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Title

Whewell's hylomorphism as a metaphorical explanation for how mind and world merge

Abstract

William Whewell's 19th century philosophy of science is sometimes glossed over as a footnote to Kant. There is however a key feature of Whewell's account worth noting. This is his appeal to Aristotle's form/matter hylomorphism as a metaphor to explain how mind and world merge in successful scientific inquiry. Whewell's hylomorphism suggests a middle way between rationalism and empiricism reminiscent of experience pragmatists like Steven Levine's view that mind and world are entwined in experience. I argue however that Levine does not adequately explain exactly how mind and world entwine. He could nonetheless do so if he appealed to Whewell's hylomorphic metaphor. We may prefer a reductive metaphysical explanation, but I suggest that pragmatists only have recourse to metaphor in this case. Both reductive and metaphorical explanations can enjoy great explanatory power if they exhibit a suitable measure of what I will call semantic distance. Semantic distance measures how close or how far apart explanandum and explanans are from each other in meaning. Metaphorical explanation as evident in Whewell's hylomorphism and as detailed via the notion of semantic distance presents a valuable new explanatory tool to those who hold that mind and world are entwined *sans* recourse to metaphysics.

Key words

William Whewell, hylomorphism, metaphorical explanation, explanatory power, experience pragmatism, Steven Levine

“Metaphor was the beginning of wisdom, the earliest scientific method” (Radman 1997, 43).

Introduction

William Whewell appeals to Aristotle’s form/matter hylomorphism as a metaphor to explain the way that mind and world interface and merge. In this paper, I argue that Whewell’s metaphor provides a robust explanatory tool for those who hold that mind and world are inextricably integrated or entwined, i.e. that there is no strict epistemology/ontology divide. Experience pragmatists hold such a view. They consider both strict realism and strict anti-realism about the external world untenable and find metaphysical attempts to explain the merger of mind and world unconvincing.

Misak (2013, 2014) argues that contemporary pragmatists should return to the classical pragmatists’ belief in the objectivity of reality without losing their core commitment to pragmatism. She identifies two lineages in the history of pragmatism. One is a line of subjectivist influence that runs from James, to Dewey, then Rorty; the other is an objectivist line that runs from Peirce, to Sellars, and now the so-called *new pragmatists* (see Misak 2007; Levine 2010). New pragmatists attempt to rehabilitate objectivity in two ways: (1) from within *language*, i.e. in terms of intersubjectivity or communal agreement; proponents include Stout, Price, Brandom, and Davidson; or (2) by appeal to *experience* as an objective mediator between mind and word; proponents include Putnam, McDowell, Misak and Levine (see Levine 2019 ch 1 for detail). Our concern in this paper is with this latter group of which I take Levine as an exemplar.

By putting experience first, experience pragmatists like Levine can secure a link between our conceptual subjectivity and the objective world out there. Invoking experience is intended to allow the external world to play a constraining epistemological role without the kind of God’s-eye view metaphysics that pragmatism rejects. The world is not *given*; instead, the world is *experienced*.

I will call the merger of mind and world MW_{merger} .

MW_{merger} : The coming together and integration of mind and world.

Our intuition is that mind and world are separate metaphysical domains (Forstmann and Burgmer 2015) linked by something like a correspondence relationship: the so-called “correspondence intuition” (Horwich 1998). Those who hold that mind and world are inextricably integrated or entwined owe an account of how this unity obtains. My metaphorical thesis is intended to provide just the tool to do so. Although I focus on experience pragmatism here, my argument may be informative to anyone who cares to explicate MW_{merger} .

Hylomorphism is enjoying something of a revival in the literature. Varieties have recently been developed in philosophy of quantum theory (Pruss 2017), philosophy of biology (Austin 2017) and philosophy of mind (Jaworski 2020). Most contemporary writers working on hylomorphism however, not only utilise the mereological tools of analytic metaphysics that pragmatists and likeminded thinkers avoid, but also overlook the applicability of hylomorphism to MW_{merger} . My Whewellian account of how form/matter hylomorphism can explain MW_{merger} should therefore make a novel contribution to the literature. Explaining MW_{merger} matters because explicating the relationship (if there is one) between mind and world is one of our most central and most challenging philosophical problems.

In section 1, I introduce Levine’s experience pragmatism. I argue that a sceptic may reasonably request more explanatory detail from Levine on how exactly MW_{merger} occurs in experience.

In section 2, I briefly introduce hylomorphism as found in the work of Aristotle and Kant. This historical explication outlines the genealogical motives for Whewell’s distinctive hylomorphic account of MW_{merger} .

In section 3, I detail Whewell’s thesis that the process of successful scientific empirical inquiry suitably entwines mental *form* and worldly *matter*. That is, Whewell’s form/matter metaphor – as applied specifically to empirical inquiry – potentially explains how MW_{merger} obtains.

I return to Levine in section 4 and suggest a way for Levine (and likeminded thinkers) to answer the sceptic from section 1. I contrast metaphorical explanations to reductive explanations; both are suitable in different explanatory circumstances. We may prefer a reductive explanation of MW_{merger} , but, since one does not seem to be available, we must settle for a metaphorical explanation. I argue that Whewell’s hylomorphic metaphor aptly fulfils this role. This is because it displays a suitable measure of what I will call *semantic distance*. Semantic distance is a

measure of an explanation's explanatory power (whether it is a reductive or metaphorical explanation). To enjoy maximal explanatory power an explanation must find a suitable degree of short versus long semantic distance between explanandum and explanans. That is, explanandum and explanans must be close enough in meaning to be intuitively analogous, but also faraway enough in meaning for the explanation to surprise us and provide novel insights into phenomena needing explanation.

I conclude that incorporating metaphorical explanation as evident in Whewell's hylomorphism and as detailed via the notion of semantic distance provides those who hold to MW_{merger} but eschew metaphysics a valuable new tool to add to their explanatory toolbox.

1. Levine and the return of experience

In this section, I introduce Steven Levine's *experience pragmatism* as an exemplar of a contemporary view that holds to MW_{merger} . The goal is to show how Levine attempts but ultimately fails to satisfactorily explain how mind and world integrate in MW_{merger} . This critique precedes my introduction of Whewell's hylomorphic metaphor in section 2 that I will argue can help in this regard. As we will see, there are significant similarities between Levine and Whewell's theses. Adopting Whewell's hylomorphism metaphor will however grant Levine's account of MW_{merger} the extra explanatory power it requires.

