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Aristotle's Hylomorphism: The Causal-Explanatory Model

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There are several innocuous or trivial ways in which to explicate Aristotle's hylomorphism. For example: objects (or kinds of object) are characterisable in terms of matter and form; or analysable into matter and form; or understood on the basis of matter and form. Serious problems arise when we seek to specify the sorts of relation holding among the different contributors to the hylomorphic picture. Here are some central general questions:

(a) What types of relation are most suitable for each n-tuple of contributors (e.g., identity, part-whole, or some other relation)?

(b) What direction and modal profile should each relation have (e.g., is form prior to matter and the compound, or is the compound prior to matter and form; is matter essentially or contingently related to form)?

In addressing such questions we find that the types, directions, or modal character of the relations that we or Aristotle may favour are often in tension with each other, or clearly lead to inconsistencies. The paper focuses on the Modal Question (M), also known as 'Ackrill's problem': is form essentially or contingently related to matter? I outline a hylomorphic model, what I label the 'causal-explanatory' model (CEM), and show how it can tackle M.

Keywords: Aristotle; hylomorphism; matter; form; compound; Ackrill's problem

1. Introduction: Questions of Hylomorphic Relations

Aristotle's hylomorphism is, roughly speaking, the idea that objects are compounds consisting of matter and form. For example, a statue is a compound of its constituent bronze and its perceptible shape. He argues that hylomorphism can address central metaphysical questions about synchronic and diachronic identity, persistence through change, individuation, the modal profile of objects, and generally the explanation of objects' nature and characteristic features. There are several innocuous or trivial ways in which to explicate his hylomorphism. Thus, for instance, one might describe it as the view in which (kinds of) objects are characterisable in terms of matter and form; or analysable into matter and form; or understood on the basis of matter and form. Serious problems arise when we seek to specify the sorts of relation holding among the different contributors to the hylomorphic picture. Here are some central general questions:

(a) What types of relation are most suitable for each n-tuple of contributors (e.g., identity, part-whole, or some other relation)?

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In addressing such questions we find that the types, directions, or modal character of the relations that we or Aristotle may favour are often in tension with each other, or clearly lead to inconsistencies. I shall offer an example of such difficulties shortly.

There is, on the other hand, a great variety of specific questions one could raise about the relations between matter, form, and compound. I shall focus just on what I shall label the 'modal' question, as it has exercised (and still troubles) interpreters extensively.[1]

> The MODAL Question (M). What is the modal link between a compound's form and matter? Is the form just accidentally related to the matter? Or is it essentially related to it? Especially on the basis of Aristotle's own artefact examples, it seems plausible to think that (for instance) the matter of a statue, say a piece of bronze, may not be, or may not have been, and perhaps will not be, a/this statue. Similarly, the flesh, bones, tissues, and chemical constituents, or the hands, eyes, or heart of a human may not be functional parts of a living human being.[2] If this is correct, the matter seems to be only contingently, non-necessarily, or non-essentially enformed by the relevant form (being a statue or being a human).[3] Indeed, it had better be independent of form in this fashion. For, in a plausible hylomorphic theory, matter should possess an identity or nature in its own right, rather than solely on the basis of form. The alternative would raise doubts as to the value of matter in, and its independent contribution to, the hylomorphic picture. However, the proximate matter or the functional organs of a living organism are, in Aristotle's view, essentially or/and necessarily alive, ensouled, or enformed by (for example) the form being a human.[4] This is the so-called homonymy thesis, in which a dead, mutilated, or non-functional finger is a finger only homonymously: it bears the same name as a properly functional finger but is different from it in essence and definition, and so is an entirely different type of thing. Aristotle sometimes likens such cases to artefacts, such as wooden or marble fingers (*Metaph.* Z.10, 1035b20–25; *DAn.* II.1, 412b10–27; *DePartAn.* I.1, 640b30–641a7; *Meteor.* IV.12, 389b28–390a2). This thesis entails that matter is essentially enformed by the relevant form.[5]

I shall first outline a hylomorphic model, what I shall label the 'causal-explanatory' model (CEM). Second, I shall show how CEM can tackle M in an economical and elegant fashion.

2. The Causal-Explanatory Model (CEM) Introduced

In *Posterior Analytics* II.1–2 Aristotle argues that in our scientific inquiries into types of process we are seeking answers to four interrelated questions:[6]

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[1] Here are some further examples of specific questions about hylomorphic relations: (1) The SAMENESS or PRIORITY Question. Is a compound the same as, or identical to, its essence or form? Is it the same as, or identical to, the combination of matter plus form? Is a form prior to, and hence non-identical to, a compound? Is it prior to matter? (2) The PART-WHOLE Question. Are form and matter parts of, or do they constitute, the compound? Or are form and matter extrinsically related to the compound, either as completely independent entities or as abstractions in thought from the compound? Another way to raise this question is to ask whether Aristotle's ontology is constituent–where matter and form are literally constituents of the compound–or whether it is relational–where matter and form bear some extrinsic (neither part-whole nor constituent-constituted) relation to the compound. For this type of discussion see Loux 2014; Lowe 2012. (3) The UNITY Question. Natural substances–whether particulars or their kinds–are paradigmatically one or are exemplary unities. But they also involve many bodily parts. Indeed, they have at least two parts, matter and form, if Aristotle's ontology follows the literally mereological or constituent approach in dealing with the PART-WHOLE question. How can such pluralities be unities? How are matter and form related to yield a unified compound? Moreover, the form itself, as a definable essence and as the primary object of definition, has at least definitional parts; for, otherwise, it would not be definable (*Metaphysics* Z.13, 1039a14–23). But it is also the basic unifier and itself robustly one. How can Aristotle's theory achieve this sort of unity for a definable, complex form? How are the items making up the form related to constitute a unified form?

[2] In the present study I shall focus on kinds of natural substance. Aristotle seems to be concerned mostly with kinds. But his views can be conservatively and systematically extended to particular substances too if we assume that the latter are essentially and so necessarily members of their kinds. For an argument in support of this last claim see Williams S. G. and Charles D. 2013: 133–9.

[3] The present claim comprises three subtly different views of the modal relation of matter to form. There is no need, for present purposes, to distinguish between these three different strands.

[4] Some recent discussions of this issue do not seem to distinguish cautiously between being *merely necessarily* thus-and-so enformed and being *essentially* thus-and-so enformed; Shields (2016: xxvi–xxviii) frames the problem in terms of necessity versus contingency; but in Shields 2016a he uses 'essentially'; Ainsworth (2016) also deploys the essentialist formulation. I shall set this issue to the side for present purposes. In what follows I shall formulate the question using the language of being 'essentially enformed'.

[5] It is important to ask about the reverse direction of dependence too. Isn't an Aristotelian form necessarily dependent for its existence on the existence of some matter or other? For it must exist in matter, if it is to exist at all. Perhaps, in some more radical views, matter of some sort intrudes even in the form's very essence. This question is addressed in more detail in Peramatzis 2015; 2013–4; 2011.

[6] The causal-explanatory model is discussed in more detail in Peramatzis 2015: 197–203; 207–10; Peramatzis 2013–14; Peramatzis 2011: 176–200; see also Charles 2010; Charles 2000; Charles 1994 (esp. 76–80).

(a)   whether something exists;
(b)   what it is;
(c)   whether something is the case; or whether an attribute belongs to an object; and
(d)   why something is the case; or why an attribute belongs to an object.

His most frequent examples are those of the lunar eclipse and thunder but he also invokes the phenomenon of sleep (*Metaph.* H.4, 1044b15–20). For instance, in studying the phenomenon of thunder we ask, first, whether this type of process exists and, second, what it is. Moreover, based on our pre-scientific understanding of the signification of the term 'thunder', we articulate the existence question, (a), in terms of a (c)-type question: does noise belong to the clouds? Similarly, we grasp the essence of thunder, described in the definition specifying what it is, (b), with the help of a (d)-style question: why does noise belong to the clouds?

  In this picture Aristotle argues for a close interdependence between knowing the existence of a phenomenon and grasping that a certain fact obtains or, in a more Aristotelian spirit, whether an attribute belongs to a type of object. More importantly, he maintains that our knowledge of the essence of a type of process and our explanatory or demonstrative knowledge (knowledge of the reason why, an answer to a (d)-type question) are similarly interdependent. He claims, then, that our definitional knowledge and practices are dependent on our explanatory grasp of things, and conversely. It should be emphasised that this is not merely an epistemic or pragmatic thesis about our knowledge or our explanatory and scientific interests. Rather, it is undergirded by a metaphysical interdependence thesis: in his view, essence and cause are co-dependent or even identical.[7] To be the essence of thunder is to be what causes the phenomenon of thunder–what brings on the occurrence of noise in the clouds. To be the essence of a lunar eclipse is to be the cause of light-loss in the moon.

  Using the twin epistemic and metaphysical interdependence theses Aristotle offers a powerful causal-explanatory model for grasping the essences of such types of entity. Our causal-explanatory knowledge is exemplified in demonstrations such as the following:

> Noise of type N belongs to every quenching of fire of type Q.
> Quenching of fire of type Q belongs to all clouds of type C.
> Noise of type N belongs to all clouds of type C.

Aristotle holds that we can 'read off' from such explanatory demonstrations the definitions of the relevant types of process, and so gain knowledge of their what-it-is or essence. Here is a sample definition related to the proof just offered:

> Thunder $=_{\text{def}}$ noise of type N belonging to clouds of type C brought on by quenching of fire of type Q.[8]

It is important to note that the middle term of the proof, 'quenching of fire of type Q', describes the efficient cause of the type of process that thunder is. Hence, it is present in the definition of thunder pre-fixed with the causal language of 'brought on by'. A similar account applies to the example of lunar eclipse, in which the middle term, picking out the efficient cause of this phenomenon, is 'screening of the sun's light by the earth'.

  In Aristotle's canonical formulations of syllogistic demonstrations the middle term is usually abbreviated by the letter B, while the major and minor terms are represented by A and C respectively.[9] The bare bones of a CEM demonstration, therefore, run as follows:

> A belongs to all Bs.
> B belongs to all Cs.
> A belongs to all Cs.

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[7]   The epistemic and metaphysical interdependencies just introduced have been discussed extensively by David Charles. He argues for the interdependence of defining and explaining and the co-determination of essence and cause. See Charles 2000, mainly chapters 8 and 10; see also Charles 2010.

[8]   I use the symbol '$=_{\text{def}}$' as standing for the relation of 'being defined as'. I do not take this to be the same as identity. Indeed, in some cases, those in which the *definiens* is prior to the *definiendum*, this relation could not be identity.

[9]   More accurately, he uses the Greek letters A (major), B (middle), and Γ (minor) but for convenience I shall use the English A, B, C.

If we introduce *D* to stand for the *definiendum*, the schema of a CEM definition runs thus:

    D =$_{def}$ *A* belonging to *C* because of *B*.

