics could have, the question of physicalism's truth would still depend on the entirely separate issue of whether all the non-fundamental entities not treated by future (ideal) physics were or were not over and

³I'll discuss why the qualifier “effectively” is needed in §3.1.

⁴To prefigure, I see both Poland's and Dowell's accounts as being primarily motivated by answering the worry about determinate content by making explicit various features that are plausibly taken to be characteristic of physics.

⁵Hence I deny Chomsky's suggestion that any entities that couldn't be explained by physics would eventually be “downwardly incorporated” into that discipline. The suggestion is implausible, insofar as the various sciences treat of their preferred levels of constitutional complexity, and moreover there isn't any evidence that downward incorporation is a methodological principle in physics (or in the sciences, generally speaking). The case to which Chomsky appeals as showing this—namely, the incorporation of electricity and magnetism into physics—doesn't show this, in particular, since at the time of the incorporation the phenomena at issue were considered as “fundamental” as other phenomena treated by physics at the time.

above the fundamental entities. It would seem, then, that a future-physics-based account isn't in danger of trivializing physicalism.⁶

The real worry, as I and other proponents of physics-based NFM accounts see it, is that a physics-based account of the physical based in future or ideal physics doesn't rule out the remote, but still live possibility that physics might ultimately posit entities that are intuitively physically unacceptable—in particular, entities that are fundamentally mental (e.g., conscious sub-atomic particles) or that bestow fundamental mentality (e.g., fundamental mental forces or interactions). So for example, Loewer (2001) starts by characterizing the second horn of Hempel's dilemma as a worry about triviality (“[If the] ‘physical in [physicalism] means facts expressible in the language of the complete physical theory of the world (if there is one), then that threatens to make [physicalism] trivial unless some conditions are placed on what makes a theory “physical”), but immediately fills in:

If it were to turn out that to account for certain clearly physical events physicists needed to posit fundamental intentional, or phenomenal, properties, then the resulting theory would not be physical. (p. 40)

Similarly, in discussing the second horn of Hempel's dilemma, Papineau (2001) says: “This difficulty is more apparent than real. [...] [I]t isn't crucial that you know exactly what a complete physics would exclude. Much more important is to know what it won't include [...] the sentient, say, or the intentional [...]” (p. 12).

By these lights, the worry isn't that future (ideal) physics is lacking in determinate content, but rather that what determinate content it has does not rule out its treating of fundamentally mental entities. Nor is the worry that a future-physics-based account of the physical threatens to render physicalism trivially true, but rather that it threatens to sanction as physically acceptable entities whose posit intuitively should render physicalism false.

This reading of Hempel's dilemma, unlike the others, identifies a real problem with the first-pass physics-based account, but it is easy enough to revise the account so as to answer

⁶This is true, that is, so long as the physics at issue is understood along lines of the afore-mentioned characteristics. If it is not, then triviality does become a threat, as on Poland's account, on which physics is the science concerned with accounting for space-time and for the composition, dynamics, and interactions of all occupants of space-time, or on any account on which future physics is assumed to be a “theory of everything”.

it. The guiding idea is to appeal to future physics, while recognizing that physicalists need not and should not hand over *all* authority to physics to determine what is physical. One feature can and should remain definitive, namely, that physical entities are not fundamentally mental: physical entities do not individually either possess or bestow mentality.⁷ In fact, participants to the physicalism debates commonly assume that any acceptable account of the physical must rule out physical entities as being fundamentally mental. So, for example, Kirk (1994) first says that the physical is ‘whatever is posited by physics’ but later qualifies “we can explicitly exclude all expressions that would ordinarily be counted as mental or psychological” (p. 78); and in his (2001) he says, “By definition the special physical vocabulary does not include psychological expressions” (p. 544). And the most common objection to paradigmatic object accounts of the physical, according to which physical entities are either objects that are supposedly “paradigmatically” physical (e.g., rocks) or any entities that enter into constituting such entities, is that such accounts are compatible with some entities at low levels of constitutional complexity being fundamentally mental.⁸

I’ll later argue that the assumption that physical entities cannot be fundamentally mental makes sense, given the characteristic deep problematic of contemporary physicalism. But as an initial motivation for imposing the NFM constraint we can note that physicalism is commonly taken to contrast both with proto-psychism (the view that mentality is a fundamental feature of fundamental entities), and emergentism (the view that mentality is a fundamental feature of non-fundamental entities). So, for example (in addition to Loewer’s and Papineau’s remarks above), consider:

- When Kim (1996) lays out the basic physicalist commitments, along with the claim that the mental supervenes on and is determined by the mental is the claim that there are “no fundamental mental entities”.
- When Chalmers (1996) addresses whether his view should be considered a version of physicalism, since he allows that the mental may in the future be accounted for

⁷As I said earlier, there is a question here of whether we should characterize this feature as being “definitive” of the physical (alternatively: of how we should understand talk of a feature’s being definitive). I will revisit this question down the line; for now, talk of definitive features should be understood fairly weakly, as indicating the imposition of an operative constraint on the account at issue. I will also later address the question of whether there are other constraints that should be imposed on a physics-based account.

⁸***cites

by an expanded physics, he maintains his dualism on grounds that his view admits “phenomenal or protophenomenal properties as fundamental” (p. 136).

- In discussing Poland’s physics-based account, which as noted does not impose the NFM constraint, Campbell (1997) says “I think this [account] would be slightly improved with a *caveat* that a dynamics which introduced forces with immanent purpose, and hence teleological causation at the base level, would not sustain a program maintaining the spirit of physicalism” (p. 224).
- Montero says that “most physicalists would take it that panpsychism—the view that mental properties pervade all aspects of the world—is incompatible with physicalism” (1999, p. 185), and more generally that “physicalists aim to refute dualism [...] the view that mentality is fundamental” (2001, p. 67).

Given that physicalism is incompatible with proto-psychism and emergentism, then while (in response to the first horn of Hempel’s dilemma) the physics-based boundaries of the physical may stretch, they cannot stretch so far as to encompass fundamental mentality. Hence the need to distinguish physicalism from its traditional rivals provides one good reason to impose the NFM constraint.⁹

This constraint motivates, as a second pass, the physics-based NFM account: an entity is physical just in case it is (approximately accurately) treated by current or future (ideal) physics, and is not fundamentally mental.¹⁰ Positing the physicality of non-fundamentally mental entities treated by better versions of physics prevents physics’ present failures from immediately falsifying physicalism, while providing continuous content to the account of the physical through the needed revisions.

⁹As I say, I’ll provide a deeper motivation both for preserving the traditional contrast, and for imposing the constraint, down the line.

¹⁰See Papineau 1993, Kirk 1994, Ravenscroft 1997, Papineau 2001, and Loewer 2001 for variations on this theme. It may also be that Hellman and Thompson’s “fundamental requirement” for a *basic positive physical predicate at a place*—namely, that satisfaction of it constitutes a sufficient condition for being a physical entity, clearly enough to be granted by physicalists and nonphysicalists alike—effectively rules out physical entities from being fundamentally mental. These accounts assume that the physical entities are those at relatively low orders of complexity, so that the identity theorist’s claim that mental entities are identical to physical entities should be understood as loose speaking: strictly speaking, the claim is that mental entities are identical to physically acceptable entities (e.g., micro-structural properties), which will not be among the effectively fundamental entities treated by physics.

3 “Internal” objections to the physics-based NFM account

In this section I consider objections to the physics-based NFM account which are “internal” to this account in accepting (or in any case not rejecting) the NFM constraint.