1.1. Levine and MW_{merger}

Levine aims to restore objectivity to pragmatism and thereby free it from the influence of Rorty's (e.g. 1989, 1991) neo-pragmatist subjectivism. Levine believes it is possible to formulate "a pragmatic account of objectivity that *can* accommodate the fact that what is objective constrains our perception, thought, and action in a way that is beyond our control" (Levine 2010, 586 original emphasis). In other words, the "world can play a rational role in the formation of our world-directed beliefs" (Levine 2010, 588).

Thus, although the pragmatist does not care for pure reason or things in themselves, she can appeal to a notion of agent-independent epistemic constraint. For Levine, there is a reality manifested in experience that extends beyond rather than depends upon our points of view. Channelling Dewey, he argues that the interaction of our sensory motor activity with problems in the world is the locus is epistemic constraint the objectivist is seeking (Laudan 1977 and Kitcher

1993 make similar arguments). *Reason* (in the mind) and *stimulus* (of the world) are entwined in our habits as experiential agents. *Inner* “rational relations” and *outer* “causal relations” are wrapped into one tangible knowledge-seeking and knowledge-forming experiential enterprise (Levine 2019).

Levine cites James who analogously discusses a sculptor working on a block of marble: “[t]he mind... works on the data it receives very much as a sculptor works on his block of stone” (James in Levine 2014, 4; see also Misak 2014, 4). The sculptor, says Levine, does not construct matter (the marble block), yet he is constrained regarding what he can do with it. Similarly, we do not create sensations, yet they constrain what we can think and do. Sensation is both beyond our control and at the same time dependent on our interests and our actions to some degree.

As we will see in section 2, this attempted fusion of internalism (anti-realism) and externalism (realism) finds its genesis in Kant and then Whewell. Although Whewell thinks MW_{merger} obtains in successful scientific inquiry while Levine thinks it obtains in experience broadly construed, we can plausibly consider scientific inquiry to be a special case of experience (I argue in section 4.2 that we should prefer Whewell’s more focused locating of MW_{merger}).

I now argue that the sceptic can justifiably press Levine for more explanatory detail on how mind and world interface and integrate in MW_{merger} . Without any metaphysical tools however, a pragmatist like Levine cannot convincingly answer the sceptic.

1.2. Levine and the sceptic

For Levine, if “thought is to be objective, of the way things genuinely are, it must be objective by way of a consideration of our experiential encounter with the world” (2019, 10). One wonders however what exactly this encounter entails. Just how are mind and world entwined in experience? How do these two *prima facie* distinct domains interface exactly? Much ink has been spilled on this important question, and there appears to be no convergence to consensus on the answer. For those who steer clear of metaphysics in the first place, the question is all the more challenging.

Pragmatist attempts to explain MW_{merger} have the potential to become lengthy and elaborate rhetorical exercises. Perhaps, this is inevitable without the detailed – albeit speculative – metaphysics that pragmatism forbids. Without correspondence principles, referential semantics

or mereological reductions for example the pragmatist relies on a style of argument that is systematically rhetorical. In place of deductive formalisms, the standard pragmatist technique seems to involve the repetitive use of synonymous terms in slow and methodical explication. Levine for example expresses MW_{merger} variously as follows:

the materiality of our natural bodies must incorporate, and be *molded* by, certain of our subjective purposes (2019, 58–59 emphasis added);

this incorporation *infuses* habits not with conceptual content but with a type of embodied sense or know-how (2019, 59 emphasis added, original emphases removed);

To say that an experience is '*mediated*' is to say that an earlier phase of an experience is interpreted by a later phase of the experience in light of its outcome or result (2019, 66 emphasis added).

Here, the relationship between some mind-like process with some world-like process is expressed respectively as “moulded”, “infused” and “mediated”. Experience is a kind of function or ‘black box’ that transforms mind into world and *vice versa*. However, to *explain* how MW_{merger} obtains in experience – how the transformation occurs within the black box – Levine reverts to the kind of synonyms listed above (moulded, infused etc). The sceptic will be left wondering however how exactly mind and world are moulded, infused etc. As Henne notes, Levine says “very little... about inquiry, whether ordinary or scientific, or about the relation between the structure of our assertions and the structure of the world” (2019 np).

It is partly for this reason that Rorty and other subject-oriented pragmatists question the epistemic relevance of an objective world mediated by experience as a constraint on our thoughts and beliefs. As Levine notes, “Rorty, Davidson, and Brandom all argue that this is a question we ought not feel compelled to answer, for to do so is to cross a line that ought not to be crossed, namely between reasons and causes” (2019, 167). For Rorty, without recourse to fine-grained metaphysics, the question of how exactly mind and world interface is mute. All we know is the subjective side of the mind/world or subject/object divide, and this is therefore all we can account for.

Interestingly, the metaphorical explanatory approach I will argue for involves a kind of synonymy. Both argument by metaphor and argument by synonymy are forms of argument by

analogy.¹ In both cases, we are told that A is to be thought of as analogous to B; A is explained by way of its likeness to B. Pragmatists like Levine are thus already utilising a metaphorically inclined approach to explaining MW_{merger} . For Levine, MW_{merger} is analogous to a moulding, infusing, and/or mediating relationship. My goal here is to make this analogical reasoning more precise by making explanatory appeal to Whewell's form/matter metaphor.

Before fleshing out this argument, let us first look at the genealogy of Whewell's form/matter metaphor. It is important to historically situate Whewell's argument so as to understand the motives for his conclusion. I therefore now briefly discuss Aristotle and Kant's hylomorphisms that influence Whewell's version introduced in section 3.

2. Aristotle and Kant's hylomorphism

Aristotle famously proposed that things in the world are compounded of a hylomorphic synthesis of *form* and *matter*. As substances come into and go out of existence, the underlying matter out of which they are composed persists through change, while their form is the varying essence or functional identity they have at some specific time and place. Like Levine, Aristotle used the following example. A bronze metal statue is melted and remoulded into a piece of jewellery. The bronze metal is the matter that takes the form of firstly a statue then secondly a piece of jewellery as its function changes. For Aristotle, form and matter are neither same nor separate. The one cannot exist without the other, yet neither can they be pulled apart. Form enmeshed in matter constitutes all things (Aristotle 1925, vi 1, vii 11). I will call Aristotle's form/matter hylomorphism FM_{metaphor} .