Aristotle refers back to this model in *Metaphysics* Z.17 but also in H.4, in the fresh start of his inquiry into substance as a cause and principle (1041a9–15; 1044a32–b8). That this is his intended reference becomes clear from the use of his pet examples of thunder and eclipse from the *Posterior Analytics* (1041a15–16; 24–25; 1044b8–15). He seems to be extending CEM beyond the process cases first by offering the artefact example of a house (1041a25–27; b5–6). This is not, strictly speaking, a substance case. But he does extend the model to substance cases too as he offers the example of the kind human (1041a32–b2; b6–7; 1044a34–b8):

    Having a certain arrangement belongs to being a human (the kind's essence).
    <u>Being a human belongs to a body made of flesh, bones, etc.</u>
    Having a certain arrangement belongs to a body made of flesh, bones, etc.

The corresponding definition of the substance-kind human is:

    Human =$_{def}$ a type of living body made of flesh, bones, etc. with a certain arrangement because of being a human.

Aristotle avoids the obvious circularity of this sample definition by using the twin epistemic and metaphysical interdependence theses already established in the *Analytics*. Ultimately, he relies on the metaphysical interdependence thesis, for he seems to identify the referent of the *B*-term, the essence being a human, with the final cause. This final cause is perhaps to be understood as being for the sake of realising a certain sort of rational life. More generally, he argues that what the *B*-term picks out is just the essence of, or what-it-is-to-be, a certain type of thing. But this, he contends, is to speak only at a very abstract or 'logical' level (*logikōs*: 1041a28). To specify the essence in more concrete terms we should identify it with a cause. In some cases, those of processes such as thunder, eclipse, or sleep, this will be the efficient cause. In other cases, such as those of living beings, it will be the final cause.[10] In further different cases, perhaps those of mathematical objects or even basic chemical elements, it may be the material or material-grounding cause (Z.17, 1041a27–32; *APo.* II.11, 94a20–24; 24–35).

    It is important to note that this picture confirms the claim made earlier that essence and cause are interdependent–indeed, they seem to be identified. Moreover, it shows that, in Aristotle's view, the 'what is it?' or essence-seeking question (b) and the 'why is it as it is?' or cause/explanation-seeking question (d) are answered at the same time. They have a single, common answer. Why, however, is CEM important for, or even relevant to, hylomorphism? The example of the human-related proof and definition should suggest that matter, form, and compound are invoked in CEM in distinctive ways. Let me spell out the structure of CEM as it applies to hylomorphic substance-kinds using the schema introduced earlier. In what follows I shall enrich this schema by invoking an analogy with the Determinate-Determinable-Determinant (=DDD) structure. The idea will be that a compound is analogous to a determinate, matter to a determinable, and form to a determinant. While this DDD analogy assigns such roles to the main players in the hylomorphic picture, CEM constitutes the bedrock of the present view: for it codifies the corresponding causal, explanatory, and determination relations among them, fixes the direction of these relations, and characterises each item as a relevant *explanans* or *explanandum*.

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[10] The sentence at 1041a32 implies that, while the one (the efficient cause) is under investigation in the cases of coming-to-be and passing-away, the other (the final cause) *also* is under investigation in the case of being. The scope of 'also' could range either over the final cause or over the case of being. In the former case the idea would be that in inquiring into the being/essence of things we should be seeking not only the efficient cause but also the final cause. In the latter case the claim would entail that, whereas the final cause is relevant to Inquiring into processes, it is important not only for such inquiries but also for inquiring into the being/essence of things. Either reading seems possible and could be linked to other important Aristotelian ideas. For example, the first reading alludes to the view that efficient causes are operative even in the case of the being/essence of things but are also accompanied with final causes. The second reading seems to invoke the idea that the final cause is important *both* in the case of processes *and* in the case of being *too.* The text seems to support better the second reading.

First, *D*, the *definiendum*, is typically a determinate substance-kind, such as human or horse.[11] Aristotle understands this as a compound type-object, consisting of matter and form taken universally (*Metaph.* Z.10, 1035b27–30). It is the main target of explanation and definition: an *explanandum* and a *definiendum*. As for the minor term, *C*: while in process cases it is the primary subject that is undergoing a change (e.g., the clouds; the moon; the heart),[12] in substance cases it is the matter. It is important to emphasise at the outset that Aristotle conceives matter *by itself* as a sort of indeterminate (or non-defined) but determinable item. At *Metaph.* Z.10, 1036a5–9, he holds that matter *by itself* is unknowable, while at Z.11, 1037a25–27, he spells this out by saying that matter (again, by itself, I take it) is not properly definable because it is indeterminate.[13] At *Metaph.* H.1, 1042a27–29, matter is only potentially a determinate thing (*tode ti*), while form is clearly determinate (cf. Δ.8, 1017b24–26). At H.2, 1042b9–11, he argues that, while matter is only potentially a definite type of thing, there are form-like *differentiae* which specify what it actually is. In the rest of the chapter he gives several examples of such *differentiae* for matter.[14] At Θ.7, 1049a13–27, he argues for his paronymy thesis, in which matter, *M*, is not the determinate character of any substance-kind compounds but only what such items are made of. Because of this, compounds are not called '*M*' but '*M*-en' (e.g., a statue is not bronze but is brazen). For compounds do not share the same essence or definition with their matter (they are not synonymous with it) but are only called after it (paronymously). He also gives the example of prime matter, which is the ultimate thing that is not a 'this something' (*tode ti*), presumably an item akin to a highest determinable. The form, by contrast, is a 'this something', a determinate, and makes matter determinate (by being said of, or essentially characterising, it). Because of this dependence on form, the matter is indeterminate (by itself) but determinable; hence, it seems correct to adopt the paronymy thesis (1049a34–b2). In *Metaphysics* Λ Aristotle touches on another important characteristic of matter which coincides with a basic feature of a determinable, i.e. that, by itself or without yet having been determined, it can be any one of the determinates (at the same level of specificity) falling under it. At Λ.2, 1069b14–20, matter is what can be either of two (or possibly more) end-products.[15] Similarly, Λ.4, 1070b10–13, characterises matter as what is potentially the bearer of a specific form, while Λ.5, 1071a8–11, argues that form is what is actually a (specific type of) entity, whereas matter could be either what is characterised by that form or what is deprived of it.[16]

To clarify this view of matter as indeterminate but determinable let us offer some examples. In artefact cases the matter is (for instance) the bronze of a statue, or the house-buildable bricks, stones, and mortar. In the case of living beings it is exemplified by items such as the body of an animal or/and its different bodily parts and organs. *C*-terms by themselves are merely determinable unless they are accompanied by the relevant shape, arrangement, configuration, structure, etc. captured by the *A*-term, or/and the relevant efficient or final cause picked out by the *B*-term. There is no reason to insist that these latter formal items–the counterparts to the *A*- and *B*-terms–are at an extremely high level of complexity. For example, 'a piece of bronze of a certain shape' (where the *A*-term would pick out the relevant sort of shape) would be sufficiently determinate. In that case, however, the relevant form would not be the shape of a statue or the related final cause of sculpting but the chemical nature of the alloy of bronze itself, say the 88% to 12% copper to tin ratio or/and the atomic and subatomic structures of its constituent metals. Taken by itself *C* could be a (type of) subject with some material characteristics: for instance, something that has an animal body. Or it could be a determinable feature such as having an animal body or being metallic. Or it could be a disjunction of

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[11] In sections 3–6 I shall set out the way in which I use the DDD conceptual apparatus in my argument. At present it should be noted that I am not relying on, nor am I proposing, any high-level theoretical account of the difficult notions of DDD.

[12] Code 2015: 14–15; 18–19.

[13] This notion is expressed by the Greek *ahoriston*, which may signify the same as 'indeterminable' or indeed 'indefinable'. There is no reason, however, to adopt this strong construal. Indeed, in Aristotle's view, it would be incorrect to think that matter is indefinable and indeterminable *tout court*. For he argues that matter is definitionally and ontologically posterior to form (Z.10, 1035b4–14). This implies that matter is defined in terms of, and is made determinate by, form but not conversely. If so, matter is indeterminate by itself but determinable by the form.

[14] I shall interpret those examples as fleshing out the 'shapy' *A*-term, which structures the matter, *C*, in virtue of the ultimate causal determinant, the form *B*. Indeed, H.3, 1044a9, maintains that the essence specified by the definition, fundamentally the form *B*, is the complete reality (*entelecheia*) and nature of the matter and the compound.

[15] At 1069b23–32 Aristotle seems to be criticising his predecessors because, while they 'touched on' the important material cause, each favoured just one specific type of matter from which everything comes to be. This is in contrast with his view of matter as a potential, determinable item, which could be any one of a certain range of specific material objects or features.

[16] To offer some examples from the physical works: At *GC.* I.5, 320a13, I.9, 326b29–34, and II.1, 329a24–35, Aristotle understands matter, and ultimately prime matter, as a potential being, a determinable which could be any one among the relevant determinates. In *Meteor.* IV.12 as a whole Aristotle takes matter to be a potential, 'unclear', and indeterminate being, while form is clearer and more determinate as we ascend towards substance-kind compounds (see especially 389b29–30; 390a2–b2).

fairly determinate material features, such as being made of either bronze or iron or steel or..., in the case of a saw. In this last case, it is obvious that the whole disjunction is a determinable item: for it does not fix which disjunct actually obtains or will obtain.[17]

The major term, *A*, then, would generally pick out a structure, configuration, arrangement, shape, or other such 'shapy' features. For example, in process cases, the presence of noise (thunder); the loss of light (lunar eclipse); or the lack of motion (sleep). In artefact cases, it would be akin to the covering shape (house); or the likeness of a human figure (statue). In the case of living beings, it would be the characteristic shape of a human body; or its being 'organic', living, or functional. In *Metaphysics* H.2–4 Aristotle describes such 'shapy' features also as *differentiae* of certain materials (H.2, 1042b12; 15–25; 31–36; 1043a19–21; H.3, 1043b10–13; H.4, 1044b18–20): for instance, the position of a stone in a house structure would be the *A*-feature characterising the determinable matter of a threshold; or being solidified would be the structural state of water in the case of ice. Moreover, he conceives the role of the *A*-term as specifying what matter actually is (H.2, 1042b9–11; 1043a5–7; 12–13; 16–21): what this piece of stone actually is is to be situated at this part of a house's entrance; what this mass of water actually is is to be in a solidified state. I shall argue that the complex consisting of such a 'shapy' *A*-feature and the determinable matter, *C*, is a determinate item, identifiable with the *definiendum D*, the compound type or species. It should not, therefore, be conceived as the determinable matter. Rather, this role should be reserved for the counterpart to the *C*-term.