3.1 Objection: the appeal to physics isn’t needed

On Crook and Gillett’s (2001) account of the physical, the basic physical entities are, roughly, the contingent non-mental ontologically basic entities.¹¹ One might think that, for purposes of formulating physicalism, something along lines of this account would be preferable to a physics-based account. After all, physicalism is an ontological thesis. Supposing that fundamental physics is aimed at discovering what contingent ontologically basic entities there are and what they do, why not leave out the middleman and simply characterize the physical in terms of the contingent ontologically basic non-fundamentally-mental entities?

I prefer a physics-based account to one appealing to ontologically basic entities for three reasons. First, notwithstanding the qualifier ‘fundamental’, it’s not clear that we should suppose that fundamental physics treats of the ontologically basic entities, as opposed to entities that are effectively basic. In particular, it seems possible that there might be deeper ontological levels opaque even to ideal physics, in not being needed to characterize natural phenomena at or above the level of fundamental physics.¹² Moreover, the assumption that there is an ontologically basic level is controversial. A physics-based account picks out the ontological level relevant to formulating physicalism, without commitment either to entities

¹¹For present purposes, this rough characterization is useful. I’m not so concerned here to compare the virtues of a physics-based NFM account with Crook and Gillett’s account—in fact, given their recognition that it is via physics that we come to know about the contingent ontologically basic entities, their account is effectively a variant of a physics-based NFM account—as I am to use their account as an opportunity to consider whether one should characterize the physical by reference to ontologically basic entities, without even an indirect appeal to physics.

¹²How this possibility bears upon the schematic physicalist thesis is unclear. It might be taken to indicate that the thesis should rather be that “All broadly scientific entities at or above the level of physical entities are nothing over and above physical entities”. Alternatively, one might stick with the usual thesis and rather reconceive physics as the scientific theory treating of all entities either at the effectively fundamental level or below. I’ll gloss over this issue in what follows.

on that level being ontologically basic or to there being an ontologically basic level.¹³ Second, a physics-based account gives us some concrete handle on what entities are at issue in the physicalist's thesis. For this reason, I would also resist Montero's (1999) suggestion that the appeal to the physical in the physicalist's thesis be replaced with an appeal to the fundamentally non-mental. Third, physicalists traditionally allow that certain ontologically non-basic entities (e.g., protons) that are simple combinations of physical entities (e.g., quarks) are physical, as opposed to just physically acceptable; so even putting aside the possibility of deeper ontological levels, there is no pressing reason to require that physical entities be ontologically basic.

3.2 Objection: the appeal to *future* physics isn't needed

Though most attempts to resolve Hempel's dilemma take for granted that one can't characterize the physical in terms of current physics, Melnyk 1997 makes an interesting case for doing so. This approach, were it to work, would have the advantage of satisfying the NFM constraint without explicitly imposing it, since current physics does not posit mentality as a fundamental feature of either simple or complex entities.

Melnyk starts out (p. 623) by noting that the first horn worry proceeds from a pessimistic induction from the failings of past theories in physics to its being very likely that current physics is both false and incomplete; in which case a current-physics-based physicalism is very likely false; in which case one should reject physicalism. Melnyk's strategy is "to challenge its final step, that is, the inference that a physicalist should abandon physicalism just because physicalism is very likely false" (p. 624). Rather, he supposes that physicalists may take the same attitude toward the hypothesis of physicalism that scientific realists take toward what they regard as the best of current scientific hypotheses. He first defines what he calls the 'SR attitude':

(SR) To take the SR attitude toward a hypothesis is (1) to regard the hypothesis as true or false in virtue of the way the mind-independent world is, and (2) to assign the hypothesis a higher probability than that of its *relevant rivals*.

¹³Hence I disagree with the letter of Loewer's (2001) remark that "[Physicalism] does imply that the only *fundamental* properties, events, and individuals are those of fundamental physics" (p. 43), though I agree with its (intended) spirit that physicalism implies that there are no fundamental entities above the level of fundamental physics.

where a hypothesis' relevant rivals are defined as follows:

(RR) Hypothesis H_1 is a relevant rival to H_2 iff (a) H_1 is sensibly intended to achieve a significant number of H_2 's theoretical goals; (b) the hypotheses, H_1 and H_2 , fail to supervene on one another; and (c) H_1 has actually been formulated.

Per RR, the relevant rivals to a hypothesis H will not include the sheer negation of the hypothesis $\neg H$, since $\neg H$ could not sensibly be intended to achieve the theoretical goals of H (so Melnyk convincingly argues). But then, since taking the SR attitude toward a hypothesis only requires regarding it as more likely to be true than its relevant rivals, and since these rivals will not include $\neg H$, it is possible to take the SR attitude toward a hypothesis without regarding it as likely, much less very likely, to be true. Supposing that the SR attitude can be identified with the attitude that scientific realists take towards what they regard to be the best current scientific theories, and that physicalists can take a similar attitude towards physicalism, a response to the first horn of Hempel's dilemma can be given:

Let physicalism be formulated in terms of current physics. Then, given that a physicalist is simply someone who takes the SR attitude toward physicalism, the mere fact that the history of physical theorizing makes physicalism unlikely to be true provides no reason by itself to abandon being a physicalist; one can remain a physicalist, just so long as physicalism, though unlikely, is still more likely than its relevant rivals. (p. 632)

The problem with Melnyk's response, as I see it, concerns his argument that scientific realists do, in fact, hold the SR attitude as defined above towards what they take to be the best scientific theories. Here Melnyk argues (convincingly) that the scientific realist's attitude toward a given hypothesis doesn't require that they assign a high probability to that hypothesis; then concludes that "In the absence of any further reason for insisting on a high-probability requirement, [the] identification of the SR attitude with the attitude that those who have broadly scientific realist and antirealist intuitions take toward what they regard as the best of current scientific hypotheses can stand" (p. 631). But the conclusion doesn't follow; for even though Melnyk is right that the attitude a scientific realist S takes toward a hypothesis H doesn't require that S assign H a high probability, neither does it require that S assign H a probability that is higher than those of its relevant rivals. This is the case, in particular, for current physics, understood as comprising our best theories of

the fundamental interactions: the quantum gauge theories comprising the Standard Model (treating of the electromagnetic, weak nuclear, and strong nuclear interactions), and GTR (treating of the gravitational interaction). Supposing, as is surely correct, that scientific realists take the characteristic attitude toward current physics, doing so cannot require their thinking that current physics is more likely than its relevant rivals; for since the Standard Model and GTR are inconsistent, current physics is, strictly speaking, false; and it makes no sense, given the standard axioms of probability, to speak of a false theory as being more likely than its relevant rivals. So the scientific realist's attitude toward their favored scientific theories cannot be understood in terms of SR, and neither can the physicalist's toward physicalism.

It rather seems that the attitude that scientific realists have towards their favored theories is that these, while usually false (hence with probability 0), are on the right track. Call this the 'SR*' attitude'. The SR* attitude seems perfectly rational; and a physicalist could certainly take this attitude towards a physicalism appealing to a characterization of physical entities in terms of current physics. But Melnyk rejects understanding physicalism in terms of the SR* attitude on grounds that the associated notions of verisimilitude or approximate truth are difficult to explicate:

[O]ne could say that a physicalist is someone who holds that physicalism, while literally false, is nevertheless closer to the truth, a better approximation to the truth, than its rivals. But [this suggestion] can only be as good as the account of verisimilitude or approximation to the truth on which it relies, and these notions are notoriously hard to explicate satisfactorily. (p. 624)

An additional worry is that any satisfactory way of explicating these notions will need to provide some means of comparing what a given theory says with the truth—where, in scientific contexts, this access to the truth must needs proceed by reference to a theory whose claim to the truth is better than that whose approximate truth is being assessed.