FM_{metaphor} : All objects are composed of entwined yet also distinct structural form and substantial matter.

While, for Levine, MW_{merger} occurs in experience, for Kant, MW_{merger} occurs in *perception*. Although he did not consider himself an Aristotelian by any means, Kant thought of MW_{merger} in hylomorphic terms. MW_{merger} is analogous to the way form/matter merge in Aristotelean objects such as statues. There is an internal and an external constraint on perceptual knowledge. The former is our *a priori* mental categories; the latter is the *a posteriori* content of sensation. When

¹ Arbib and Hesse argue that "all language is metaphorical"; "linguistic reference always depends on perceived similarities and differences" (1986, 153; see also Lakoff and Johnson 1980; cf. Pylyshyn 2007 and Camp 2020).

it comes to perception, says Kant, “[s]pace and time are its pure forms; sensation as such as its matter” (1996, A43/B60). Form and matter are “two concepts which lie at the basis of all other reflection, so very inseparably are they bound up with the use of the understanding” (Kant 1996, A266/B322). Moreover, as Whewell will later affirm,

[w]ith every manner in which we are affected there are two parts: matter, i.e., the impression of sensation, and form, i.e., [the] manner in which the impressions are unified in my mind (Kant in Pollok 2014; see also Kant 1996, A20/B34, A42/B59, A51/B75).

Pollok (2014) calls this “Kant’s transcendental hylomorphism” which shifts Aristotle’s ontological hylomorphism to epistemology. Application of the understanding provides the form that ‘shapes’ the matter that constituting the manifold of sense impressions. Form is a mental overlay on matter rather than a metaphysical universal coupled to matter independent of cognition as Aristotle had it (see Buchdahl 1971; Breitenbach 2011 and Rohlf 2020 for detail).

Kant shares with Whewell a common influence in Bacon who proposed a middle way between rationalism (realism) and empiricism (anti-realism). Bacon was critical of Aristotle’s claim that the contents of sensation are *given* to the understanding. Instead, by way of a corrective inductive method, the scientifically trained mind adjusts to and organises sensed phenomena in the empirically informed process of gaining knowledge of the world (Bacon 1878; see also Hintikka 1974; Pérez-Ramos 1996 and Klein and Giglioni 2020).² Whewell likewise emphasises the mutual role played by the world presented in sensation and our cognitive faculties that affect it. Knowledge of the world advances by way of an evolving dual rational/empirical method as evident in science properly practiced.

According to Snyder, Whewell’s philosophy is “most notable for its compound nature, being an amalgam of 19th century British empiricism and a curious Kantian-Platonic type of idealism” (1994, 785). For our purposes, the most significant aspect of Whewell’s amalgam is his notion of *subject and object hylomorphically entwined in scientific empirical inquiry*.

3. Whewell’s form/matter metaphor

² Bacon therefore serves as a genealogical link between Aristotle and Kant (see Floridi 2018). Wolff’s (1963) experimental philosophy, as influenced by Suarez, made a similar impression on Kant (see Heider 2015 and Hettche and Dyck 2019). See Langton (1998) for comparisons between Kant and Leibniz and Locke.

Like Levine and Kant, for Whewell, there is both an internal and an external constraint on knowledge. Whewell calls the former fundamental ideas (approximately Kantian categories); the latter is an outer reality apparent in sensation (see Wettersten 2001 and Snyder 2006 ch 1 for detail). There is however no clear-cut separation between subject and object, between mind and world or between theory and fact.³ For Whewell, these complimentary elements are conjoined in empirical practice producing scientific truths. Scientific inquiry oscillates between passive reflection and active participation; theory and fact co-evolve in the progress of science.

According to Buchdahl, Whewell emphasises “the Kantian doctrine that it is not possible to make a sharp distinction between the ‘sensational’ and the ‘intellectual’ aspects of knowledge; that the division between ‘data’ and ‘inference’ is artificial” (1971, 350). Every inquiring act knits together putatively juxtaposed theoretical and factual elements. Metaphorically, “there is a mask of theory over the whole face of nature” (Whewell 1840, I, 24). One may think of “Sensations as the Matter, and Ideas as the Form, of our knowledge” (Whewell 1858, I, 38).⁴

For Whewell, there is interpretation involved in even our simplest observations. We do not perceive solid objects for example; we only perceive shapes, colours and shades. As with Kant, the solidity these sense-impressions have is a unifying form provided by the subject. Whewell writes,

Sensations and Ideas in our knowledge are like Matter and Form in bodies. Matter cannot exist without Form, nor Form without Matter: yet the two are altogether distinct and

³ Whewell often uses the terms ‘subject’, ‘structure’, ‘theory’, ‘thought’ and ‘form’ interchangeably, all of which approximately denote our putative inner mental realm. The same goes for ‘object’, ‘substance’, ‘fact’, ‘sensation’ and ‘matter’, all of which approximately denote the putative outer worldly realm.

⁴ It should be noted that hylomorphism was not Whewell’s primary way of reasoning about experience and knowledge. Much of his epistemology focused on inductive knowledge which led to his famous *consilience of inductions* thesis. In science, once the mind has grouped together some facts (as in hylomorphism), we extend the conception so-formed to unknown testable cases. This “special process in the mind”, says Whewell, is the process of induction; “[w]e infer more than we see” (1858a, I: 46). Further, when several empirically confirmed lines of induction converge on the same conclusion, we can take such a conclusion to be true; this is the consilience of inductions (see Laudan 1971; Butts 1987; and Snyder 1994, 2021 for more on Whewell and induction).

opposite. There is no possibility either of separating, or of confounding them (1840, I, xvii–xviii).

According to Morrison, “Whewell’s antithesis is an attempt to illuminate the relation between epistemology and ontology by stressing their interactive nature” (1997, 419–420). Whewell’s amalgamation of subject and object “embodies a kind of identity between the knower and the thing known” (Morrison 1997, 422).

For Whewell, mind and world merge successfully when they are most perfectly synchronous, and this synchrony synthesises truths. Scientific inquiry – involving hypothesis, induction, observation, experiment, prediction, verification and consilience – is the method that most successfully brings mind and world into such alignment. That is, mental form and worldly matter are most harmoniously entwined in the activity of successful empirical inquiry at the heart of the scientific method properly practised (see Ducasse 1951a, 1951b, Schickore 2018 and Snyder 2006 ch 1, 2021 for detail on Whewell’s scientific method).