The middle term of a CEM demonstration, *B*, picks out the essence of, what-it-is-to-be, or what makes the matter, *C*, and the compound, *D*, what they are (Z.17, 1041a28; b7–9).[18] It is a cause, a principle of being, and in the case of paradigmatic substance-kinds, living beings, it is their nature (Z.17, 1041a9–10; 27–28; b7–8; b25–31; H.3, 1043b21–23; 1044a7–9). The specific type of cause *B* is depends on the sort of *definiendum* under discussion. In the case of processes it is an efficient cause, such as the quenching of fire or the screening by the earth. In artefact cases it will be the final cause, what the relevant skill, craft, or art aims at. In the case of living substances it will again be the final cause, the kind of soul or life that successful, complete, or flourishing members of the kind have. The notion of success, completeness, or flourishing is captured by Aristotle's technical term *entelecheia* or complete being: the *B*-term captures just this complete way or mode of being (H.3, 1044a9). To take up the analogy with determinables (the analogues of matter) and determinates (the analogues of the species or substance-kind compounds), *B* is a determinant: it is a specific way of being for the matter, and what yields the determinate compound by determining the matter in the relevant way. The jargon of 'ways' or 'modes of being' is important at this juncture: an essence is *not* an object or a type of object but is *how* and *why* specifically a (type of) object essentially is. It is the what-it-is-to-be for (types of) objects and why they are as they are. It should be clear from these remarks that all these characteristics of *B* also apply to the form. It is *B*, then, which is, strictly speaking, the essence or form, the primary *explanans* of the substance-kind and its necessary features, and the dominant segment of the *definiens* specifying *D*'s nature.[19] I shall clarify what I mean by 'primary *explanans*' or 'dominant segment of the *definiens*' shortly.[20]

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[17] Balme (1987: 304–5) argues that the definition of living compounds includes disjunctions of material characteristics which the relevant type of living being might possess. However, he seems to take the scope of such disjunctions too broadly. He includes items such as 'either blue or green or brown eyes'. The picture I am adumbrating is about what is involved in the essential definition of natural substance-kinds. Hence, the scope of the disjunctions I am alluding to at present would be significantly narrower. For instance, the definition of a human being would make reference, through its *C*-term, to important sense organs such as eyes or hands (*Metaph.* Z.11, 1036b28–32) but would not need to specify their colour or size. From that definition, however, or from a fuller definition of a human eye, it would be possible to derive (*inter alia*) the necessary, essence-based feature of eyes having either blue or green or brown or... colour.

[18] Balme (1987: 297–8) discusses *Metaphysics* Z.17 and argues that the essence is 'that which has made the matter *PQR* into an *X*'. In this formulation it is unclear whether '*PQR*' corresponds to the *C*-term by itself–just the matter–or to the *C*-term as characterised by *A*–the complex of matter actually having a structure, shape, state, etc. It seems clear, however, that Balme's *X* picks out the substance-kind, the *definiendum D*.

[19] Bostock (2006b) raises an important worry which is relevant to my present claims. Has Aristotle packed too many features into the form? Has he ascribed too many, and incompatible, roles to the form? While it is true that the form has some 'logical' or more abstract features (such as being the essence or the what-it-is), as well as some more concrete or causal features (being a principle, cause, nature, etc.), I think that Aristotle's distinct levels or layers of analysis save his picture from inconsistency. There does not seem to be a clash between the logical or abstract role of an essence or what-it-is and that of a concrete cause. Rather, the kind of item that an essence is just is to be a specific type of cause–efficient or final in most cases. Further, whether it is an efficient or final (or perhaps even material-grounding) cause depends on the kind of *definiendum* or *explanandum* in question. In addition, further considerations about the *definiendum* or *explanandum* will settle what sort of principle the essence or form is. In the case of defining changing things or changes themselves it will be a principle of becoming; in the case of defining stable things or stable aspects of things it will be a principle of being (*Metaph.* Z.17, 1041a30–32).

[20] For a recent discussion of some of these issues from the perspective of how we come to know essences and definitions, see Bronstein 2016 (esp. chapter 9).

Two complications ought to be introduced into this rough outline of CEM. First, in the definitional schema I offered earlier,

$D =_{\text{def}} A$ belonging to C because of B,

there is a sense in which the entire *definiens* describes the essence or form of the compound type, *D*. For a defining account describes the essence, and what we find on the right-hand-side of this formula is a defining account. However, the 'because of *B*' segment of this *definiens* seems more important as it describes the basic, causal or explanatory, part of *D*'s essence. If so, it is the dominant segment of *D*'s *definiens* picking out the primary *explanans* of *D*'s being. By contrast, the first segment of the *definiens*, '*A* belonging to *C*' is non-causal or non-explanatory. Indeed, this segment is an *explanandum* on a par with the 'official' *explanandum* or *definiendum*, *D*. For *A*'s belonging to *C* is in need of an explanation in the same way in which *D*'s nature and necessary features require an explanation. The *explanans* is common to both cases: it is the cause picked out by the *B*-term. Thus, a lunar eclipse's nature is understood on the basis of the efficient cause, the earth's screening the sun's light. At the same time, though, this efficient cause accounts for why light-loss belongs to the moon. This suggests that the *definiendum*, *D*, and the *A–C* complex are equivalent or even the same. At the same time, though, while the first segment, '*A* belonging to *C*', is non-causal or non-explanatory, yet it captures part of the essence of the *definiendum*. Indeed, if it is seen as an *explanandum* and is referred back to the *explanans B*-term, it is an important contributor to CEM. We could conceive it as a 'defective' or 'incomplete' definition of *D*.[21]

The second complication arises from the claim just made about the relation between the *definiendum*, *D*, and the complex *A–C*: the *definiendum*-term, '*D*', and the non-explanatory segment of the *definiens*, '*A* belonging to *C*', are necessarily co-extensive, perhaps even same in signification.[22] This raises a crucial question about the way in which CEM fits with hylomorphism. Is it clear which terms in CEM correspond to the form, matter, and compound? My earlier sketch suggested that *C* is, in a way, the matter: bones, flesh, etc. in the human case. Alternatively, however, one could see the entire complex *A* plus *C* (or *A*'s belonging to *C*) as the matter analogue. The problem seems to arise from the following two points. First, *A* in a way is a 'form-like' item, what matter actually is: a certain shape, arrangement, configuration, structure, etc. This would entail that *C* by itself should stand for matter. Second, *A* is some matter's own intimate, non-causal, or non-basically-causal features: the matter's own shape, structure, configuration, etc. This would indicate that matter is represented by the whole *A–C* complex. This complication is also important for ascertaining the role of form in CEM. If matter is *C* by itself, while *A* is 'form-like', what is the role of *B*? Is it a second form,

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21 In *Metaphysics* H.4 Aristotle draws a similar distinction between broad, explanation- or cause-involving, definition and narrow, non-explanatory or non-causal, definition. He describes the broad essence/definition as an account in which the cause is clear (1044b12–15). What underwrites this sort of clarity is the presence of the *B*-term, what describes the efficient or final cause (as the case may be). By contrast, a narrow account which specifies the *definiendum* only in non-causal terms, as *A*'s belonging to *C*, is causally unclear: defining the eclipse as a type of lunar light-loss does not provide its efficient cause and so does not demarcate it from other, irrelevant light-losses of the moon (e.g., a lunar light-loss due to the presence of clouds; cf. *APo.* II.8, 93a37–39). The second implication of H.4's contrast between broad/clear and narrow/unclear definition is that the second segment of the *definiens*, 'because of *B*', the causal-explanatory part, is what primarily provides the what-it-is, essence, or form of the *definiendum*. If so, this would be a sort of narrow but clear definition of *D*. The nature of a lunar eclipse as a light-loss is basically to be a celestial or lunar phenomenon brought on by the earth's screening of the sun's light. A thunder, that sort of cloud noise, is a meteorological phenomenon caused by the quenching of fire in the clouds.

22 This claim has interesting links to Aristotle's view of the different questions and related stages of scientific inquiry in *Posterior Analytics* II. While the interpretation of this view is controversial, I shall assume the three-stage view advocated by D. Charles. In the first stage we are in possession only of knowledge of the signification of terms: we know (e.g.) that 'lunar eclipse' signifies the same as 'light-loss in the moon' or that 'thunder' signifies the same as 'noise in the clouds'. This strongly suggests that 'lunar eclipse' and 'light-loss in the moon' are necessarily co-extensive or even the same in signification. The same point holds for 'thunder' and 'noise in the clouds'. In the second stage we gain knowledge of existence in that observation, experience, or other similar sources provide us with knowledge that the process of lunar eclipse or thunder exists. In effect, we discover that a certain type of light-loss belongs to the moon; or that a certain type of noise belongs to the clouds. This second stage knowledge enables us to see that there should be a middle term, a cause or explanation for the relevant phenomenon. We are now in a position to reach the third stage, in which we ask 'why does *A* belong to *C*?' and 'what is *D*?', seeking for precisely that middle term, cause, or explanation. In this way we are able to answer the 'why is it as it is?' and the 'what is it?' questions at the same time. Light-loss belongs to the moon because the earth screens the sun's light. Noise belongs to the clouds because fire is quenched in them. By the same token, to be a lunar light-loss of the relevant type is to be brought on by the earth's screening; to be a cloud noise of the relevant type is to be caused by fire being quenched. Similar considerations should apply to our inquiries into natural substances too. For the three-stage view, see Charles 2000: 23–77.

alongside *A*? Wouldn't this result lead to some sort of formal over-determination of *D*?[23] If, by contrast, matter is *A–C*, could *A* retain its 'form-like' status, and could it be what matter actually is?

There are two main ways in which to tackle this question. First, it could be argued that the middle term, *B*, as the determinant, directly determines each of *C* (the matter-like item) and *A* (the form-like item) separately. In carrying through these two separate tasks *B* fulfills its role as the primary essence, form, and determinant of a hylomorphic compound. It may be unclear, however, why the two separate *explananda*, *A* and *C*, 'fit together': why does *A* belong to *C* if the determinant, *B*, operates separately on each of these two items?

The second approach would be to hold that the determinant *B* is directly causally responsible for the form-like item, *A*, and through *A*, indirectly operates on the matter-like item, *C*. If the relevant determination relation is transitive, *B*'s direct determination of *A*, and *A*'s direct determination of *C*, imply that *B* indirectly and ultimately determines *C*.[24]

The second solution seems attractive for several reasons. First, it seems to be corroborated by Aristotle's process examples. In the case of a lunar eclipse, the earth's screening directly causes light-loss; light-loss is a feature which characterises the moon; so indirectly the earth's screening determines the condition of the moon. Similarly, for thunder: the fire's quenching directly causes noise; noise characterises the clouds; hence, ultimately the fire's quenching determines the noisy state of the clouds.[25] It is not hard to outline an analogous picture for artefact or natural substance cases. In the house example, the final cause of (e.g.) protecting humans and their belongings from adverse weather conditions determines the covering shape, while the latter is the state or arrangement of the bricks, stones, etc.; hence, ultimately the final cause determines what condition the house-buildable materials are in. Further, while realising a certain type of rational life seems to determine the arrangement or shape characteristic of humans (e.g., the presence of hands capable to wield tools), the latter characterises the (living) human body; the final cause, then, indirectly determines the relevant state, structure, and shape of the human body.