Consider, for example, one of the few accounts of verisimilitude not seen as a clear failure, due to Newton-Smith (1981). This account provides a means of assessing when a theory T_1 has greater verisimilitude than another theory T_2 , roughly by comparing the number of truths among the list of consequences t_1 and t_2 of T_1 and T_2 , respectively. But how do we know which consequences are true?

Of course, deciding which sentences in t_1 and t_2 is no easy matter [...]. So Newton-Smith proposes that the only practical way to judge their truth is from the perspective of some third theory T_3 , a plausible candidate for which would be a theory that we presently regard as true. (Curd and Cover 1998, p. 1256)

It's unclear how this account could be used to assess the relative verisimilitude of rival fundamental physical theories T_1 and T_2 , since presumably there won't be any third theory T_3 "that we presently regard as true" from the perspective of which we could judge the truth of the sentences in t_1 and t_2 . We could make sense of this process of comparison, at least as an abstract possibility, if we take T_3 to be *future* or *ideal* fundamental physical theory. But then (besides the fact that we aren't actually in a position to occupy the perspective of T_3) making sense of the approximate truth of fundamental physical theories will require reference to future (ideal) versions of those theories. So though we can understand physicalists as taking the SR* attitude towards a physicalism based in current physics, if a full account of the notion of approximate truth at issue in this attitude makes reference to future (ideal) versions of current physics, this strategy will not vindicate a current-physics-based account of the physical. In particular, physicalists characterizing the physical in terms of current physics will still face the worries associated with Hempel's second horn. Moreover, in order to avoid the most pressing of these worries, they will have to explicitly impose the NFM constraint.¹⁴

3.3 Objection: the imposition of constraints is *ad hoc*

In discussing the physics-based NFM account, Montero (2001) remarks:

The middle ground [of] leaving the job of making all substantial ontological hypotheses up to the scientists *except* for the hypothesis that the mental is not

¹⁴Even if current physics happened to be true and complete, the NFM constraint would need to be imposed. For a characterization of the physical defined only in terms of current physics would fail to provide a basis for intuitions concerning what entities do and do not count as physical in counterfactual situations where the true physics is different from ours; and relatedly, for intuitions concerning whether physicalism is or is not true in such situations (see Stoljar 2001). The natural response on behalf of either current- or future-physics-based accounts of the physical, is to allow that, in counterfactual reasoning, worlds containing entities that are relevantly similar to the actual physical entities also count as physical; and we can assess whether or not physicalism is true in such a world by considering whether all the broadly scientific entities at that world are nothing over and above the entities that count as physical at that world. But again, in order to preserve physicalism's contrast with proto-psychism and emergentism, the relevant respects of similarity cannot extend to embrace entities that are fundamentally mental. So counterfactual reasoning about the physical provides further reason to impose the NFM constraint, for either kind of physics-based approach.

fundamental, seems oddly *ad hoc*. Why should this bit of *a priori* reasoning be allowed and not others? (p. 71)

Montero's remarks are, in context, intended to call into question the strategy of combining the NFM constraint with the physics-based strategy: in her view the imposition of this constraint "is really the whole game" (to which I respond as I did in §3.1). But one can also extract from Montero's remarks the worry that there might be other features, besides simply "the mental", that any adequate account of the physical (adequate for formulating physicalism, that is) should rule out. Suppose that in ruling out fundamental mentality we take ourselves to have ruled out as fundamental the two traditional "marks of the mental"; namely, qualitative experience and intentionality (the ability to represent what needn't exist). There remain other features of reality that surely should also be ruled out as both physical and fundamental—for example, the moral and the aesthetic. If we were to find out that entities at relatively low orders of constitutional complexity were moral agents, or that aesthetic responses involved a new fundamental interaction or force, then this would plausibly falsify physicalism. So shouldn't those endorsing a physics-based account of the physical also impose a *no fundamental morality* constraint and a *no fundamental aesthetics* constraint, among other constraints?

The worry, however, is that doing so threatens to lead to an *ad hoc* and unsystematic account of the physical. What, after all, are mentality, morality, and aesthetics supposed to have in common, that rules them out as being fundamental? If constraints are introduced on a case-by-case basis, as opposed to being generated out of some more fundamental principle, then this lack of unity will infect the associated account of the physical, and in turn the associated account of physicalism.

Certainly the physicalist will want to rule out the moral and the aesthetic as being fundamental. As I see it, the proponent of a physics-based NFM account has two broad strategies for accommodating this fact.

First, they can bite the bullet and accept that their account of the physical will likely appeal to an unsystematic list of constraints, but maintain that doing so is acceptable, because (1) the resulting lack of systematicity is "swamped" by the unity associated with the appeal to physics, such that the resulting account of the physical has sufficient unity to

serve as a plausible basis for formulating physicalism; and because (2) the alternative (that is, defining the physical *without* imposing whatever constraints are needed) is fatal, in that it results in an account of the physical that renders physicalism compatible with various of its traditional rivals.¹⁵

Second, they can attempt to identify some one or few number of features common to those seemingly diverse entities that are to be excluded as fundamental, that would show that the associated constraints were not, after all, *ad hoc*. This is my preferred strategy, for I am inclined to believe that all, or nearly all, the entities that physicalists would find it important to exclude as fundamental will have in common that mentality is a precondition of their existence, in a strong sense according to which their existence is to some degree constituted by a conscious mind.¹⁶ So, for example, it seems it seems reasonable to suppose that mentality is a precondition of moral agency, in that only cognizing entities are capable of grasping moral concepts and associated truths (if such there be), and deciding to act (or not act) in accordance with these concepts and truths. Similarly it seems reasonable to suppose that mentality is a precondition of aesthetics, in that only cognizing entities are capable of grasping aesthetic concepts and perceiving, creating, and responding to aesthetic states of affairs. And more generally, it seems reasonable to suppose that mentality is a precondition of any normative states of affairs, in that only cognizing entities are capable of grasping normative concepts and making corresponding judgments of value.¹⁷

For some very wide swath of the entities entering into the proposed constraints, then, it seems reasonable to suppose that there is an underlying commonality having to do with each having mentality as a precondition of their existence.¹⁸ This commonality enables the

¹⁵The adequacy of this response will depend on whether physicalism really must be so incompatible.

¹⁶So, for example, it would not suffice for the sort of precondition of mentality at issue here that, e.g., moral agency could be instantiated in a non-conscious entity so long as a thinking being existed somewhere in the world.

¹⁷Obviously, a full defense of these claims would involve arguing that, e.g., moral properties are not appropriately taken to be occurrent dispositional properties of entities not possessing mentality (unless this status as “moral” has been bestowed upon them by an entity bestowing mentality, as with an immoral document). I think this last is plausible roughly for the same reason that I think it is not appropriate to take the property of “being aesthetically pleasing” to be an occurrent dispositional property of a rock that has never been seen by creatures capable of aesthetic response. Such a full defense is obviously beyond the scope of this paper.

¹⁸It may even be that we can “reduce” the set of constraints even further—to basic conscious awareness, understood as a precondition for both qualitative experience and intentionality, along with all those normative and other entities having qualitative experience and/or intentionality as preconditions of their existence.

proponent of the physics-based NFM account of the physical to provide a unified explanation, appealing only to the NFM constraint, of why a wide variety of seemingly diverse entities should be ruled out as fundamental on any adequate account of the physical.

What about fundamental miraculous powers—shouldn't they also be ruled out? Here the proponent of a physics-based NFM account has some choices. First, it is plausible that the characterization of physics as a *scientific* theory is sufficient to rule out the future posit of entities with fundamental miraculous powers. Second, it might be that the NFM constraint would also rule out fundamental miraculous powers. Whether this was so would depend on what it is for a power to be miraculous. Miracles violate laws, but what is the source of the violation? Traditionally, miracles are brought about by force of will of sentient beings (e.g., gods or angels), in which case the having of miraculous powers presupposes mentality, and such powers are ruled out by the NFM constraint. Third, if miraculous powers are not ruled out by physics alone, and can occur without mentality—if there might be sub-atomic “interferers” whose participation in the causal nexus was precisely that of intermittent “spoiler”—then it seems to me that neither physicalists nor their rivals would find the designation of such entities as physical particularly problematic, in which case no constraint would be needed.