For Whewell, our ability to make novel predictions and manipulations of the world when science is at its best verifies the synchrony of mind and world. The more precise our predictions and manipulations, the more mind and world come into alignment. We can think of science as the pursuit of the infallible alignment of mind and world. As Whewell puts it, “our knowledge is then most complete, then most truly deserves the name of Science, when both its elements are most perfect” (Whewell 1858b, 170).

Whewell does not articulate fine-grained detail of MW_{merger} however. He does not posit mereological relations or bridging laws for example to explain what occurs at the interface of mind and world. Instead, he appeals to hylomorphism (FM_{metaphor}). Whewell refers to FM_{metaphor} as an “illustration” or a “metaphor” for the relationship between theory and fact. He uses the example of a die. Ivory is the substantial *matter* and cubeness the structural *form* of the die; the former is *sensed*, while the latter is *conceived* (Whewell 1840, I, 29–30). However, the ivory cannot be separated from the cube; as in Aristotle’s statue, they are one. Neither the substance of ivory nor the structure of a cube can stand alone; substance must have some structure and

structure must have some substance.⁵ Whewell thus draws on FM_{metaphor} to offer a metaphorical explanation of MW_{merger} . The product is what I will call $W_{\text{synthesis}}$.

$W_{\text{synthesis}}$: Whewell's account of the coming together of mind and world (MW_{merger}) in successful scientific inquiry by appeal to form/matter hylomorphism (FM_{metaphor}).

Thus, MW_{merger} is the explanandum we seek to understand; FM_{metaphor} is the appropriate explanans; $W_{\text{synthesis}}$ is the explanatory framework within which we link explanandum to explanans. FM_{metaphor} as entailed in $W_{\text{synthesis}}$ explains MW_{merger} . I argue to this effect in some detail in section 4.

Importantly, Whewell recognises that mind and world are separate during analysis. We conceptualise them as distinct in the process of coming to grips with their harmony. Only while deliberating the entwinement of theory and fact, do we separate the two as a conceptual heuristic strategy; “no knowledge can exist without the practical union of the two, nor any philosophy without their speculative separation” (Whewell 1840, I, 33). However, the distinction fades as we examine mind and world's conjoined role in successful scientific inquiry. The “difference is unsubstantial”; the “boundary-line... melts away” (Whewell 1840, I, 25).

Having outlined $W_{\text{synthesis}}$ as Whewell's explanation for MW_{merger} in terms of FM_{metaphor} , we can return to how it may be relevant to current writers concerned with MW_{merger} . $W_{\text{synthesis}}$ will be of no interest to idealists, eliminativists or dualists since they do not advocate for MW_{merger} . $W_{\text{synthesis}}$ may however be useful those who hold both that mind and world co-constitute the content of perception, sensation, experience or the like and that metaphysical speculation into the problem should be avoided. Experience pragmatists hold such a view; Quinean naturalists and non-reductive physicalists arguably do likewise. From here on, I will focus on Levine's recently developed experience pragmatism. This serves as a case study for how those who hold to MW_{merger} could benefit from adopting $W_{\text{synthesis}}$ entailing FM_{metaphor} .

Before doing so, it is important to mention how Whewell links to contemporary pragmatism.⁶ Hanson (1958) cites Whewell as an influence on his theory-ladenness of observation thesis made

⁵ We are ignoring mathematical and purely logical structures since Whewell is interested in scientific knowledge about the so-called physical world.

⁶ See Butts (1987) and Cowles (2016) for discussion on the link between Whewell and early pragmatism.

famous by Kuhn (1962) and then Feyerabend (1975) (see Kordig 1971 and Boyd and Bogen 2021 for an overview). Whewell can be thought of as anticipating Hanson *et al.* when he emphasises the role our conceptual faculties play in shaping the world as sensed in scientific inquiry.

Scientific observations, says Whewell, are “idea-laden”, and each science has a particular set of ideas it uses to organise facts. Similarly, for Kuhn, statements about the world depend, in part, on our prior assumptions for their meaning and practical application; empirical facts are *theory-laden*. Middle (i.e. pragmatist) Putnam similarly denies that “it makes sense to ask whether our concepts ‘match’ something totally uncontaminated by conceptualization” (1981, 54). Rorty likewise cites James and Dewey in criticising any distinction “between a cognitive nature or level and a noncognitive nature or level... between scheme and content, or between subject and object” (Rorty 1995, 285 fn 53). Even if these writers are not self-proclaimed hylomorphists, we can identify a clear thematic continuity from Whewell to contemporary pragmatism. As mentioned in section 1, Levine is critical of the conclusions Rorty draws from this collapse of mind/world dualism. Nonetheless, the general theory-ladenness of observation thesis that has become something of an orthodoxy in the philosophy of science and that was anticipated by Whewell is central to Levine’s argument for experience pragmatism.

4. Applying Whewell’s hylomorphic metaphor to Levine’s experience pragmatism

I ended section 1 with the conclusion that, without the kind of fine-grained metaphysical explanation that pragmatism forbids, the sceptic may justifiably withhold commitment to MW_{merger} . In what follows, I argue that Whewell’s metaphorical approach can suitably answer the sceptic without appeal to metaphysics. The argument proceeds as follows.

In section 4.1, I contrast reductive or low-level explanations with non-reductive high-level explanations and conclude that both enjoy certain domains of application.

In section 4.2, I introduce the key notion of *semantic distance*. *Long* semantic distance equates to increased explanatory power, while *short* semantic distance equates to closeness of meaning between explanandum and explanans.

In section 4.3, I argue that Whewell’s *scientific inquiry* rather than Levine’s *experience* is the locus of MW_{merger} . I also outline why FM_{metaphor} is a suitable metaphor for explaining MW_{merger} .

In section 4.4, I discuss the potential problem that, if explanatory power increases with semantic distance, then an explanans completely detached in meaning from its explanandum should grant maximal explanatory power, which is absurd. I thus schematise a way to find a suitable balance between short versus long semantic distance.

In section 4.5, I discuss a possible objection experience pragmatists may level against my proposed account of MW_{merger} : it falls prey to the *myth of the given*. I show that this is not the case.