Second, this view explains why the *A*-term, though 'form-like', is not the fundamental form or cause. It is form-like, and so picks out the shape, structure, arrangement, etc., because it is an intermediate determinant, cause, or *explanans*. It operates causally on *C* but only insofar as it is made to be in a certain way by the ultimate cause, *B*. It is not surprising, then, that it has this derivative or intermediate formal and causal character. Nor is this view of indirect or mediated determination or causation foreign to Aristotle's thought. In *Metaphysics* Θ.8 he seems to be adopting just this approach in the case of the so-called 'transitive' capacities, their activities, and the related final goal (1050a23–34). For example, the craft of house-building, a capacity, is definitionally and essentially posterior to its exercise: for it is for the sake of actual house-building. The latter, however, is as it is for the sake of the completed house, the end-result which is separate from house-building (as a house exists even if/when no house-building is ongoing). Indirectly, then, the *telos* of a house determines (definitionally and essentially) the very craft of house-building, a capacity, through its exercise. Apart from supporting the view of indirect causal determination, this parallel also emphasises the importance of identifying basic essential features with specific types of cause (in the present example, final causes).[26]

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[23] Ackrill (1979: 74–5) formulates a version of this question.

[24] There is a third possibility but it seems a non-starter if my present argument is correct. It might be thought that the determinant, *B*, determines the entire complex *A–C* as determinable matter. I just argued, however, that this complex is necessarily equivalent to, or even the same in nature as, the determinate compound, *D*. If so, *A–C*, too, is determinate and so could not play the role of determinable matter. It seems correct, though, to conceive *A–C* as a highly specific or even proximate material item, an entity which is effectively the same as the determinate compound *D*.

[25] A different, but not incompatible, way in which to put this point is to hold that *B* is causally responsible for bringing on a certain state, action, function, passion, or something similar in objects in which it is present by activating their corresponding potential for exemplifying such a state, action, function, passion, etc. By being present in the clouds, for instance, the quenching of fire causes the noisy state of the clouds by activating their potential to be noisy in the relevant manner. Thus, while fire-quenching generally causes noise and noise directly determines the clouds' condition, fire-quenching is what activates the clouds' capacity for being in such a noisy state, and so what ultimately determines their condition.

[26] Aristotle argues for the fundamentality of essence as form and cause (especially as a final cause) in *Physics* II.8 too. At 198b23–29 he discusses the anti-teleological, materialist view, and implies that material parts of natural substances, such as teeth, have their 'shapy' features, such as being sharp (for front teeth) or being broad (for molars), not just as a matter of brute necessity. Nor can it be a happy coincidence that such material parts with the relevant features perform successfully their respective functions (e.g., the sharp front teeth tear food, while the broad molars chew it). Rather, the 'always' or 'for the most part' status of the connection between material parts and their characteristic 'shapy' features is to be explained ultimately in terms of their nature or form, which is identified with the final cause (199a20–32; especially 199a30–32).
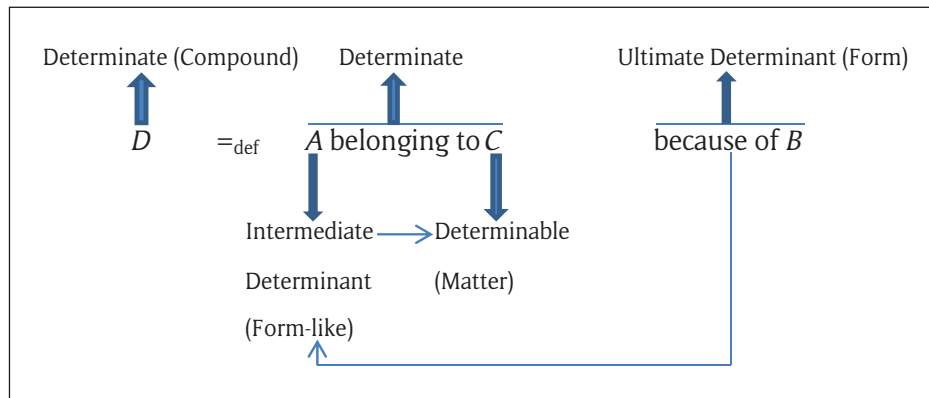
Figure 1: An Illustration of CEM.

This suggestion has serious implications for the question as to which term discharges the role of matter in CEM. To tackle this question it is important to start from the idea invoked earlier that a *definiendum*-term, '*D*', is necessarily co-extensive or even the same in signification as '*A* belonging to *C*'. A lunar eclipse just is a certain type of light-loss in the moon. A thunder just is a certain type of cloud noise. A human is essentially the same as a type of living being with a body made of flesh, bones, etc.

Furthermore, since *D* is the determinate *definiendum* and *explanandum*, and *D* is equivalent to or the same as the complex *A*−*C*, it follows that *A*−*C*, too, is a determinate item, as well as a *definiendum* and *explanandum*. This implies that the form (the referent of the *B*-term) is the determinant not only for *D* but also for *A*−*C* as a whole. If this is correct, what is properly speaking the determinable matter in CEM should be the *C*-term by itself. For *A*−*C* has already been made determinate by, or is determinate in virtue of, the ultimate determinant, *B*, the form.[27] This also holds for *D*. Both *D* and *A*−*C* are determinate but do not, as it were, wear their determinant on their sleeve. It is a significant epistemic achievement to discover this determinant, *B*, and to see *D* and *A*−*C* as being explained, caused, or made determinate by it.

To summarise the correspondences between CEM and hylomorphism, it is helpful to use **Figure 1** (where block arrows specify what each term stands for, while thin arrows codify explanatory, causal, and determination relations and their direction): **Figure 1** illustrates how, assuming the transitivity of the determination relation, the form, *B*, determines the structure, *A*, of the matter, *C*, while *A* shapes or 'conditions' the matter, *C*. If so, *B* fundamentally determines *C*. The additional assumption that *D* is the same in nature as *A*−*C* suggests that both *D* and *A*−*C* are the relevant determinates, whereas *B* is their ultimate determinant. The determinable matter, *C*, therefore, is directly determined by the relevant 'shapy' feature, *A*, but indirectly and ultimately by *A*'s determinant, the basic cause, *B*, the essence or form. In this way, CEM gives a concrete model for the priority of form over the compound (whether *D* or *A*−*C*) but also over the matter, *C*.

There is a serious worry one might raise at this juncture. The assumption that the determinate compound *D* is essentially the same as the complex *A*−*C* may be thought to entail that a compound is not a type of object but a fact or a state of affairs: that *A* belongs to *C*; or *A*'s belonging to *C* (equivalently: that *C* is *A*; or *C*'s being *A*).[28] It is true that Aristotle insists that we should articulate or set out substance-kinds such as human or artefact-types such as house into, respectively, a certain structure's belonging to flesh, bones etc. or a covering shape belonging to bricks, stones, etc. (*Metaph.* Z.17, 1041a20–27; 32-b7; H.2, 1043a7–12). But this need not entail that these latter complexes are ontologically basic. Rather, we could still conceive them as compounds of a type of object, matter, with a type of shape or structure. It would be misleading to think, for example, that just because Aristotle reserves a place for accidental compounds, such as a pale human, in his ontology, those entities are basic. Rather, accidental compounds exist in virtue of a (type of) substance's possessing some or other accidental attribute. Similarly, hylomorphic compounds are neither facts nor states of affairs but just (types of) matter possessing certain structural or 'shapy' features. This sort of predicational structure of a hylomorphic compound need not cancel out or reverse the priorities of Aristotle's ontology.

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[27] As noted earlier, this point explains why the whole nexus *A*−*C* could not be the determinable matter which is made determinate by *B*.

[28] Loux (2014: 153) raises this interesting problem.

3. CEM and the Modal Question (M)

Let me first outline the CEM-based response to M. I shall discuss some further details in sections 4–6. As I argued earlier, in a promising view of CEM, a form bears a determination relation to the matter: as a determinant a form makes matter a determinate type of thing. Without a form, then, the matter is not a real entity at all but only an abstract and merely determinable feature or a thing with such a feature. In the present context, an abstract item should be understood as an entity which is grasped by abstracting in thought from a fully real, determinate entity. To be sure, determinable items such as being coloured are, loosely speaking, existents, while statements picking out such items, such as 'this is coloured', are meaningful and truth-apt. However, just as there is no real entity which is simply to be coloured, there is no real entity which is just the material (type of) object or the material feature encoded in the *C*-term. If this is correct, there may be a way in which to prevent M from arising: for it seems nonsensical to ask the modal question 'is "it", the matter, contingently or essentially enformed by "its" corresponding form?' Simply put, there does not seem to be any proper or robust referent for the pronoun 'it'; there does not seem to be any real *it* which the matter, by itself, is. It is the form which renders matter an 'it', as it were, by making matter what it is. For a form is what-it-is-to-be for the matter, a principle and a cause in virtue of which the matter is some definite type of thing (Z.17, 1041a9–10; b7–9). A form itself is determinate, and a determinate-making entity: a 'this something' (*tode ti*; *Metaph*. Δ.8, 1017b24–26; Z.3, 1029a27–30; H.1, 1042a28–29); 'precisely what a certain type of thing is' (*hoper ti*; *hoper tode ti*; Z.4, 1030a3–7); and, more to the point, a 'determinate' item (Θ.7, 1049a34-b2, contrasts the *tode ti* form with the *ahoriston* matter). The matter, by contrast, is a determinable, or like a determinable, with some of the basic features characteristic of the DDD structure.

  Before setting out this line of approach to M, let me attempt to offer a diagnosis of the state of the debate about this issue. The central question underlying M is about the modal status of the relation between matter and form: is matter contingently or essentially thus-and-so enformed?[29] The worry is that the standard attempts to reply to this question lead to inconsistency: the matter proves to be both contingently and essentially enformed. We could frame the standard putative solutions along the lines of the following dilemma.

  1st Horn: The 'Two Matters' Strategy. The inconsistency does not arise, for it is not the same matter which is both contingently and essentially enformed. This strategy seems to have two versions.