Of course, there might be other entities that a physicalist might want to rule out as fundamental, that are not obviously ruled out by either the NFM constraint or by the characteristics of physics. If so, then it might be that the proponent of the physics-based NFM account would have to impose one or more additional constraints. This would involve some loss of systematicity, but given that most constraints can be treated as above, biting this bullet needn't be particularly painful.

3.4 Preliminary conclusion

I conclude that, given that one accepts the NFM constraint, the physics-based NFM approach is a good bet: it avoids the most worrisome aspect of Hempel's dilemma, characterizes the physical in a fashion that is both defensible and systematic, and provides a basis for formulating physicalism as incompatible with both proto-psychism and emergentism.

4 An “external” objection to the physics-based NFM constraint

I turn now to a sort of objection to the physics-based NFM account which is “external” to the account in rejecting the imposition of the NFM constraint, and which is encoded in competing accounts of the physical that do not impose the constraint. My focus will be on Dowell’s (2005) physics-based IFT (‘integrated fundamental theory’) account.

4.1 Hempel’s dilemma and Dowell’s physics-based IFT account

Dowell understands the second horn of Hempel’s dilemma as invoking the worry is that “if physicalism is the thesis that there’s nothing over and above the posits of ideal physics, then physicalism lacks determinate content” (p. 1). As noted, I don’t think that this is much of a worry, but that is mainly because I agree with Dowell that it may be avoided by attention to various definitive characteristics of physics:

A fully fleshed-out version of a formulation in terms of ideal physics must go on to identify what makes a physical theory physical. [...] [T]he best method for fleshing out such a view begins by tying being a physical theory to being a theory with the hallmarks of scientific theories and then identifies physical theories among the scientific ones by their characteristic subject matter, roughly, the world’s most fundamental elements. (p. 2)

Dowell is also sensitive to the reading of Hempel’s dilemma according to which the worry is that a future-physics-based account of the physical threatens to render physicalism trivially true; and in order to avoid this triviality she aims to show that a physics-based IFT account will exclude at least some entities whose existence would intuitively falsify physicalism. In particular, she is concerned to exclude entities with miraculous causal powers.¹⁹ Among the hallmarks that Dowell takes to be characteristic of scientific theories is that their subject matter fits into a unified pattern of laws, which serve as a basis for explanation and prediction. But then there is no danger that future physics will posit entities with miraculous causal

¹⁹Hence Dowell faults Poland’s physics-based account as being compatible with the existence of entities that are intuitively physically unacceptable—namely, occupants of space-time with miraculous powers. As such (p.c.) Poland’s account “doesn’t get the extension of “the physical” right and makes physicalism true in cases in which it isn’t”.

powers, for our notion of such entities is “such that their nature is incompatible with the kind of prediction and unified explanation that’s available for the posits of physical theories” (p. 11). More generally,

[O]n the present account anything whose existence and behavior can neither itself be explained and predicted nor figure in explanations and predictions is incapable of being integrated into the complete and ideal theory in the present sense and so is non-physical and its existence falsifies physicalism. Given this, the content of physicalism in the present, science-based sense is both determinate and falsifiable and so that content is not trivial [...]. (p. 12)

Hence Dowell’s strategy of making explicit the *form* of the physics at issue in a physics-based account of the physical has the nice feature of also ruling out certain untoward *contents* of future physics, in the process avoiding the indeterminate content and triviality readings of Hempel’s dilemma.

On the other hand, the physics-based IFT account does not avoid that reading of Hempel’s dilemma on which it primarily invokes the worry that future physics might posit entities with fundamental mentality. For so long as such entities could be appropriately integrated into a law-governed and explanatory theory of fundamental entities, they could, according to the IFT account, be physical. And though certain mental entities—those involved in the having of free will, if such there be—might be incompatible with such a theory for much the same reason as miraculous causal powers are, other mental entities—qualitative experiences, psychological attitudes, moral agents, aesthetic responses, and so on—might well be sufficiently law-governed that, on some admittedly unlikely course of scientific progress, they ended up being part of future physics. And so Dowell acknowledges:

There’s nothing in the very idea of a posit of our complete and ideal scientific theory of our world’s most fundamental elements that rules out that some mental properties are among those posits. That means that, on the present view, it is not *a priori* that no mental property is among the basic physical ones. (p. 2)

A physics-based IFT account thus indirectly involves rejecting the NFM constraint; and hence renders physicalism compatible, in principle, with versions of proto-psychism and emergentism.²⁰

²⁰As per Campbell’s earlier remarks, Poland’s account is also so compatible.

Dowell also acknowledges that some might see this consequence of her an account as constituting a *reductio*, but resists this route to rejecting her account, for two reasons. First, she has an alternative explanation for why people have *thought* that the physical could not be fundamentally mental: “[W]e should ask: Why do we think its turning out that quarks are conscious is its turning out that physicalism is false? The answer, I think, is that we think it incredible that our ideal physical theory should say so” (fn. 28). In other words, those accepting the constraint have inappropriately interpreted an unlikely possibility as being a definitive characteristic, where the claim that a characteristic is definitive is taken to indicate that it is *a priori* that the physical could not turn out to be fundamentally mental. Second, if those accepting the constraint want to resist such a deflationary explanation, then they owe her an account of the source of the supposed *a priori* incompatibility, that shows why it isn’t open to her to maintain that it is rather *a posteriori* that the physical is not fundamentally mental. Since she has an apparently coherent story to tell about how it could be that the physical turned out to be fundamentally mental, such an argument for *a priori* incompatibility presumably isn’t obvious (p. 14). And this leaves the ball in her opponent’s court.

4.2 Two unavailable routes to deflecting the objection

Dowell’s interpretation of the second horn of Hempel’s dilemma as only consisting of the indeterminate content and triviality readings, and her rejection of the NFM constraint as any part of her physics-based IFT account, constitute indirect objections both to my preferred reading of the the second horn, and to the imposition of the NFM constraint in my preferred physics-based account. The two objections effectively come to the same thing, however, since both turn on the denial of the supposition that physical entities can’t be fundamentally mental. Accordingly, it isn’t open to me to deflect her objection by rejecting her account, on grounds that it doesn’t avoid my preferred reading of Hempel’s dilemma!

Neither can Dowell’s account be rejected on grounds that, in allowing that physicalism is compatible with various forms of dualism, it floats entirely free of traditional preoccupations of physicalists. It’s true that her account does not preserve—except as an *a posteriori* dispute—the rivalry between physicalism and proto-psychism, on the one hand, and emer-

gentism, on the other; and later I will argue that this is, for purposes of making sense of the sort of problematic characteristic of contemporary physicalism, a fatal flaw. But it does preserve one rivalry: that between physicalists and so-called “vitalists”; and more generally, an important historical time-segment of those who self-identified as physicalists. Here it’s worth recalling that Carnap, along with Neurath, introduced the term *physicalism* into philosophical discourse, and at the time (according to Gates 2001, p. 251), the term “seemed theirs to define”. Physicalism has undergone various changes from its logical positivist beginnings, but in any case there’s little doubt that Carnap, Neurath, Reichenbach, and other associates of the Vienna Circle assumed that physicalism involved commitment to lawfully integrated fundamental theory, both as a concomitant of their commitment to the unity of science and as part of their preferred approach to scientific explanation as requiring laws (eventually codified in Hempel’s Deductive-Nomological and Inductive-Statistical accounts; see Hempel 1965), according to which every genuine scientific explanation must include at least one empirical law in its explanans.