4.1. Low-level versus high-level explanations

We generally find it difficult to understand phenomena that are highly abstract or that are on very large or very small scales. Metaphor explains these conceptually distant phenomena in terms of the objects and processes within our conceptual range (see Levy 2020). On the large scale of climate change science for example, the atmosphere is explained as a “container” with CO_2 as its “content”; CO_2 “attacks” the atmosphere which “seeks” to “balance” input and output; while on the small scale of neurobiology for example, the action potential – the propagation of information along a nerve cell’s axon – is variously explained as “jumping”, “travelling” and “reinitiating itself” along the cell axon (Niebert and Gropengiesser 2015, 905–920).

Regarding how metaphorical explanation works, Niebert and Gropengiesser write,

[e]ach conceptual metaphor has the same mode of operation: the structure of the (embodied) source domain is metaphorically projected to the target domain to achieve understanding. The embodied conceptions in the source domain provide an inference pattern to reason about the target domain (2015, 905).

Regarding the topic of this paper, MW_{merger} is the target domain and FM_{metaphor} is the source domain; $W_{\text{synthesis}}$ links the two. FM_{metaphor} as explicated in $W_{\text{synthesis}}$ grants understanding of MW_{merger} .

Often, when we ask for an explanation, we are asking for a causal-historical account. In our case however, we want to know *how* MW_{merger} obtains rather than why it obtains, how it came about or what it will do. We are thus concerned with synchronic (non-causal) explanations rather than diachronic (causal, functional or teleological) explanations (see Baron and Norton 2021, 188–190 for more on this distinction). We are concerned with a *how* explanation rather than a *why*

explanation of MW_{merger} (see Godfrey-Smith 2008 for more on how explanations). Newton-Smith (2001) calls the relevant kind of explanation “explanation by identity”: the explanatory work is done by the identity between explanandum and explanans rather than the causal connection between them (see also Wimsatt 2007 ch 11).

A suitable identity between explanandum and explanans must obtain in the mind of one who requests the explanation. The explanandum is something mysterious that can be made familiar by being conceptually linked to something with which one is acquainted: the explanans. A explains B by way of A’s likeness to B whether in terms of a likeness in composition, structure or behaviour. For an explanation to obtain however, A and B must be suitably linked in the *understanding*. Explanation involves an appeal to the intuitive conceptual apparatus of one requesting the explanation.⁷ Thus, if alternative modes of (*how*) explanation fail to capture suitable explanatory precision, metaphor can come into play given that it is – by definition – an expression of similarity intended to grant understanding. For those like the experience pragmatists who consider mind and world entwined but who lack a suitable explanation thereof, appeal to metaphor can therefore fulfil a suitable explanatory role.

Some may wonder however why metaphor should count as genuine explanation. Does explanation not require talk of subphenomenal hidden variables that ground phenomena needing explanation? Often, if one requests an explanation, one is asking for something *deeper* than metaphor: an underlying explanans that accounts for how or why some phenomenon obtains and how that phenomenon fits into our overall world picture (see van der Merwe 2020). Elster for example states that “to explain is to provide a mechanism, to open up the black box and show the nuts and bolts, the cogs and wheels of the internal machinery” (1983, 24).

It is debated however whether reductive – i.e. low-level – explanations have more explanatory power than holistic – i.e. high-level – explanations (Hempel and Oppenheim 1948; Oppenheim and Putnam 1958; Simon 1962; Pylyshyn 1993; Rosenberg 2006 and Kim 2008 say “yes”; Fodor 1974; Putnam 1975; Weslake 2010; Clarke 2016 and Batterman 2018 say “no”). Pragmatists can accept reductive explanations up to a point, but not when they venture into the metaphysical domain beyond the remit of empirical confirmation. We can accept chemical explanations of

⁷ See Fischer (2014) for an informative discussion on the role of metaphor in *philosophical* intuitions.

biological phenomena, and physical explanations of chemical phenomena for example: all fall within the purview of empirical science. We should however reject explanations of physical phenomena in terms of undetectable entities such as supersymmetric strings (for now), not to mention logical atoms, tropes, quiddities and the like.

We often rightly prefer a high-level explanation on pragmatic, utilitarian grounds given that an empirically verified low-level explanation is unavailable. In medicine for example, depending on our aims, we may give priority to either low or high-level explanations. If we aim to cure a patient of some disease, we may give priority to low-level micro-biological factors, but if we aim to prevent a population from getting the disease in the first place, we should take high-level environmental factors into account (see van Bouwel *et al.* 2011 and Broadbent 2019 for detail).⁸

Plausibly, it would be preferable to explain MW_{merger} in terms of some fundamental entities or structures rather than by metaphor. We would then gain an understanding of how MW_{merger} fits into the broader natural world and how it relates to other phenomena potentially explained by the same reductive base. Such a deep low-level explanation is however not currently available, hence my argument for metaphorical explanation.⁹

4.2. Semantic distance; long and short

We have discussed three kinds of (synchronic) explanation: (1) synonymy, (2) metaphor, and (3) reduction. (1) and (2) are high-level or what we can think of as *horizontal* explanations, while (3) is a low-level or *vertical* explanation. Further, as I will now outline, (1) does not increase semantic distance and therefore explanatory power; (2) and (3) increase semantic distance and therefore explanatory power even if (2) does so horizontally and (3) does so vertically.

I am cashing out the explanatory power of metaphor in terms of semantic distance because, as noted in section 4.1, A explains B by way of A's likeness to B. 'Likeness' denotes a semantic relationship between explanandum and explanans. There may indeed be other criteria and other ways to measure explanatory power. However, given that we are comparing metaphor to

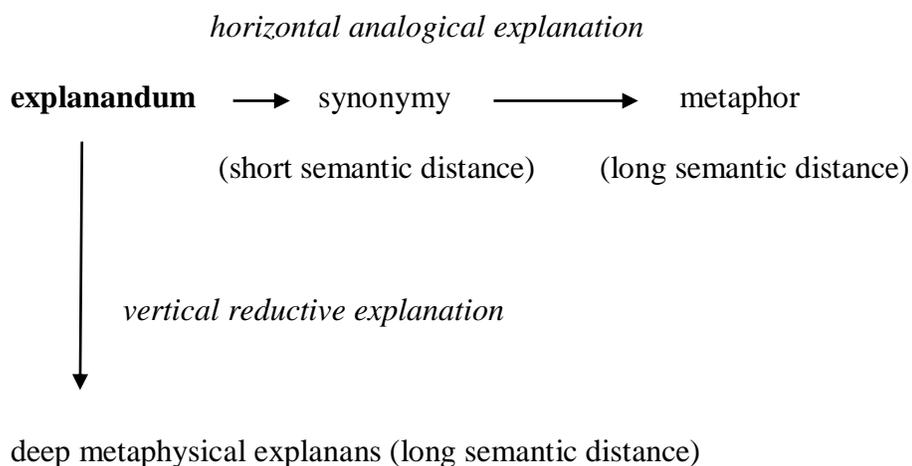
⁸ Thank you to an anonymous reviewer for stressing this point.