(a) Matter is just contingently enformed by a specific form. For example, the bronze constituting this statue is only contingently of this 'statuesque' type; for it can, and indeed will, be present even if/when the statue is destroyed. At the same time, however, this strand of thought finds it necessary (due to some of Aristotle's own claims about matter) to hold that matter by itself has no character or being; it is indefinable and unknowable. Only derivatively, by virtue of a form, does it receive an essential character and does it become definable and knowable. If so, however, there is a second type of matter, that which has an essential character bestowed upon it by form, and which is essentially thus-and-so enformed.[30]

(b) The matter is just essentially enformed by a specific form. If it were not thus-and-so enformed, it would not be that sort of matter. This is a different way in which to formulate the homonymy thesis sketched in section 1. For the enformed matter of a living human being is a separate type of matter from the corpse existing at the end of the process of passing-away. The latter is a human body only homonymously: for it is not living, and so does not have the same essence or definition as a living human body. Proponents of this view point out more overtly the lack of parsimony that their approach entails because of its introduction of several levels of enformed versus homonymous or non-enformed matter.[31] There are different ways in which to develop this approach. The functionalist line argues that it is only functional matter which is enformed and (at least in some

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[29] The paradigm formulation of M is found in Ackrill 1979: 68–70; Ackrill himself responds to a worry raised by Wiggins 1971: 46–49; 76–78, nn. 58 and 61.

[30] This version of the 'Two Matters' strategy is favoured by Loux, 2014: 146–7; see also Lewis 1994: 266; Lewis argues that while life is the form-analogue for the human body or sight is the form-analogue for the eye, yet such form-analogues are strictly external to the body or the eye (respectively). This seems to entail the presence of two matters: one which is only contingently enformed and for which the form-analogue is external; and another which is indeed enformed by the relevant form-analogue. It is unclear how Lewis's view of form as external to (e.g.) the human body could accommodate Aristotle's position that the form of natural living beings is their nature, an *internal* principle of change and rest (*Phys*. II.1, 192b13–14; 193a28–31).

[31] Shields (2016: xxviii) writes that 'it may seem […] an offence to parsimony', while in Shields 2016a he remarks that it 'may seem in one way or another extravagant, unparsimonious, or simply at variance with common sense'.

views) is also a part of the form.32 Spiritualists, by contrast, hold that, in Aristotle's view, matter is pregnant with life or awareness (depending on the kind of case in view).33 At the same time, though, functionalist interpreters of Aristotle also invoke constitutive, generic, remote, or malign (insofar as it is non-functional) matter or what they call 'realiser-matter'.34 Similarly, spiritualists introduce material parts, bodily organs, physical processes or/and states obtaining in parallel to spiritual 'changes'. It is surprising that despite their numerous disagreements, functionalists and spiritualists seem to follow a similar path. There is one type of matter, the benign one, which is essentially enformed. And there is a second type of matter, the base one, which is not essentially enformed but must be present as some sort of enabler or realiser for the functional, form-laden matter.

The difference between (a) and (b) seems to be one of emphasis. Proponents of (a) focus on the type of matter that is contingently enformed–perhaps because of their reliance on Aristotle's artefact examples–and are compelled to introduce a second type of matter, which is essentially enformed. Interpreters who favour (b), by contrast, seem to focus on the reverse order–perhaps because of their interest in living beings and their apparently essentially 'living' or 'functional' matter. Let us, at any rate, turn to the 2nd horn.

2nd Horn: 'No Matter at All' (and perhaps also 'No Form at All'). The relation of form and matter to the compound is that of being abstractions in thought from the same thing. Further, because of this, the relation between matter and form is one of mutually 'fitting together': for they are non-real, abstract, and theoretical posits, aspects, or respects anchored in the same one thing, the compound.35 This approach is sometimes labelled the 'Compound First' view.36 Alternatively, it is called the 'non-explanatory' view.37

Can this, 'Two matters versus No Matter at All' dilemma be dissolved by contending that the question 'does it, the matter, relate contingently or essentially to form?' does not arise at all? The suggestion, as sketched earlier, would be that there is no proper 'it' for the question to arise. Material items, by themselves, are, or consist of, merely determinable features or things characterised by such features.38 If this is correct, there is not yet any proper entity to be contingently or essentially related to form. For only determinates are specific types of entity that could have essential or contingent features. To be sure, determinables presumably have mere Cambridge properties (such as being discussed in this paper). They could also be thought as having the features ascribed to them by a (correct) theory of determinables, determinates, and determinants, or any other similar 'theoretical' features. Similarly, they have features insofar as they are abstract entities themselves. Compare how Platonist Forms have theoretical properties within the theory of Forms (insofar as they are just Forms) such as being intelligible, imperceptible, separate, etc. Yet, at least according to the Platonist, this does not render them particulars that participate in any extra 'super-Forms'. Similarly, thinkers who subscribe to bare particulars theorise about them and attribute theoretical properties to them without thereby making them non-bare particulars.

By no means does this view entail that predicates or terms corresponding to such material, determinable features or objects with such features are devoid of sense. Rather, linguistic items such as 'being material' or 'this material object', to give a schematic example, are meaningful. Similarly, sentences which use such items grammatically are well-formed. But our present focus is not simply on language but on real-world

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32 See, for example, the functionalist views of Whiting 1992: 79–81; 84–7; see also Whiting 1991 and 1986; Shields 2016: xxvi-xxviii; Irwin 1988: 245–7; 250–2; Gill 2010; 2001; 1993; 1989; Nussbaum & Putnam (1992: 32) argue that matter must be suitable and in the right state for the form. Whiting (1986: 372) also argues that this sort of functional matter is indeed part of the form as the former is fully definable in terms of the latter.

33 A seminal spiritualist interpreter is Burnyeat (1992: 21; 25–26): bodily organs 'are essentially alive, essentially capable of awareness'.

34 For the language of 'realiser-matter', see Nussbaum & Putnam 1992 (37; 39–40; 40–45; 55) where they understand Aristotle's enmattered formulae (*enhuloi logoi*: *DAn.* I.1, 403a24–27) as realised functions.

35 This sort of view is espoused by Kosman 1987: 362–3. Other proponents arguably include Mary Louise Gill (Gill 2010; 2001; 1993; 1989); perhaps James Lennox (Lennox 2008); and Scaltsas 1994. In Peramatzis 2015 (195–6) that view is labelled 'Compound First'. Charles (1994: 76–80) also discusses a version of the non-explanatory view and contrasts it with his preferred explanatory approach.

36 See Peramatzis 2015: 195–6.

37 Charles 1994: 76–80.

38 Ferejohn (1994: 306) formulates a view which is congenial to my suggestion. A similar approach is followed by Charles (2004: 166) in his discussion of prime matter in *De Generatione et Corruptione*. Frank Lewis (Lewis 2008: 138–139) argues for a view of prime matter different from Charles's, and explicitly critical of the idea of matter as a determinable abstract object. While Charles takes determinable matter to be a sort of abstract *object*, Lewis thinks that it is a second-level *property*. I shall discuss their views briefly in section 5, and shall argue that it is more plausible to construct a hybrid, object-cum-property view of matter as a determinable.

features or objects insofar as they have such features. Using this criterion it seems plausible to think that determinable material items are not fully-fledged real-world features or objects with such features as they are not determinate entities at all. To be sure, determinable material items can, indeed do, hold good of certain types of object. Moreover, they serve an important role in our pre-definitional, non-explanatory, or non-causal understanding of things. For example, being a geometrical solid or being a geometrical figure having three dimensions certainly holds good of being a sphere. It is also an important part of our basic, pre-scientific grasp of the concept of a sphere. But it does not codify the explanation or the cause of the specific nature of a sphere. This is fixed by the relevant determinant, being equidistant from the centre. It is only determinate entities, then, which can (for example) underwrite objective distinctions between different types of thing or play causal roles in the real world.[39] These last two requirements are cognate with the presuppositions of CEM. For, in this model, what is fundamentally real, the form (picked out by the *B*-term), makes the compound and the related matter the types of entity they are. And it does so by determining them through some or other of the four Aristotelian causal routes.[40]

   An important remark is in order at this juncture. If matter is merely determinable, it may be thought that it could be any of the determinates (at the same level of specificity) falling under it. But if so, it may be concluded that matter, after all, has an essential relation to some or other among the (mutually incompatible) determinate disjuncts under it. For instance, the bronze could be either a brazen sphere or a brazen statue or a brazen shield or… But there is some or other determinate type of thing (among the relevant disjuncts) which that piece of bronze is essentially related to. If this is correct, the matter is essentially that determinate type of thing. This sort of reasoning, however, is not sound. For it is indeterminate which disjunct matter is essentially related to: this is exactly what it is for matter by itself to be a merely determinable feature or an object with such a feature.[41] We are not warranted, then, to conclude that matter, by itself, is essentially thus-and-so. For this conclusion cannot be licensed by the limited resources available to us, the matter's merely determinable character and the related disjunction(s) derived from it.[42]

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[39] A similar point is made by Gorman (2014: 132–133) in his discussion of foundation or support relations holding between essences and their essence-bearers: such relations obtain only between determinates. In my view, the determinant, the form *B*, makes the compound *D* a determinate type of thing by operating on the determinable matter *C* (through the intermediate *A*). At the same time, however, it renders matter a determinate type of material entity by establishing the connection with its characteristic, 'shapy' features, the correlate of the *A*-term. Oderberg (2014: 167), on the other hand, argues that form is the 'determining principle of the actuality of something'. This claim focuses on the role of form as a determinant but also implies that matter is (or is like) a determinable, and is rendered determinate by form.

[40] It may be useful to compare this line of thought with contemporary discussions which oppose ontologies of abundant properties in favour of sparse properties. Only the latter can undergird genuine distinctions between different real-world types of object and can discharge important instrumental causal roles. The former, by contrast, are gerrymandered, artificial, unnatural, and causally suspect, if not outright inert. In my view, the form, insofar as it is a determinant, is an analogue of sparse properties. For a recent discussion, congenial to hylomorphism and in favour of sparse properties, see Jaworsky 2016: 29–37.

[41] For a similar approach see Charles 2010a.