In particular, the Vienna Circle’s rejection of Driesch’s “vitalist” account appears to have been specifically motivated by such concerns (see Carnap 1966 for discussion). Driesch’s account was inspired by his pioneering research into embryology and limb regeneration in sea urchins: having noted that embryonic cells, up to a certain stage of development, could become any kind of cell in the mature animal, he proposed that every living organism possesses an ‘entelechy’ responsible for directing the development of the organism and for maintaining its integrity. Entelechies were also supposed to explain psychological phenomena—especially free will. Both cases had in common, according to Driesch, that the phenomena at issue could not be predicted on the basis of the laws of physics and chemistry. For present purposes, what is most important about Driesch’s view is that it was considered anti-physicalistic by Carnap and others in the Vienna circle, not because it involved fundamental mentality, but rather because it was not lawlike:

Carnap and Reichenbach could not accept that Driesch’s entelechy theory really explained anything. In defending the entelechy theory against this accusation, Carnap recalls Driesch retorting that his introduction of the term *entelechy* to explain the behavior of organisms was no different from physicists introducing the term *magnetism* to explain the behavior of magnets and bits of iron. [...] Carnap responded by pointing out that the cases are relevantly different. For

when physicists introduced the term *magnetism*, they did not simply posit the existence of an unobservable entity; they also specified laws that magnetized bodies must obey. These laws can be used to make predictions that can be tested by experiment and observation. Driesch's entelechy theory specifies no such laws and is thus completely lacking in predictive power. Therefore, Carnap concludes, Driesch's theory does not give genuine explanations. (Curd and Cover 1998, p. 768)

Hence at least one traditional dispute between physicalism and its traditional rivals was primarily motivated by the latter positing entities that were insufficiently law-governed, and which could not, as a result, be sufficiently integrated into a lawful and explanatory fundamental theory. Though it remains that a physics-based IFT account doesn't preserve other historical aspects of the physicalism debates (namely, those involving the apparent motivations for materialist and physicalist rejections of proto-psychism and emergentism) presumably Dowell could reply that continuity only requires that her account make sense of one historical aspect of the traditional physicalism debates—unless, that is, there is reason to think that certain aspects of the neglected debates (namely, commitment to the NFM constraint) need to be incorporated into any contemporary formulation of physicalism.

We cannot avoid directly engaging with the reasons for imposing the NFM constraint, then, if we are to respond to the objection that we need not impose the constraint. First, though, let me state one reason why I reject Dowell's deflationary explanation of intuitions to the effect that physicalism would be falsified were physics to posit fundamentally mental entities; namely, that “we think it incredible that our ideal physical theory should say so”.²¹ Simply stated, this explanation of our intuitions cannot be correct; for there are all kinds of entities that we would find it “incredible” for fundamental physics to posit—say, fundamental particles whose behavior under the influence of certain fields traced out incredibly complex geometric patterns—but which would not give rise to the intuitions that physicalism would thereby be falsified.

²¹Other reasons will supervene on the discussions in §4.4–4.6.

4.3 Is it *a priori* that the physical isn't fundamentally mental?

Given that I reject the deflationary account of intuitions that we should impose the NFM constraint, then, according to Dowell, warrantably imposing the constraint “requires an argument showing that there is some unobvious *a priori* incompatibility in our concepts of the mental and the basically physical” (p. 14). If this were required, then the physics-based NFM account might well be in trouble, since so far as I can see, there isn't likely to be any such argument. Of course, many of us have doubts about what might be called the “method of hypothetical cases” (of the sort endorsed in Jackson 1998 and Chalmers and Jackson 2001) that is supposed to enable us to gain *a priori* knowledge of what is and is not compatible with application of a given concept or term.²² Without getting too deeply into this debate I will just ostend briefly to the sort of case that motivates me to think that there is likely very little *a priori* about concepts concerning empirical states of affairs.

Consider the concept associated with being an acid.²³ It was originally taken to be definitive of acids²⁴ that they contained oxygen, so that, at one point in time, the assertion of a sentence like “All acids contain oxygen” could have been defended simply on grounds of understanding the terms involved. If what is definitive concerning a concept tracks what is *a priori* about that concept, then one could have given a seemingly air-tight argument that there was an *a priori* incompatibility in our concepts of being an acid and containing oxygen.

²²As per Melnyk (2005, p. 2), “The method consists in [...] asking oneself, for a variety of hypothetical situations, whether one *would* apply a given concept, or word, to something in that hypothetical situation; and the end to which the method is taken to be, together with further reflection, a sufficient means is the discovery *a priori* of necessary truths that can be formulated by using the concept or word (e.g., truths expressing necessary and sufficient conditions for the applicability of the given concept or word”. Melnyk's doubts primarily turn on the fact that there isn't any existent account of what it is to possess a concept or be competent with a term that would underwrite such possession or competence giving one *a priori* cognitive access to the content of the concept or term. Stalnaker (2003) more straightforwardly doubts that applications of the method give us information about our own semantics, as opposed to the semantics of the hypothetical worlds that are variously considered as actual. My own doubts are analogous to doubts that the expectedness value in Bayes's theorem can be calculated. The latter doubts arise from the fact that calculating this value ultimately requires that we be able to antecedently identify all the rival hypotheses to the hypothesis whose confirmation is at issue; but as a matter of pathetic fact, we simply can't assume that we have the imaginative foresight required to do this. Similarly, I take it to be a matter of pathetic fact (of the sort illustrated in the simple example in the text) that we simply can't assume that we, collectively much less individually, are able to antecedently either consider the full range of hypothetical scenarios that might be relevant to supposed *a priori* deliberation, or realistically take ourselves to be in a position to do more than guess as regards whether it would or would not be appropriate to apply a given concept or term in a great many of those hypothetical scenarios that we are imaginatively equipped able to consider.

²³This case is discussed in Mill 1843 and Kitcher 1980.

²⁴I will gloss the use-mention distinction as applied to concepts and what falls under them.

Nonetheless, a substance was later discovered that was both judged to be an acid, and which didn't contain oxygen—namely, hydrochloric acid, consisting only of hydrogen and chlorine.

In my view this sort of definitional variability is common, especially for concepts pertaining to broadly scientific entities.²⁵ And while a full defense of this thesis is beyond the scope of this paper, it seems to me plausible that what we take to be definitional about any given empirical concept, at a given point in time, will be a function of, at a minimum, the historical and theoretical features we associate with the concept at that time, as well as the intended uses for the concept at that time. So, for example (though I am only speculating), the fact that all the substances originally classified as acids contained oxygen may have been particularly salient; hence considered definitive of the concept. Later, it seems likely, the causal rather than the compositional features of acids became more salient—no doubt in part because these causal features were more relevant to the intended uses for the concept (as picking out entities capable of producing certain effects).

How to respond to the apparent definitional variability of empirical concepts is a good question, but without deciding on an answer it seems we can draw three morals, relevant for present purposes. First, given that even a concept as apparently transparent as that of being an acid can undergo definitional change as a result of various *a posteriori* pressures, it is only to be expected that judgments about what is definitional about a concept with historical, theoretical, and pragmatic associations as rich as that of the physical will vary, depending on which of these associations are being attended to. Second, as a consequence of the first moral it is doubtful that considerations pertaining to what is *a priori*, *simpliciter* about the concept will help in legislating between competing accounts of the physical.²⁶

²⁵Of course, there are ways of interpreting the sort of phenomenon just described that do not suppose that a change in what is taken to be definitional about the concept has occurred. For example, one could suggest that the apparent variability reflected that the term 'acid' came to be associated with a different concept. I can't canvas all the options or argue for my preferred interpretation here, but I take it that it doesn't matter, in that on my preferred interpretation I am (as should already be clear) *granting* to Dowell that there is no *a priori* incompatibility between the physical and the fundamentally non-mental; and will shortly argue that even so, we should impose the constraint.