⁹ As Simon notes, "an in-principle reductionist may be at the same time a pragmatic holist" (1962, 468; see also Wimsatt 2007 ch 12). Kim (2008) argues that we can utilise reductive explanations without embracing metaphysical reductionism.

reductive explanation, which clearly involves some notion of metered distance, semantic distance can suitably capture the value of both. Taylor's (forthcoming) account of *explanatory distance* has notable similarities to the notion of semantic distance developed here. For Taylor, a suitable *dependency* relation – viz. metaphysical grounding – finds the correct distance between explanandum and explanans. Contra the view expressed here however, Taylor considers the relationship between explanandum and explanans to be metaphysical rather than semantic, making her account incompatible with pragmatism (she also does not consider the role of metaphorical explanation).¹⁰

As intimated at the end of section 1, synonymy is a minimal kind of analogy compared to metaphor. Synonymy draws analogy between concepts close in meaning; we can say that the *semantic distance* between the two concepts is *short*. There is a short semantic distance between MW_{merger}'s 'merging' relationship and Levine's 'moulding', 'infusing' or 'mediating' relationship; the explanatory concepts are synonyms. Conversely, in metaphor the concepts we are asked to analogise are further apart in meaning; the semantic distance between the two concepts is *long*. There is long semantic distance between MW_{merger}'s 'merging' relationship and FM_{metaphor}'s 'form/matter' hylomorphism; they are analogous, but they are not synonyms.

My semantic distance thesis can be schematised as follows (arrows denote direction of increasing explanatory power):



¹⁰ Wilsch (2015) also equates explanation with metaphysical grounding. See Dasgupta (2017) for criticism of such a view.

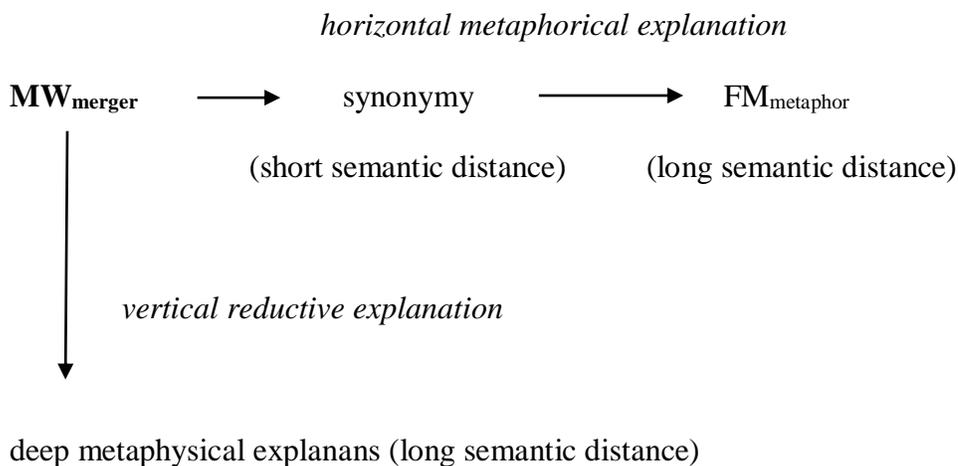
When our willingness to engage in deep – i.e. metaphysical – explanations bottoms out, we can only proceed horizontally if we wish to increase explanatory power. Thus, metaphor is preferable to synonymy because it has longer semantic distance and therefore greater explanatory power. Levine’s synonyms introduced in section 1 – moulded, infused and mediated – each connote a coming together of two elements where one or both are transforming the other in some way. However, given synonymy’s short semantic distance, it has little explanatory power.

The explanatory power associated with long semantic distance is a function of the *insight* an explanation grants to the understanding. That is, an explanation must surprise us with some new insight; there must be what Gopnik (1998) calls an “aha moment”. Levy writes that metaphor

frames a target by imaginatively juxtaposing it with a familiar subject matter. In this way it highlights certain properties and makes accessible certain patterns of reasoning, thus enhancing understanding (2020, 293–294; see also Arbib and Hesse 1986, 156).

As with surprise, there are thus elements of imagination or creativity in metaphorical explanation that are mostly absent in synonymy. This is because in synonymy we merely think of the relevant explanandum in a similar way to how we did before. Daane notes likewise that “[m]etaphors help thinkers and writers forge new connections, relevancies, realities and, at the same time, control the way they view the world” (1995, 1). We come understand some phenomena in an interesting new way that escapes previous puzzlement (Lakoff and Johnson 1980; Bradie 1999).

Thus, applying the above schema to MW_{merger} :



Regarding science, Levy notes that both scientific models and metaphors are forms of “surrogate representation” involving “employment of the imagination” (2020, 295; see also Bradie 1999).¹¹ According to Agosta and Brooks, scientific theories are narrative metaphors that have the characteristic of pointing the way to truth; “metaphor is the poetic growth medium for new conceptual frameworks in science” (2020, 17; see also Lakoff and Johnson 1980; Hesse 1993; Elgin 2006; cf. Lewontin 1963). Metaphors in science can also serve a temporary explanatory purpose – as heuristics or placeholders – while scientists work on some deeper explanation (Black 1962; Camp 2020). Scientists often seek a reductive explanation, but metaphor can fulfil a provisional role where reductive explanation – if preferable – is not (yet) possible (Boyd 1993).