[42] Is it a consequent of the present view that ultimately prime matter is the matter of, or underlies, every (material) object? *In the case of determinables it is clear that a (higher or highest) determinable comprises all the (intermediate) determinables under it: being a geometrical figure subsumes being a geometrical solid; and both subsume the determinate being a sphere. The relation of* being a determinable of *is transitive. Is the relation of underlying, or being the matter of, analogously transitive just because we understand matter by itself as a determinable? Bostock (2006a: 33) answers in the affirmative: he argues that underlying is a transitive relation and concludes that Aristotelian prime matter underlies everything. In this approach, being brazen (for example) would be the determinable for a brazen statue, consisting of copper and tin the determinable of bronze, consisting of atoms of copper and tin the determinable of the copper-tin alloy, and so on and so forth up to the highest determinable. Do we have to follow this sequence up to the ultimate level of prime matter (*Metaph.* Θ.7, 1049a18–27)? Not necessarily, in my view. For, while transitivity may well apply to matter insofar as it is determinable, it need not carry over to it insofar as it is the constituent matter or the 'underlier' of something. For these last two notions carry out explanatory tasks which could not be undertaken by lower-level determinable matter, let alone prime matter. For instance, while the matter of a saw at the appropriate level of specificity–say the bronze with its material attributes–explains certain material and change-related features of a saw, matter at the molecular, atomic, subatomic, or indeed 'prime matter' level need not, and in many cases cannot, succeed in such explanatory tasks. The electron clouds constituting the copper and tin atoms in the bronze alloy do not seem to be explanatorily relevant, or at least not relevant in the appropriate way. They explain certain properties of copper and tin atoms but do not explain a saw's properties in the way in which the bronze alloy does: for the bronze and its hardness explain why or how a saw's blade and teeth have the capacity to cut certain materials. Similarly, while bricks or house-buildable materials explain certain relevant properties of a house, it is questionable whether the clay constituting the bricks or the earth and water constituting the clay could do so. If this is correct, the present view would imply that, while prime matter is a sort of highest determinable material feature or object with such a feature, it could not be the appropriate constituent or underlying matter of everything. The flipside of this implication is that, whereas prime matter can be accommodated in Aristotle's ontology as the ultimate or highest determinable, it does not prove to be a type of substance in the way in which Aristotle conceives matter to be a substance in that it is a metaphysical subject and a 'this' in potentiality (*Metaph.* Z.3, 1028b36–1029a5; a30–b33; H.1, 1042a24–b3; H.2, 1042b9–11; 1043a26–28). While I shall not discuss the difficult topic of prime*

4. Developing CEM's Reply to the Modal Question (M)

It may be helpful to illustrate how CEM tackles M using some examples. A good starting-point would be to emphasise, on the basis of the DDD analogy, that matter by itself, an isolated *C*, cannot be a *bona fide* part of the *definiens* of an existent type of compound, *D*. For only an existent, determinate type of entity can be part of the explanatory essence of another existent, determinate type of thing. If so, matter, *C*, insofar as it is part of an explanatory essence, is always *C* in a specific way, made determinate first by its characteristic 'shapy' *A* features and ultimately by the cause, *B*, the form. In the DDD structure, there is an abstract way or level in which the account of the determinable being a geometrical solid (for instance, being a geometrical shape having three dimensions) is part of our grasp of the determinate being a sphere and the determinant being equidistant from the centre. But this is merely a definition by abstraction. It does not describe the real-world explanatory and causal order but just a mundane truth. It is true that being a sphere is being a geometrical solid. If we proceed on the basis of just this mundane truth, however, we may posit erroneous hypotheses or make incorrect explanatory inferences. For, without having the determinant, being equidistant from the centre, our reliance on just being a geometrical solid may misguide us into thinking that being a sphere is to be a solid in (for example) the conical sort of way. That is, we may err in our selection of a determinant disjunct. What is part of the explanatory *definiens* of being a sphere, therefore, is not merely the isolated determinable being a geometrical solid but always a determinate way of being a geometrical solid. Thus, it is by way of being equidistant from the centre that being a geometrical solid constitutes the explanatory essence of being a sphere. And this specific way is fixed by the relevant determinant, the analogue of the form, *B*, in CEM.

Aristotle himself warns of the dangers of defining natural, perceptible, and changeable (kinds of) objects on the basis of abstractions in thought. Importantly, he contrasts the case of mathematical entities, in which this sort of abstraction does not give rise to any errors, with natural, hylomorphic cases, in which excessive abstraction does lead to errors (*Phys.* II.2, 193b31–194a7). Such errors could be flagrant falsities, as in the case of defining bodily parts exclusively in terms of geometrical shapes. Or they could yield explanatory mistakes, as in the case of defining snubness as just geometrical concavity, and then being unable properly to explain why snubness involves changeability. For example, while a geometrical concavity is immutable, a snub nose can be squeezed into a different shape by a punch and then restore its nasal concavity (or concave nasality).[43]

Let us explore how the DDD analogy could be developed for a hylomorphic artefact example, such as a saw (*Phys.* II.9, 200a7–13 and 24–29; *DePartAn.* I.1, 642a10–14).[44] Being metallic or being of a metal constitution (*C*-term) is part of the account of a saw and of the capacity to cut or divide (wood, metal, salt, or...) in a certain way.[45] But the specific way of being metallic, say the blade- and teeth-involving way (*A*-term), is determined by the form, *B*, the capacity to cut/divide in a certain fashion. In the present example, this form is identified with a final cause, that of successfully performing the function of cutting/dividing in the relevant manner. The idea, then, is that the form, *B*, explains why *A* is as it is, why it is the characteristic shape, structure, arrangement, or what have you, of the matter, *C*. Performing the function of cutting/dividing in the relevant manner determines that the character of being metallic ought to be blade- and teeth-shaped. The latter sort of shape determines the structure or state of being metallic. Fundamentally, therefore, *B*, the form identified with the final cause (in the present example), determines the matter, *C*, through the intermediate determinant, *A* (assuming the transitivity of the causal, explanatory, and determination relations).

It should be noted that this picture entails not only that the matter, *C*, is determinable but also that the intermediate determinant, *A*, is itself quasi-determinable. For insofar as it is directly determined by the form-cause, *B*, *A* itself should possess some sort of determinability. On the other hand, insofar as it determines directly the matter, *C*, it should also have a determinant aspect parasitic upon *B*'s fundamentally determinant operation. Let us first take up the material term, *C*. In the example of a saw, we could describe the determinable nature of matter in several, mutually compatible, ways. It could be simply the abstract

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matter at present, I think that it is worth bringing out this (in my view, attractive) implication. Charles's view (Charles 2004: 166) seems to have a similar implication. He insists, though, that prime matter is something like a highest abstract and determinable *object*. See also Charles 2010a.

[43] For further discussion of this point see Peramatzis 2011, especially chapters 4 and 5.

[44] I shall restrict my discussion to artefact examples as they are more accessible than the examples of living beings. For a proper discussion of living substance-kinds, it would be necessary to examine not only the *De Anima* and the *Parva Naturalia* but also, and most importantly, the biological works. I shall postpone this demanding task for another study.

[45] Notably, I am formulating the *C*-term as 'being metallic' consistently with the paronymy thesis discussed in section 2.

feature of being metallic. Or that (subject, substratum, object, or type of object) which is metallic or made of metal. Perhaps, more informatively, it is a corresponding disjunction of a certain range of metals a saw could be made of: being made of either bronze or iron (both of which are now superseded by steel) or steel or zinc or copper (the latter two used for sawing salt blocks). In the alternative, object- or substratum-jargon: that which is made of either bronze or iron or steel or... It should be emphasised that disjunctions of this sort include a certain range of specific types of metal *only if, and in virtue of the fact that*, the form-cause, *B*, has already discharged its role as a determinant (with the 'shapy' *A* features as an intermediary). Without *B*, *C* by itself could encompass only indeterminate or merely determinable disjunctions: either bronze or iron or..., where the dots are to be filled in by any and every type of metal.[46] The *A*-term, on the other hand, being blade- and teeth-involving, is determinable insofar as it does not by itself render specific the type of blade or teeth in question.[47] It is basically *B*, the form and final cause of successfully performing the cutting/dividing function in a relevant fashion, which determines that the blade and teeth structure ought to be imposed on the relevant range of metals, and ought to possess the capacity to cut/divide certain materials in a certain way.

How or why, in this picture, does the DDD analogy integral to my view of CEM, help resolve M? As noted earlier, the matter, *C*, is not an independent conjunct or an actually determinate existent. It is merely a determinable, a sort of abstraction in thought from the determinate compound and ultimately the determinant form *B*. An abstraction, however, is not, strictly speaking, a proper subject of metaphysical predication. If so, it by itself is not contingently or essentially anything. To pick it out appropriately, one needs to refer to or describe it as a determinate item. But this is feasible only by reference to the 'shapy' *A*-features and ultimately the form *B*. It is clear that the matter *C*, insofar as it is merely determinable, need not obtain in just a certain *B*-way. But it must be *C* in some or other specific *B*-way in order to be a determinate item.

This view should be distinguished from a different idea growing out of an analogy with particulars and their essential dependence on their form. It seems correct to think that the dependence of a particular object on its essence/form is conditional upon the existence of the relevant particular:

(i)   Socrates, if he exists, is essentially a human.

By analogy, it could be thought that the DDD view of matter and form I am presently adumbrating amounts to the following claim:

(ii)   A body, if it exists, is essentially enformed by the human form.

It seems plausible to think that (i) is equivalent to

(i′)   Socrates, if he exists as a human, is essentially a human.

Correspondingly, (ii) can be recast as

(ii′) A body, if it exists as an (organic, living, functional) human body, is essentially enformed by the human form.

By contrast,

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[46] While at *Phys*. II.9, 200a7–13 and 24–29, Aristotle seems to think that a saw's form hypothetically necessitates being made of just iron, at *DePartAn*. I.1, 642a10–14, he uses the disjunction being made of either iron or bronze (for a hatchet). I shall modify this latter example and use it for the case of a saw too. One may think that both examples are incorrect, especially the former: for a saw is not made only of iron; indeed, it is not made only of either iron or bronze. I do not find this objection decisive. First, it is not unusual for Aristotle to be casual or cursory in offering examples. Second, the disjunction in *De Partibus Animalium* I.1 may be seen as incomplete, with an understood '...'. Similarly, the *Physics* II.9 example may be incomplete; indeed, it may be taken as expandable into a similar disjunction. Lastly, and more importantly, in the *Physics* II.9 example, Aristotle may be using 'iron' in a par excellence manner: 'iron' may be used as a paradigmatic kind of metal, indicating that a saw is to be made of a certain range of metallic materials (see Liddell H. G. and Scott R. 1996: 1597, their entry for *sidêr-ous* and its variants: one case signifies 'made of iron *or* steel' (my emphasis), while the phrase '*sidêrous ouranos*' may mean iron or generally metal sky). In what follows I shall cast the example using the assumption that a saw's matter is being metallic or being either bronze or iron or... I am indebted to Keith McPartland for discussion of this point. I have also benefitted from his unpublished paper on hypothetical necessity.
[47] For Aristotle's use of the example of saw-teeth see *Phys*. II.9, 200b5–7.

(iii) A body, if it exists as a (non-organic, non-living, non-functional) non-human body, is contingently enformed by the human form.

It seems clear that (ii′) and (iii) deploy two different types of matter: (ii′) is about the so-called 'functional' or 'spiritual' sort of matter, whereas (iii) is about the constitutive, remote, or 'malign' matter of a human being.[48] If this were the import of the DDD view of form and matter in CEM, this view would be a notational variant of the 1st, 'Two Matters' horn of the dilemma I introduced in section 3 about M. Moreover, it would clearly be a trivial or circular view, as is obvious from (ii′) and (iii).