²⁶For example, while I am happy to take the features Dowell canvasses as definitive of fundamental physics *given a certain conception of and intended use of fundamental physics*, I can think of scenarios where this conception changes in response to some or other reasonable trajectory of scientific investigation—even to embrace the posit of entities whose behaviors cannot be subsumed under anything recognizable as natural law. After all, in fundamental physics we have already given up deterministic for quantum indeterministic laws, which allow that the occurrence of specific quantum events are neither predictable nor explainable. How far from this is the posit of events that are not subsumed even by probabilistic laws? Hence one not

But third, there is no need to throw the definitional baby out with the *a priori* bath water. Relative to a given set of historical, theoretical, and pragmatic associations, it often *will* be clear whether a given feature is or is not definitive of a given concept—or, one might rather say, whether some relativized constraint should be imposed on the concept. And this suggests a way of legislating between competing accounts of a given concept that come down differently on whether a given constraint should be imposed: namely, canvass the historical and theoretical features presently associated with the concept, and the presently intended uses for the concept, and see whether any of these require that the constraint be imposed.

This will be my strategy for arguing that the NFM constraint should be imposed on an satisfactory account of the physical. That is, my response to Dowell’s call to provide an argument that the NFM constraint is *a priori* will rather take the form of arguing that the primary historical and theoretical associations, and primary intended use for the concept of the physical—namely, providing a basis for characterizing the mind-body problem, and the range of positions associated with this problem—all require that the NFM constraint be imposed. I’ll start with the last task first.

4.4 The contemporary mind-body problem

At a crucial level of abstraction, there isn’t any difference between the historical mind-body problem—as treated, for example, by Descartes—and the contemporary problem. The problem has always been, and remains, how to make sense of the relationship between mind and body, given that these seem so different, on the one hand, and yet are so obviously intimately ontologically (and causally²⁷) related, on the other. What has changed is mainly the conception of mind and body at issue—a change that reflects both the general rejection of mental substance, and the general acceptance of science as informing our understanding of body. As Kim (1998) says:

[A]rguably the mind-body problem as we now know it had its origin in two classic papers²⁸ [whose authors] proposed an approach to the nature of mind that has

very useful way for me to throw the ball back in her court would be to challenge her to provide an argument that there is an *a priori* incompatibility in our notions of physics and non-law-governed behavior. Such an argument is no more likely to be forthcoming in her case than in mine.

²⁷Hence it is that the mind-body problem shades into the problem of mental causation.

²⁸Smart 1958 and Feigl 1959.

come to be called the mind-body identity theory [...] . It was an intriguing and exciting idea that mental events could just *be* brain processes [...] But the identity theory was unexpectedly short-lived [...] [It nonetheless] helped set the basic parameters and constraints for the debates that were to come [...] One indication of this is the fact that when the brain state theory began fading away in the late 1960s and early 1970s few lapsed back into Cartesianism or other serious forms of mind-body dualism. Through the 1970s and 1980s and down to this day, the mind-body problem—*our* mind-body problem—has been that of finding a place for the mind in a world that is fundamentally physical. The shared project of the majority of those who have worked on the mind-body problem over the past few decades has been to find a way of accommodating the mental within a principled physicalist scheme, while at the same time preserving it as something distinctive—that is, without losing what we value, or find special, in our nature as creatures with minds.

In characterizing the mind-body problem as the problem of finding a place for the mind in a world that is fundamentally physical Kim doesn't mean to rule out the possibility of non-physicalist solutions. What he rather has in mind is that nearly all presently proposed solutions to the mind-body problem—including comparatively “non-serious” forms of dualism, like emergentism and epiphenomenalism—are in agreement that there is a realm of physical entities which do not themselves involve fundamental mentality of the sort characteristic of “Cartesianism or other serious forms of mind-body dualism”, upon which all other broadly scientific entities supervene (or better: ontologically depend).²⁹ This much already supports thinking that the contemporary mind-body problem presupposes the NFM constraint. Moreover, if we characterize the physical as subject to this constraint then we can make room even for “serious” forms of dualism to be solutions: these will be ones that deny that all broadly physical entities supervene on the physical, by maintaining that there are fundamental entities—substances, in the case of Cartesian dualism; properties, in the case of proto-psychism—that are not physical, because fundamentally mental. So, a concept of the physical subject to the NFM constraint provides a basis for characterizing the contemporary mind-body problem, and enables all the major positions in that debate to be distinguished.

²⁹Hence traditional emergentists maintain that while all broadly scientific entities ontologically depend on physical entities, some nonfundamental scientific entities involve fundamental mentality (as would be the case if a new fundamental “mental” interaction came into play at certain complex levels of organization); and epiphenomenalists maintain that while all broadly scientific entities ontologically depend on physical entities, some physically acceptable entities cause fundamental mental entities (e.g., qualitative mental experiences) that, as it happens, have no causal powers of their own.

By way of contrast, if the operative notion of the physical is compatible with the physical's being fundamentally mental, then it's not clear that the mind-body problem even gets off the ground. In the contemporary problem we now look to physics, or the sciences treating of uncontroversially physically acceptable entities, as filling in the "body" side of the mind-body problem. But the problem of reconciling dependence with difference is the same:

Why does pain arise when there is electrical activity in the pyramidal cell layers, and not under another neural condition? Why doesn't itch or tickle arise from pyramidal cell activity? Why should any conscious sensation at all arise when pyramidal cell activity occurs? Why should there be consciousness in a world that is ultimately nothing but bits of matter scattered over space-time points? (Kim... need the citation)

And as Nagel (1985, p. 51) put it:

What is needed is something we do not have: a theory of conscious organisms as physical systems composed of chemical elements and occupying space, which also have an individual perspective on the world, and in some cases a capacity for self-awareness as well. In some way that we do not now understand our minds as well as our bodies come into being when these materials are suitably combined and organized. The strange truth seems to be that certain complex, biologically generated physical systems, of which each of us is an example, have rich nonphysical properties.

But if the physical can be fundamentally mental, then the effective difference between the mental and the physical would dissolve, and the mind-body problem with it. If the physical can be fundamentally mental, then the truth about how mentality occurs in complex systems needn't be any stranger than the truth about how mass occurs in complex systems: in either case, the property existing at the higher-level could presumably be seen simply as an additive or other function of the lower-level property as instanced in its parts. So an account of the physical that does not impose the NFM constraint does not seem to provide an appropriate basis for characterizing the contemporary mind-body problem.³⁰

³⁰One might wonder: could an account of the physical not imposing the NFM give rise to a different problem—say (given Dowell's physics-based IFT account) the problem of how to fit mind into a scientific world? Perhaps so, but in general this isn't much of a problem. It's not hard to see how most aspects of mentality could be part of a fully integrated science, since both qualitative and intentional mental states appear to be part of a system of causal and constitutive laws. This is one reason why functionalism has gotten such a grip in the philosophy of mind; but of course one doesn't have to be any sort of functionalist to think that these aspects of mentality are law-governed. Arguably, only one feature associated with mentality poses even a *prima facie* problem for lawful integration; namely, free will. As such, Dowell's account could

Relatedly, unless we impose the NFM constraint we cannot accommodate the diverse menu of solutions to this problem. We already noted that such an account renders physicalism compatible with both protopsychism and emergentism,³¹ and that many participants to the physicalism debates were ready to reject such accounts on these grounds alone. With the mind-body problem before us we can see the deeper reason for this rejection; namely, that an account of the physical that collapses these accounts collapses importantly distinct solutions to the mind-body problem. What is particularly distinctive of the physicalist's solution to the mind-body problem is that, in contrast to the panpsychist, she accepts the burden of solving the problem by taking mentality to arise out of complex configurations of entities that are not themselves mental. Moreover, in contrast to the emergentist, she aims to solve the mystery without taking some complex entities to be fundamentally mental. So, for example, Boyd 1980, p. 85 says:

The materialist asserts that all natural phenomena, all events, processes, objects, and so forth, are in fact physical: all objects are composed solely of matter and all events and processes consist solely in interactions between material things. Mental events, states, and processes, in particular, differ from uncontroversially physical events, states, and processes only in the particular arrangements or configurations of matter and material forces that realize them. Pains are quite different from, for instance, earthquakes; but the difference is configurational, not constitutional.