One of the most famous metaphors in science is Darwin’s metaphor of ‘natural selection’. Nature does not strictly-speaking *select* between organisms; ‘selection’ – as conventionally understood – requires an agent to do the selecting. Darwin drew the selection analogy from what is now called artificial selection: a breeder selects between organisms she sees fit for some anthropic purpose. Darwin’s natural selection metaphor presented a high-level horizontal explanation of evolution to those accustomed to artificial selection. Today however, most evolutionary biologists understand evolution in terms of a lower level vertical explanation: in terms of alleles in gene pools or gene frequencies in fitness space for example (see Brooks 2011; Agosta and Brooks 2020 and Scheiner and Mindell 2020).¹²

In sum, Levine’s synonymy will have more explanatory power if he increases the semantic distance he utilises in his efforts to explain MW_{merger} ; that is, if he switches from synonymy to metaphor. This will go some way to answering the sceptic even if we do not speculate on the metaphysics of MW_{merger} .¹³ For experience pragmatists and likeminded thinkers, metaphor

¹¹ See Montuschi (2001) for more on different conceptions of metaphor in the philosophy of science. See Sullivan-Clarke (2019) for an overview of how analogical reasoning can both aid and at times hamper the progress of science.

¹² Note the further metaphors – “pools” and “space” – at the lower explanatory level. The project to explain these metaphors by reference to some even lower level explanans is ongoing. See Levy (2011) for an account of metaphor in cellular and molecular biology.

¹³ Although analogical argument is a form of ampliative reasoning, it is permissible for the pragmatist because it does not necessarily invoke metaphysics.

appears to be a viable explanatory option all things considered. As Camp quoting Emily Dickenson suggests, metaphors are “telling the truth but telling it slant” (2020, 324).

4.3. The locus of MW_{merger} , and why FM_{metaphor} is a suitable explanation of MW_{merger}

I propose that two features of $W_{\text{synthesis}}$ can be of use to Levine in making his account of MW_{merger} more epistemically robust and therefore better able to counter the sceptic from section 1.2:

1. As per Whewell, scientific inquiry, rather than experience, is the locus of MW_{merger} ;
2. FM_{metaphor} is a suitable metaphor for explaining MW_{merger} .

Regarding 1, Levine argues that MW_{merger} occurs in experience. ‘Experience’ is however a notably broad concept that he does not define in any precise manner (see Kraut’s 2020 review of Levine’s 2019). Plausibly, one can count every moment of existence as experience, and, if MW_{merger} occurs in every such moment, then not much has been explained. Such an explanation amounts to the claim that mind is always aligned with world, and this is clearly not the case. Our everyday experience is sometimes demonstrably fallible: we *experience* the Sun as rotating around a stationary Earth for example. In such cases, mind and world are misaligned in experience. The scientific method has been, in part, developed to overcome our intuitive foibles and biases (see Pinker 2021). Whewell’s notion that mind and world interface and align most perfectly in successful scientific inquiry is therefore more apt as the locus of MW_{merger} .

What begins as an antithesis is, for Whewell, in the end a synthesis. Successful scientific inquiry is the locus where mind and world synchronise, and the degree of empirical success achieved in scientific practice determines the degree of alignment between mind and world. $W_{\text{synthesis}}$ (with the help of FM_{metaphor}) thus explains MW_{merger} in a robust way. MW_{merger} does not occur in experience broadly-construed as Levine has it. Instead, it occurs within a rather narrow range of conditions specific to scientific inquiry functioning at its best.

Regarding 2, even if we accept that metaphors can have the desired explanatory power, we still need to establish that FM_{metaphor} is a suitable metaphor for explaining MW_{merger} . I propose that the form/matter hylomorphism Aristotle considered constitutive of the identity of all objects nicely captures the way we might think of mind and world synchronised. The relationship between form and matter (or structure and substance) is one of mutual dependency and synchronous

affect. Idealism, eliminativism and dualism aside, since Kant, it has been largely accepted that mind and world are likewise mutually dependent in generating the identity of and truths about things of the world.¹⁴ Hylomorphism suitably captures the way that two elements can be so inextricably conjoined yet also conceptually separate. We cannot imagine form separate from matter or matter separate from form, yet we can somehow conceptualise them as distinct elements individually analysable. Likewise, mind and world jointly construct and constitute all things,¹⁵ yet we easily conceptualise them as separate. This state of being both one and many is aptly embodied in FM_{metaphor} . We cannot say exactly what fine-grained events or processes occur at the interface of mind and world, yet hylomorphism appears to capture the nature of that state in a suitably analogue way.

Plausibly, by thinking of world as matter and mind as form, we come to think of world as substantial and dispositional, recalcitrant yet also malleable; and the way that the mind seems to overlay the world imbuing it with semantic and aesthetic qualities is nicely analogous to the way that form ostensibly does so with matter. This hylomorphic explanation captures our imagination, grants insight and eases our puzzlement to some notable degree. One can feel content that one understands MW_{merger} significantly better than before by thinking of it as analogous to FM_{metaphor} . Even if not a final, complete explanation, FM_{metaphor} has robust explanatory power compared to synonymy for example.

4.4. Finding a suitable balance between short and long semantic distance

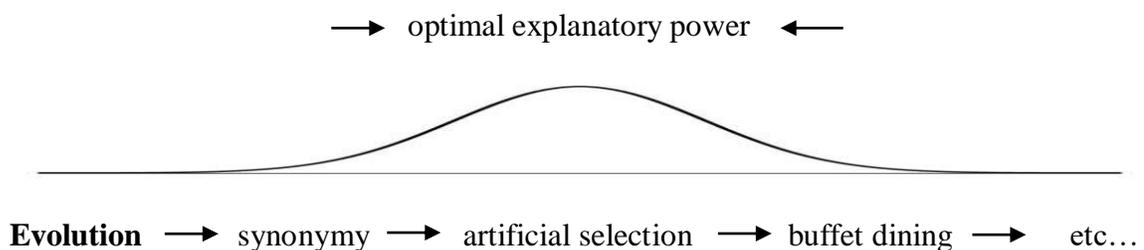
An obvious objection is that, if explanatory power increases with semantic distance, then some explanans completely unrelated in meaning to its explanandum should have maximal explanatory power. We should make the absurd conclusion that an arbitrary analogue having

¹⁴ It is not clear quite which aspects of MW_{merger} are contributed by the mind and which are contributed by the world. For Kant and Whewell, the mind contributes space and time. Yet there is ongoing debate in contemporary philosophy of physics over the nature of space and time and to what degree they are constructed versus represented (see Maudlin 2012 for an overview). It appears however that the mind does contribute something (colour seems a fairly non-controversial example). In any case, I leave it open as to what precisely mind versus world contribute to MW_{merger} given that we are concerned here with *how* mind and world contribute to MW_{merger} and not *what* they contribute.