The DDD view, however, has only a superficial affinity to this idea of conditional dependence. More importantly, it is not simply a version of the 'Two Matters' strategy, nor is it trivial or circular. For my claim is that matter, if it is a real, existent, determinate entity at all but is not a merely determinable or abstract item, is essentially in the way the relevant determinant, the form B, renders it. This claim is about a genuine, single type of matter, the specific matter of the compound, D, which has been rendered determinate by the determinant B through the imposition of its characteristic structure, A. There is not, however, any separate or different single, unified, or determinate type of matter, which is only contingently related to a certain form B. Rather, the other item is a mere determinable, such as being metallic or being made of either bronze or iron or steel or... This is not essentially specifiable in terms of any determinant form. Just like the determinable being a geometrical solid, it is not a proper entity at all, and so is not yet or by itself essentially or contingently anything at all.

This claim, as noted in section 3, need not imply that matter-signifying predicates or terms are meaningless. Rather, they have a merely abstract, generic, or disjunctive meaning, just as standard determinable-signifying linguistic items have. For instance, 'being a geometrical solid' seems to signify the same as 'being a geometrical figure having three dimensions'. Similarly, 'being made of metal' (for the case of a saw) signifies (let us suppose) the same as 'being made of either bronze or iron or steel or...'. By contrast, if and when the determinable matter is operated upon by the determinant form, B, the corresponding matter-signifying term acquires a specific or definite meaning due to its union with the shape-signifying A-term established by the determinant/form-signifying B-term. 'Being made of a certain type of metal (say, steel) involving a blade and teeth' has a specific signification. And it owes its specificity ultimately to the corresponding determinant-signifying B-term: 'being capable of performing successfully the function of cutting/dividing in the relevant manner'.

5. Determinable Matter and Metaphysical Subjecthood

A serious worry arises at this juncture. Aristotle holds that matter is a subject of metaphysical predication, of which the form is said or predicated (*Metaph*. Z.3, 1028b36–1029a5; Z.13, 1038b2–6; Θ.7, 1049a27–36). Indeed, in my examples I provided cases of matter either as determinable material features or subjects, substrata, objects, or types of object with such features. Aristotle uses the example of 'this wood' as a subject-signifying phrase which picks out a genuine subject of metaphysical predication (*APo*. I.22, 83a1–20). How can my view insist on matter's mere determinability without undermining or even eradicating its status as such a subject? An alternative way to raise this issue is to object that my view collapses into the 'No Matter at All' horn of the dilemma I formulated in section 3.[49]

A possible reply to this worry may employ as a starting-point the notion of indefinite reference. Aristotle seems to endorse this notion in his discussion of the so-called 'non-universal statements about a universal' (*De Interpretatione* 7, 17b7–12; 29–37; cf. *APr*. I.1, 24a19–22; I.4, 26a29–30; I.7, 29a27–29). He holds that statements such as 'human is pale' are indefinite (*adiohoristos*) and logically equivalent to particular propositions such as 'some human(s) is (are) pale'. Just like the particular statement 'some/a human is pale', the indefinite statement 'human is pale', if true, refers to some or other human, not to any determinate human. Similarly, in modern discussions of indefinite reference, while a (true) statement such as 'Socrates walks/is walking' clearly makes a definite reference to Socrates, 'a man walks/is walking' (if true) has only an indefinite reference to some or other man.[50] Indeed, we may think of indefinite reference as implying a

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disjunction such as 'either Socrates or Callias or... walks'. This would be congenial to my view of the possible signification of determinable/matter-signifying predicates or terms. The notion of reference to a (type of) object is important in the present context: for if matter-related terms are to signify genuine metaphysical subjects, they ought to be able to denote, designate, or refer to (types of) objects, Aristotelian subjects or substrata.[51] This claim does not entail that reference is basic. Rather, it is still compatible with the idea that meaning and ultimately essence are fundamental. For the semantic notion of meaning and its worldly counterpart, essence, would constitute that in virtue of which any proper reference is achieved: a particular human being (say Socrates) and a particular human body are metaphysical subjects, while the corresponding terms refer to such metaphysical subjects, ultimately in virtue of the essence being a human.

If this is a promising route, my view of matter as merely determinable would suggest that all matter-signifying linguistic items have an indefinite reference. To be sure, we could distinguish between (at least) two different sorts of case. The first would include all instances in which matter-signifying terms have a straightforwardly indefinite reference: 'wood', 'being wooden', 'some wood', etc. Here material terms are not accompanied by any count nouns, definite articles, or any other such devices which could secure some definite reference. If so, these terms have only an indefinite reference. The second type of case would comprise examples such as 'this wood' or 'this/the subject, substratum, object, or type of object which is made of wood'. In such examples there are demonstrative phrases, pronouns, or other similar devices which seem to yield a superficially stable definite reference. But such a reference is not entirely secure without the addition of formal terms. If this is correct, we can understand this second case as intermediate between definite and indefinite reference.

One way in which material terms falling under either of these two cases may acquire a definite reference is (1) by complementing them with count-nouns or other similar phrases signifying a shape, form, or definite kind. For example: 'this plank-shaped piece of wood'; 'this cylindrical lump of wood'; etc. In such cases, however, we add formal or quasi-formal terms onto the relevant material terms. This procedure could be extended all the way down to material terms such as 'this molecule of H_2O', 'this atom of C_{12}', 'this nucleus of H', or 'this cloud formation of electrons'. While such terms signify low-level cases of matter, they are accompanied by formal terms signifying (for instance) the structure of a certain type of molecule, atom, nucleus, or what have you. If this is correct, these are cases of definite reference but not cases in which matter *by itself* achieves this sort of definite reference. Rather, in such cases definite reference is achieved as a result of describing matter as a determinate type of entity, the counterpart to the complex *A−C* in CEM: matter thus-and-so shaped; or perhaps even this sort of matter with an (overt or covert) reference to the basic causal determinant, the form *B*.

A second way to think about fortifying the reference of material terms is (2) by emphasising that they may be coupled with ostensive devices, demonstrative pronouns, or other similar phrases: 'this here now wood'; 'this/the wood before me'; etc. Aristotle would accept such examples as a starting-point for achieving a definite reference but he would deny that this sort of reference has any stability or scientific robustness. In *Metaphysics* Z.10 and Z.15 he argues that perceptible particular items by themselves, picked out ostensively or demonstratively, are not properly definable or knowable as they may be not actually perceived. In such a case it is unclear whether they are or are not what they essentially are. For, when not actually perceived, they may perish (Z.10, 1036a5−7; Z.15, 1039b27−1040a7).[52] In his view, then, ostensive or demonstrative resources will not yield material terms with a sustained definite reference. They would not, therefore, secure rigorously the metaphysical subjecthood of matter.

Third, we could think that (3) material terms have a quasi-definite reference in the way in which determinable-signifying terms may be thought to have reference. For example, 'being a geometrical solid' may be taken as picking out the feature of being a geometrical shape having three dimensions. Similarly, 'a/the geometrical solid' would refer to a/the object which has the relevant feature. Alternatively, but consistently with this line, one may think that such terms pick out a disjunction of specific features or a disjunction of objects with such features: being either a sphere or a cube or a cone or...; or a/the object which is some or other among these

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'Some *F Gs*'. My view need not adopt this last, more radical claim.

[51] I am including all these importantly distinct notions in this claim as there is no need, for present purposes, to distinguish between denotation, designation, and reference.

[52] In my reading of these passages, Aristotle is not raising a sort of Cartesian worry that there is uncertainty in the case of cognising particular perceptibles through ostensive or demonstrative linguistic means. Rather, he holds that there is lack of clarity (Z.10, 1036a7: *ou dêlon*; Z.15, 1040a2: *adêla*): our grasp of the cause/explanation of the nature or the necessary features of such items is deficient for the reasons he gives.

sorts of solid. Analogously, material terms (in the example of a saw) would refer to being made of either bronze or iron or... Further, they could refer to items such as the generic chemical character of being metallic (e.g., being an electrical and thermal conductor, hard, opaque, shiny, malleable, fusible, ductile, etc.). The difference of this suggestion from (2) is that the modal status of such items seems to be non-contingent. For, if a saw exists and is hence made of metal, it is necessary that it be made of either bronze or iron or... Similarly, if this condition is met, it is necessary that it have the generic chemical nature of being metallic. Why are such necessary cases not sufficient to secure a robust definite reference for material terms?

Aristotle seems to come to grips with an analogous question in *Posterior Analytics* I.4–5 and I.33. He holds that, while it is necessary that every triangle be either equilateral or isosceles or scalene, a proof which would rely on this merely necessary but non-essential feature would not constitute a genuine case of scientific–causal and explanatory–grasp of any feature proven to belong to every triangle. For such a grasp requires a demonstration from a triangle's essential features, a triangle as such or as a single unified kind (*APo.* I.5, 74a25–32; for *katholou*, *kath' hauto*, and *hê(i) auto*, see I.4, 73a34–b32). While knowing from merely necessary features may at most constitute reliable, true belief, it cannot constitute proper, causal, explanatory, or stable knowledge (*APo.* I.33, 89a19–23; 33–37; b3–6).[53] If this is correct, terms which latch onto merely necessary features of matter could not have a solid definite reference in the way in which scientific, essence/form-based terms have, even if the former achieve reference fairly reliably. This idea is analogous to the claim that merely true belief may be reliable in some measure but is not as successful as knowledge.

Three points of clarification are in order. First, both (2) and (3) seem to be modally defective in some or other fashion. While ostensive or demonstrative devices may achieve a definite reference for material terms, they may also fail to do so. Merely necessary features, on the other hand, have greater modal force but lack in causal and explanatory underpinning. By contrast, matter-signifying phrases which include expressions picking out the 'shapy' feature, *A*, and ultimately refer back to the determinant form, *B*, possess, precisely in virtue of this formal determination, the causal and explanatory force required for a definite reference. For, with the addition of such formal terms, matter-signifying phrases pick out determinate features or (types of) objects with such features.

Second, both (2) and (3) suggest that there are 'penumbral', as it were, ways in which material terms may achieve a reduced type of reference. If this is correct, there is a reduced way in which material terms *by themselves* signify subjects, substrata, objects, or types of object, appropriate for forms to be metaphysically predicated of. The twin worries, therefore, that the view of matter as a determinable does not accommodate Aristotle's remarks about the subjecthood of matter or that it collapses into a 'No Matter at All' approach can be decisively defused. Merely determinable matter can be picked out by terms with this indefinite sort of reference. Without additional formal terms latching onto determinant causes or explanations, however, such material terms cannot have a definite reference.