If we do not impose the NFM constraint on our account of the physical, we cannot correctly characterize the physicalist's solution to the mind-body problem as locating mentality in purely configurational goings-on involving non-mental entities.

4.5 The present historical associations

The contemporary physicalist strategy of characterizing the mental in terms of configurations of non-mental goings has clear historical roots in a chain of broadly materialist doctrines stretching back to the late 5th century B.C., and the atomistic metaphysics of Leucippus and his student, Democritus. A quick survey follows.

serve as the basis for a problem specifically focused on how to fit free will into a physical world. But insofar as the contemporary mind-body problem aims to fit qualitative experience and intentionality into a physical world, characterizing this problem requires that we impose the NFM constraint.

³¹Assuming, as regards Dowell's account, that the fundamentally mental entities were sufficiently law-governed that they could be integrated into the fundamental theory, etc.

Democritan atomists gave a mechanical account of human perception in terms of atoms of different sizes and textures flowing from objects into channels associated with the sense organs, where they collide with other atoms, thereby giving rise to sensation. Epicurus (342 - 270 B.C.) and Lucretius (born c. 99 B.C.) followed suit. Materialism waned in the post-classical period under the influence of Aristotelian and Christian doctrine, but was revived in the 16th century, most notably by Pierre Gassendi and Thomas Hobbes, both of whom attempted to account for sensation, as well as inanimate phenomena, on a materialist basis. Hobbes took as the basis for his materialistic metaphysics a definition of body (a.k.a. matter) as anything both existing independent of thought and having volume. On his account, all natural phenomena is to be understood by reference to motion, or change of motion, of bodies; in particular, sensations are motions in a human's body, and changes of sensation are changes of that motion. An anonymous manuscript, the *Ame matrielle* (the material soul), written around the turn of the 17th century, attempted to provide explanations for mental functioning along Democritan lines; for example, pleasure and pain are said to consist, respectively, in the flow of finer or coarser particles through the channels of the brain. In the mid-18th century, the "medical materialist" Julien de La Mettrie argued that man was a self-moving machine, and that all mental activity could be seen, upon examination, to have a physical nature. In the late 18th century, Paul d'Holbach, a German nobleman, argued that no phenomena are outside nature, where nature was taken to be a causally determined succession of arrangements of matter in motion; and he provided what appear to be the first behaviorist analyses of mental characteristics, such as character and wit. Inspired by late 18th-century developments in chemistry (effected by Joseph Priestly in England and Antoine-Laurent Lavoisier in France), 19th century materialists (including Jacob Moleschott, Karl Vogt, and Emil Du Bois-Reymond) attempted to provide physico-chemical explanations of mental functioning. Darwin's publications in the late 19th-century provided yet another source of (and support for) materialist explanation of physiological (including mental) functions. In the early 20th century, logical positivists such as Carnap and Neurath developed proto-behaviorist accounts of mental states, as a likely strategy for ensuring (on a roughly verificationist account) the meaningfulness of statements about minds. And this line of approach was developed by analytic behaviorists, most notably Ryle, who

argued that attributions of intentions, beliefs, desires, etc. are to be understood as attributions of dispositions to behave in characteristic manners in appropriate circumstances (where dispositions were supposed to be some state of the material body). This takes us up to Feigl and Smart; and to the general physicalist strategy as described by Boyd, above.

Each of these historical doctrines, like contemporary physicalism, attempt to provide an ontological account of mentality in terms of configurations of goings-on that are not themselves mental. What distinguishes contemporary physicalism from certain (though not all) of these doctrines is mainly that the account of mentality is ultimately supposed to be in terms of configurations of non-mental goings-on that are effectively fundamental. But the physical entities, whatever else they might be, are the entities that are supposed to provide an ultimate basis for the physicalist's account of the mental. Hence physicalism's evident status as a descendent of materialism presupposes that the NFM constraint is imposed on the operative account of the physical.

But what about the sort of physicalist concern with the physical as a paradigm of lawfulness, that provided a historical grip to Dowell's physics-based IFT account? Here I'll just point out that, while things could have gone differently, as it has turned out this concern now plays very little role in the contemporary debate:

[C]ontemporary physicalism is an ontological rather than a methodological doctrine. It claims that everything is physically constituted, not that everything should be studied by the methods used in physical science. This emphasis on ontology rather than methodology marks a striking contrast with the 'unity of science' doctrines prevalent among logical positivists in the first half of the century. The logical positivists were much exercised by the question of whether the different branches of science, from physics to psychology, should all use the same method of controlled observation and systematic generalization. They paid little or no attention to the question of whether everything is made of the same physical stuff. By contrast, physicalism, as it is understood today, does not have these specific methodological implications. [...] You can be a physicalist about biology, say, and yet deny that biology is concerned with laws. (Papineau 2001, p. 3)

The positivist's preoccupation with lawfulness and scientific methodology is a presently ignored blip on the physicalist's historical screen. Of course I don't mean to suggest that Dowell's physics-based IFT account is intended to capture anything like a positivist understanding of the physical; rather, it seems aimed at capturing what might be called a

“scientific” notion of the physical. But her account is similarly concerned with the *form* (as involving laws, in particular), rather than the *content*, of the science that is supposed to treat of entities serving as a basis for physicalist explanation. Insofar as contemporary physicalism ignores such formal considerations, we may rest with taking the present concept of the physical to rather reflect the historical associations with the material, understood as a non-mental basis for mental goings-on.

4.6 The present theoretical associations

In asking what are the present theoretical associations with the concept of the physical, I have in mind the question: What is the most plausible “rational reconstruction” of why physicalists have looked to physics, in particular, as providing a basis for their ontological account of the natural world? In my view the answer is not, *pace* Crane and Mellor 1990, that physicalists have been particularly impressed with the success of fundamental science.

Rather, keeping the mind-body problem and the associations with materialism and the material in mind, it seems that the physicalist’s appeal to physics is largely that of a placeholder for—unsurprisingly—those fundamental goings on that are not fundamentally mental. As per my remarks in §3.1, physicalists have good reasons to look to physics as treating of those effectively fundamental entities that are to serve as the ontological basis for all other scientific entities, since doing so gives them a concrete (and if they are right, comprehensive) basis of operations. Moreover, physicalists have been confident—overly so, it seems—that fundamental physics would not posit fundamentally mental entities. In my view, that’s all there is to why physicalists have appealed to physics in characterizing the physical.

In particular, given the fading of the positivist blip, the appeal to physics in characterizing the physical doesn’t carry any general commitment on the part of physicalists to the methods of physics, except insofar as those methods are useful for determining what the effectively fundamental entities are and what they are like. All this is just to say that physicalists would wash their hands of physics (and physicalism) if physics did start positing fundamentally mental entities, however law-governed and well-integrated such entities might be. As Montero (2001) correctly says: “Science may, indeed, be the measure of all things, but if science posits fundamental mental entities or properties, physicalists, I take it, throw in the towel” (p. 69).