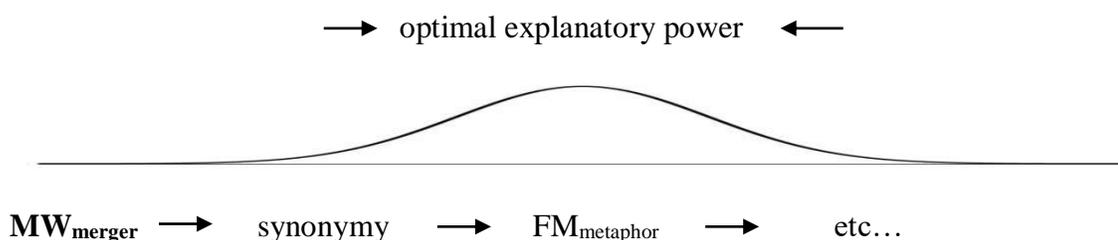
¹⁵ Excluding mathematical and purely logical things (recall fn 3).

zero closeness of meaning to MW_{merger} will have maximal explanatory power. As such, I propose we do not ‘stretch’ semantic distance so far that the resemblance between explanandum and explanans is lost. There is thus a trade-off between closeness of meaning and explanatory power. The best analogy for the explanatory job at hand will maximise explanatory power without losing the semantic resemblance between explanandum and explanans.

Darwin’s artificial selection metaphor from the last section for example explains evolution by analogy to selective breeding. One could also attempt to explain evolution by analogy to buffet dining perhaps. In both cases, desired items are selected from a variety. However, we can see that semantic distance is now being stretched too far resulting in loss of closeness of meaning between explanandum and explanans. Although explanatory power increases initially as closeness of meaning diminishes, it will begin to taper off as semantic distance is overstretched. Schematically:



Returning to MW_{merger} , we have seen how synonymy is very close in meaning to MW_{merger} but consequently lacks explanatory power. As argued in the previous section however, FM_{metaphor} explicated in $W_{\text{synthesis}}$ suitably explains MW_{merger} . Consequently, it has the correct balance between closeness of meaning and semantic distance to maximise explanatory power. *Mutatis mutandis*:



A suitable likeness obtains when the semantic distance between explanandum and explanans is neither too short nor too long. Too short, and we will gain no new insight: there will be no aha moment; too far and we will fail to gain understanding: we will not see the conceptual

connection between explanandum and explanans. We seek a suitable semantic distance between explanandum and explanans where the trade-off between insight and understanding is optimised.

4.5. Possible objection: the myth of the given

Experience pragmatists may however object that $W_{\text{synthesis}}$ falls prey to the *myth of the given*. For Dewey, it is a mistake to hold with Kant that the content of sensation can influence our inferences without itself having inferential content (see de Vries 2021 for detail). Levine presents the myth of the given in the form of a dilemma:

if sensations are truly *independent* of thought... how can they be *homogeneous* enough with thought so as to solicit, or give the cue for, the right or correct thought? And if they are homogeneous enough with thought to solicit it, how can we say that they exist prior to thought, as is necessary if they are to constrain thought from the outside? (2019, 164 original emphasis).

As discussed in section 3, Whewell draws on Kant to argue that the facts – the content of sensation – are the objective half of MW_{merger} ; theory being the subjective half. $W_{\text{synthesis}}$ may therefore be prone to the myth of the given. Is Whewell's content of sensation *given* to thought without having any thought-like properties for the mind to latch onto and merge with?

As mentioned in section 3, Whewell thinks of mind and world as separate in analysis yet united in reality. In scientific terms, MW_{merger} obtains when the form of theory and the matter of experiment mesh harmoniously in successful empirical inquiry. Dewey expresses a similar view; he writes that the

facts by which [a] theory is to be verified or disproved are not a fixed, unchangeable, body; if a theory gets its verification through the facts, the facts get a transformed and enlarged meaning through the theory... Both idea [mind] and 'facts' [world] are flexible, and verification is the process of mutual adjustment, of organic interaction (Dewey in Levine 2019, 163; see Dewey 1903).

This is Dewey's way of overcoming the myth of the given (see Levine 2019, 164–165, 229–230). Facts are not statically given; they are instead pliable to the influence of theory. Whewell likewise understands theory and fact to co-evolve in the process of scientific inquiry (section 3). He does not take the content of sensation to be independent of thought yet somehow also

influential on thought. Instead, they are mutually affective; we only conceptually separate them in coming to understand their unity.

Drawing again on metaphor, we can think of Aristotle's statue sculptor as treating form and matter separately during the planning and sculpting of her piece. As she works, form and matter interact under her guidance. They become increasingly aligned to her initial blueprint as the piece nears completion. Once complete, we now think of the statue as a work of art; form and matter are in harmony. For the sculpture to be a sculpture *qua* artwork – for it to have identity, meaning or beauty – we must consider it as a whole.

Conclusion

For Whewell, when empirical science is functioning at its best, mind and world are most perfectly aligned; the one blends into the other; they co-evolve in harmony. This merging of mind and world (MW_{merger}) is analogous to the form and matter that constitutes Aristotelian objects (FM_{metaphor}). Whewell's form/matter metaphor ($W_{\text{synthesis}}$) draws on FM_{metaphor} to articulate a robust account of how MW_{merger} obtains in successful scientific inquiry. $W_{\text{synthesis}}$ seems to satisfy both our intuition that mind and world are distinct and the evident truism that there is no God's eye view from which to analyse their separation.

Experience pragmatists who reject Rortian subjectivism may find it useful to draw on $W_{\text{synthesis}}$ entailing FM_{metaphor} as a way to explain MW_{merger} . $W_{\text{synthesis}}$ provides those who hold to MW_{merger} *sans* metaphysics a valuable new explanatory tool. We may at times prefer vertical reductive explanations, but we must sometimes be content with horizontal analogue explanations, as in the case of MW_{merger} . What exactly a deep explanation of MW_{merger} would look like is, in any event, unclear. The debate amongst metaphysicians is ongoing. Perhaps some future science will develop such an explanation or – more likely in my view – metaphorical explanation is all we have.

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