Finally, in my examples of determinable matter I have deployed either material features (e.g., being metallic) or things with such features (a/the metallic thing) or corresponding disjunctions (being made of either bronze or iron or...; a/the thing which is made of either bronze or iron or...). Is this a serious conflation between fundamentally different sorts of entity or is there a principled way in which to defend my practice? To address this question, it is useful to touch on two different discussions of prime matter which seem cognate with, or at least congenial to, my view. My general view of matter is most proximate to David Charles's account of Aristotelian prime matter as an abstract or logical *object*, a highest determinable sort of object.[54] Frank Lewis, by contrast, openly criticises this object-based approach. He argues that prime matter is a second-level (*not* second-order) *property* of things: that is, a functional property which is had by virtue of a thing's possessing certain sorts of first-level causal properties (such as being material in specific form-determined ways) which realise the relevant functions.[55] The reason why I was overly generous in the ontology of my examples of determinable matter is that I think that we cannot successfully side with just a single camp in this debate. For not only do we need to ascribe to matter some weakly object-like aspects to underwrite its substratum-, subject-, or object-like character (this would be achieved by way of (2) or (3), just outlined).

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[53] For the idea that non-accidental or merely necessary connections, predications, or accounts should not be identified with scientific definitions, see *APo.* II.10, 93b32–37 and 93b28–94a7. Aristotle seems to argue that such accounts may be at most introductory or pre-scientific accounts of the signification of terms. They are superseded, however, by definitions which include the causal-explanatory *B*-term of demonstrations. These issues are discussed in Peramatzis forthcoming.

[54] Charles 2004: 166. He compares his conception of matter with Kit Fine's account of arbitrary objects as the denotation of variables in open sentences of predicate logic (Fine 1985).

[55] Lewis 2008: 138–139.

We also need to conceive it as feature- or property-like to dissolve the received dilemma (as I formulated it in section 3) about M. For, in my view, matter by itself is not a proper object at all: it cannot genuinely be picked out by any 'it' as it is not a determinate thing. Moreover, consistently with Lewis's view, we need to understand matter as a feature had in virtue of first-level determinate material features (incorporating 'shapy' *A*-features), which owe their specificity to the determinant form, *B*. I submit that the DDD view of matter and form in my account of CEM may provide us with just such a hybrid view of matter.

6. Further Questions and Interim Conclusions

A basic question about my view is what exactly the DDD structure is, and how it relates to CEM. My reply is that, for present purposes, I do not need to presuppose or offer any theoretically committed position about DDDs.[56] Rather I assume only some fairly incontrovertible claims about their logical structure and interrelations. Here is a non-exhaustive list of such claims:

(a)   Real or/and concrete entities are not merely determinable but are always determinate.
(b)   A determinate is to be a determinable in a specific way.
(c)   All determinates at the same level of specificity are mutually incompatible.
(d)   All determinates and determinants are fully subsumed under their corresponding determinable: being a sphere and being equidistant from the centre do not merely overlap or intersect with being a geometrical solid but are fully under it.
(e)   An account or definition of a determinate in terms of its determinable and determinant does not consist in a mere conjunction of, or a simple overlap/intersection between, independent components.

More importantly, I take the DDD structure to be allocating appropriate roles [such as those encapsulated in claims (a)-(e)] to the compound, matter, and form: for these three hylomorphic players seem to have DDD-like profiles. It is basically CEM, however, which specifies the relevant determination relation as essentialist and causal: the form (as determinant) is what makes the matter (determinable) and the compound (determinate) what they are; it is the cause of their being as they are and of their having their characteristic necessary attributes. Furthermore, CEM underwrites the direction of this determination relation and conceptualises the determinant form as an *explanans*, with the determinable matter and the determinate compound serving as *explananda*.

  If this is correct, CEM constrains what parts of the DDD structure are inherited in Aristotelian hylomorphism. First, it does not allow for any old determinant to play the role of the basic *B*-term. Rather, it requires that only items which are causally and explanatorily fundamental in one of the four Aristotelian causal ways can serve such a role. Second, the determinant *B*-term picks out an essential feature or an essence, what makes something what it is, explains its non-essential necessary features, and grounds the characteristic capacities of the compound and its matter. Third, CEM sets similar causal constraints on the determinable matter, *C*: for it ought to play the explanatory role of being 'the matter for' or/and 'the underlier of' the compound.[57] Finally, CEM suggests that the 'shapy' features, *A*, explain the condition of the determinable matter, *C*, and are in turn explained by reference to the determinant cause or form, *B*. Similarly, the compound, *D*, and the equivalent articulated complex *A—C* are *explananda* to be understood on the basis of the determinant *explanans*, the essence or form *B*.

  These causal and explanatory constraints introduced into the DDD structure by CEM also defuse a related objection, in which the use of the concepts of DDD is deemed an unnatural or *ad hoc* stipulation. This worry is overcome once it becomes clear that CEM constitutes the bedrock of my view: while the helpful logical structure of DDDs partly applies to CEM, it is nevertheless governed by the latter. This picture does not, therefore, consist of a mere stipulation in which the problem of the matter—form relation is resolved in a cheap fashion by 'legislating' that form is the determinant of the determinable matter. The exegetical reply

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[56]   It may be helpful to point out that, in my view, any plausible account of DDDs should subscribe to a starting-point emphasised by Thomason (1969: 97; 99–101): in setting out the structure of DDDs we should not rely on merely formal criteria, for they are not sufficient to block counterexamples. Thus, Thomason criticises Woods 1967 as Woods's view of DDDs makes determinables theorems of first-order predicate logic.

[57]   As noted earlier, this point entails that the transitivity of *being a determinable of* is not taken over by the more substantive relation of *being the matter for* or *being the underlier of*. If so, prime matter does not turn out to be the constituent matter or underlier of every material object but is only the highest and most abstract determinable material object or feature.

to the present stipulation challenge is that the notion of a determinant captures (part of) Aristotle's view of form as a 'this' (*tode ti*; *hoper tode ti*) and as the cause in virtue of which matter is made something determinate (*Metaph.* Z.17, 1041b7–8: *to aition tês hulês hō(i) ti estin*). What else would the maker of something's what-it-is be, if not a determinant? Conceptually, too, however, if indeed the essence or form is the cause and principle of being for the compound and the matter, what else would it be if not a determinant of a specific causal and explanatory variety?[58]

Finally, my view may also face what could be labelled 'the incredulous' objection: surely, there is a determinate material present when the compound and its form are present? Not all material items are indeterminate or merely determinable. I sought to come to grips with this sort of challenge in my discussion of the possible signification of material terms and predicates by themselves or in isolation. In this case, I argued, material linguistic items signify features such as being metallic; or (the) metallic object(s); or the generic feature of being a thermal and electrical conductor, being ductile, etc.; or a determinable disjunction such as being made of either bronze or iron or... At any rate, all such items are abstract, generic, and non-explanatory. They are comparable with features such as being fleshy without having any structure or arrangement, or being metallic without any shape or function. A further illustration of this point could be provided on the basis of cases in which an artefact is made from another artefact. For instance, a carpenter may decide to build a wooden chair out of a wooden table. It seems clear that insofar as the wood already constitutes a wooden table, it is determinate, for it possesses the form of being a table. This is so despite the fact that the wood is the matter out of which the chair will be built. The wood, by contrast, is not yet determinate but is merely determinable insofar as it is that which will soon come to constitute the wooden chair. For in this latter respect the wood is not *anymore* characterisable in terms of the form of being a table, nor does it *yet* possess the form of being a chair. Hence, material items are determinable unless one conflates them with hylomorphic compounds or the equivalent *A–C* complexes in CEM. But if one takes this step, one is already smuggling in formal determinations into one's putative material items.

A more direct way in which to tackle the incredulous objection is to point out that my view does not rule out the presence of formal determinations at fairly low-levels of material beings. To provide the example of *Meteorologica* IV.12, at lower-levels of material beings it is unclear and indeterminate (arguably, not in a merely epistemic manner) what the essence or form is in the sense of function or *telos* (389b29–30; 390a2–20). But this is not to say that it is generally unclear and indeterminate what the essence or form is even in the sense of what-it-is or what-it-is-to-be something–the shape, figure, structure, configuration, arrangement, etc. of basic material components, perhaps plus the relevant efficient causes or 'motions' of such components (*Phys.* II.9, 200a30–32). If lower-level material beings are understood in this fashion, however, they are rendered types of hylomorphic compound and so are already enformed and fully determinate in virtue of the relevant essence or form. Thus, for example, a pocket or mass of fire is determinate in virtue of the hot and the dry plus their structure or ratio. Or this cubical lump of ice is determinate in virtue of the chemical nature of water and its shape, plus its solidified state, brought on by the efficient cause of complete lack of heat, the counterpart to the *B*-term (*APo.* II.12, 95a16–21). Such cases, however, are not material items by themselves. Rather, they are already enformed compounds (if at lower-levels) which are determinate in virtue of a form, typically understood as an efficient cause (as in the example just offered from *APo.* II.12) or even a merely 'matter-plus-structure' cause (the so-called 'material-grounding' cause of *APo.* II.11). What the incredulous objection misses, therefore, is that my view does not imply that material items are generally indeterminate and merely determinable: for they are not such if they have already been

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[58] There is a further question about the DDD structure. My view deploys this structure in CEM to characterise an aspect of the matter–form relation *within the compound*. But does this structure also apply to the relation among the items making up the form's own definable complexity? My reply to this difficulty is simply that the DDD structure does not apply to forms and their internal definable complexity. What is decisive in the case of forms is the primacy condition introduced in *Metaphysics* Z.4–6 and Z.11: the items constituting the intrinsic definable complexity of primary substances, essences or forms, are not said 'by some things being predicated of essentially different things' (*mê allo kat' allou*: *Metaph.* Z.4, 1030a6–14; Z.6, 1031a28–31; b13–14; 1032a4–6; Z.11, 1037b3–4). In this picture, no item within the form's own definable complexity is a determinable; nor is any such item a determinant. Rather, they determine each other's nature: for they are separately incomplete and indeterminate but essentially interdependent and co-determined. If this is correct, the case of forms calls for an idiosyncratic DDD model: for a form's integral aspects do not have a determinable–determinant relation but are *mutual* determinants. It is important to emphasise that this seems to hold good regardless of whether forms are pure, functionalist, spiritualist, or matter-involving. The only requirement presupposed by the present point is that forms, as primary substances, are definable and so possess internal definable complexity. This requirement seems incontrovertible in *Metaphysics* ZH (Z.13, 1039a14–23; H.3, 1043a29–36; 1043b2–14; 28–1044a9; H.6, 1045a31–b7). For example, at *Metaph.* H.3, 1043a29–36, Aristotle suggests that the form of a house is defined as a covering or shelter of a certain sort, the form of a line as a sort of duality, and the form of a human as a specific type of soul.

rendered definite types of material entity. Matter by itself, by contrast, without any contribution by any *A*- or *B*-term, is deemed merely determinable and so, taken in isolation, turns out to be an indeterminate item.

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Competing Interests

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