Given that this is so, the thing to do is to be explicit about the largely pragmatic commitment to physics as characterizing the physical entities, and impose the NFM constraint.

5 Conclusion

To circle things up, it seems to me that one explanation of why proponents of certain accounts of the physical have not thought they had to impose the NFM constraint is due to these accounts being generated mainly as responses to Hempel's dilemma. In attempting to avoid this dilemma (and in particular, the "no determinate content" and "triviality" readings of its second horn) they have constructed accounts that, when input into the schematic physicalist thesis, give the account determinate content—in particular, by not rendering the thesis trivially true. Satisfying these requirements may be sufficient for characterizing the physical in such a way as to avoid (the relevant readings of) Hempel's dilemma, but they are not sufficient to making sense of physicalism as a historically embedded doctrine aiming to solve certain problems—namely, the mind-body problem—in a certain distinctive fashion. This latter requires that we characterize the physical in such a way that the physicalist's claim that "all broadly scientific entities are nothing over and above physical entities" will map onto their strategy of explaining mentality—and all other natural phenomena, for that matter—using only components that are not themselves fundamentally mental.

References

- Armstrong, David M., 1997. *A World of States of Affairs*. Cambridge: Cambridge.
- Boyd, Richard, 1980. "Materialism without Reduction: What Physicalism does Not Entail". In Ned Block, editor, *Readings in the Philosophy of Psychology*, 67–106. Cambridge: Harvard University Press.
- Campbell, Keith, 1997. "Review of *Physicalism; the Philosophical Foundations*". *Philosophy and Phenomenological Research*, 57:223–226.
- Carnap, Rudolf, 1966. *Philosophical Foundations of Physics*. New York: Basic Books. Reprinted by Dover in 1995 as *An Introduction to the Philosophy of Science*.
- Chalmers, David, 1996. *The Conscious Mind*. Oxford: Oxford University Press.
- Chalmers, David J. and Frank Jackson, 2001. "Conceptual Analysis and Reductive Explanation". *The Philosophical Review*, 110:315–60.
- Chomsky, Noam, 1968. *Language and Mind*. New York: Harcourt Brace and World.
- Chomsky, Noam, 1986. *Knowledge of Language*. New York: Praeger.
- Crane, Tim and Hugh Mellor, 1990. "There is No Question of Physicalism". *Mind*, 99:185–206.
- Crook, Seth and Carl Gillett, 2001. "Why Physics Alone Cannot Define the 'Physical': Materialism, Metaphysics, and the Formulation of Physicalism". *Canadian Journal of Philosophy*, 31:333–360.
- Curd, Martin and J. A. Cover, 1998. *Philosophy of Science: The Central Issues*, chapter Commentary on 'Models of Explanation, 766–804. New York: W. W. Norton and Company, Inc.
- Davidson, Donald, 1970. "Mental Events". In L. Foster and J. Swanson, editors, *Experience and Theory*. Amherst: Massachusetts University Press. Reprinted in Davidson 1980.

- Davidson, Donald, 1980. *Essays on Actions and Events*. Oxford: Oxford University Press.
- Dowell, Janice, 2005. “The Physical: Empirical, Not Metaphysical”. *Philosophical Studies*. Forthcoming.
- Feigl, Herbert, 1959. “The ‘Mental’ and the ‘Physical’”. In Grover Maxwell Herbert Feigl and Michael Scriven, editors, *Minnesota Studies in the Philosophy of Science*, volume 2. Minneapolis: University of Minnesota Press.
- Gates, Gary, 2001. “Physicalism, Empiricism, and Positivism”. In Carl Gillett and Barry Loewer, editors, *Physicalism and Its Discontents*, 251–267. Cambridge: Cambridge University Press.
- Hellman, Geoffrey, 1985. “Determination and Logical Truth”. *Journal of Philosophy*, 82:607–616.
- Hellman, Geoffrey and Frank Thompson, 1975. “Physicalism: Ontology, Determination, and Reduction”. *Journal of Philosophy*, 72:551–564.
- Hempel, Carl, 1965. *Aspects of Scientific Explanation and Other Essays in the Philosophy of Science*. New York: The Free Press.
- Hempel, Carl, 1979. “Comment at a Symposium on Nelson Goodman’s *Ways of Worldmaking*”. In *Presented at the 76th Annual Meeting of the American Philosophical Association*.
- Jackson, Frank, 1998. *From Metaphysics to Ethics: A Defense of Conceptual Analysis*. Oxford: Oxford University Press.
- Kim, Jaegwon, 1996. *Philosophy of Mind*. Boulder: Westview Press.
- Kim, Jaegwon, 1998. *Mind in a Physical World*. Cambridge: MIT Press.
- Kirk, Robert, 1994. *Raw Feeling: A Philosophical Account of the Essence of Consciousness*. New York: Oxford University Press.
- Kirk, Robert, 1996. “Physicalism Lives”. *Ratio (New Series)*, 9:85–89.

- Kirk, Robert, 2001. "Nonreductive Physicalism and Strict Implication". *Australasian Journal of Philosophy*, 79:544–552.
- Kitcher, Philip, 1980. "Arithmetic for the Millian". *Philosophical Studies*, 37.
- Lewis, David, 1983. "New Work for a Theory of Universals". *Australasian Journal of Philosophy*, 61:343–77.
- Loewer, Barry, 2001. "From Physics to Physicalism". In Carl Gillett and Barry Loewer, editors, *Physicalism and Its Discontents*, 37–56. Cambridge: Cambridge University Press.
- Melnyk, Andrew, 1997. "How to Keep the 'Physical' in Physicalism". *Journal of Philosophy*, 94:622–637.
- Melnyk, Andrew, 2005. "Conceptual and Linguistic Analysis: A Two-Step Program". In progress.
- Mill, John S., 1843. *A System of Logic*. London: Longmans, Green, Reader, and Dyer.
- Montero, Barbara, 1999. "The Body Problem". *Nous*, 33:183–200.
- Montero, Barbara, 2001. "Post-Physicalism". *Journal of Consciousness Studies*, 8:61–80.
- Nagel, Thomas, 1985. *The View from Nowhere*. Oxford: Clarendon Press.
- Newton-Smith, W. H., 1981. *The Rationality of Science*. London: Routledge and Kegan Paul.
- Papineau, David, 1993. *Philosophical Naturalism*. Oxford: Basil Blackwell.
- Papineau, David, 2001. "The Rise of Physicalism". In Carl Gillett and Barry Loewer, editors, *Physicalism and Its Discontents*, 3–36. Cambridge: Cambridge University Press.
- Pettit, Philip, 1995. "Microphysicalism, Dottism, and Reduction". *Analysis*, 55:141–146.
- Poland, Jeffrey, 1994. *Physicalism; the Philosophical Foundations*. Oxford: Clarendon Press.
- Ravenscroft, Ian, 1997. "Physical Properties". *Southern Journal of Philosophy*, 35:419–431.

- Smart, J. J. C., 1958. "Sensations and Brain Processes". *The Philosophical Review*, 68:141–156.
- Stalnaker, Robert, 2003. *Ways a World Might Be*. Oxford: Clarendon Press.
- Stoljar, Daniel, 2001. "Physicalism". *Stanford On-line Encyclopedia of Philosophy*.
- Wilson, Jessica, forthcoming. "Supervenience-based Formulations of Physicalism". *Nous*.
- Witmer, Gene, 2001. "Sufficiency Claims and Physicalism". In Carl Gillett and Barry Loewer, editors, *Physicalism and Its Discontents*, 57–73. Cambridge: Cambridge University Press.