

Unity of definition in Metaphysics H.6 and Z.12

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In *Metaphysics* H.6 Aristotle asks: “What unifies a definition, making its parts into a whole and not a mere list?” A definition is a single account, he says, not by being tied together like the *Iliad* (the whole poem in twenty-four books), but by being of one thing. Although a definition is a complex formula, consisting of a number of linguistic parts, it is one if the object defined is one. So the unity of definition is parasitic on the unity of the object defined. Aristotle is looking for basic entities, whose being is fully determined by their essence and not by other entities which claim priority. These basic entities ground our understanding of other things. What, then, makes an object one, whose account is a definition? Aristotle discusses three sorts of examples: substantial forms, material composites, and categorial properties.¹

Start with a determinate form such as man.² What makes man one? Suppose we define man as “biped animal”: why is man one thing and not an aggregate of two things, animal and biped, which are distinct from each other and logically prior to it – that is, mentioned in its

It gives me great pleasure to dedicate this chapter to Allan Gotthelf. Its topics relate to his own pioneering research on division, definition, and the unity of substances. My interest in these issues was stimulated by exciting work being done on Aristotle’s biology, which Allan has done so much to foster. I was privileged to attend a National Endowment for the Humanities seminar on Aristotle’s biology, organized by Allan Gotthelf in Williamstown in 1983. It was a memorable and intellectually pivotal event for me, and I take this occasion to thank him. This essay is a descendant of Gill 2003, but substantially revised and expanded, including the discussion of Z.12. The current version profited from discussion at the Universities of Rochester and Oxford. I especially thank Jim Lennox for his helpful criticisms of the penultimate draft.

¹ Most scholars identify only two problems of unity in H.6 – forms and material composites – and take one or the other to be the chapter’s main focus. I regard the unity of categorial properties (H.6.1045a36–b7) as a further topic.

² For Aristotle man is a universal compound composed of form and matter taken universally, not a pure form (*Metaph.* Z.10.1035b27–30). We might therefore wonder why he focuses on man rather than a pure form such as soul. I take it that he focuses on man as form, both here and in the related discussion in Z.12, because he is contrasting his own view with Plato’s, and for Plato man is a sample form. Cf. Harte 1996, 281–2.

definition?³ The question threatens the Platonists, who regard animal and biped as separate forms. Aristotle poses the problem thus:

Why is man not those [animal and biped], and men will exist by participation, not in one thing, man, but in two things, animal and biped, and so in general, man would not be one but more than one, animal and biped? It is evident that those who proceed in this way, as they are accustomed to define and speak, cannot give an account and solve the difficulty. (1045a17–22)

The trouble with the Platonists is that they treat their forms as definite and actual entities;⁴ so the form man is what it is by partaking of two more ultimate entities, biped and animal. Aristotle states his own solution as follows:⁵

But if, as we say, the one is matter, the other form, and the one in potentiality, the other in actuality, the thing we are seeking would no longer seem to be a difficulty. (1045a23–5)

Apparently, biped animal is one thing and not two, because one of the components is matter, the other form, the one in potentiality, the other in actuality. But what does this proposal mean? The obvious place to look for clarification is in the next lines, where Aristotle discusses the unity of a material composite and says that the difficulty is the same.⁶

I will argue that the subsequent passage is the wrong place to look for clarification. We will properly understand the unity of composites only once we understand the unity of genus and differentia, and for that we must rely on Aristotle's first discussion of the topic in *Metaphysics* Z.12. But

³ Aristotle discusses various sorts of priorities. In *Metaph.* Z.1.1028a34–6, he claims that Y is logically prior (i.e. prior in *logos*) to X, if the account of X must mention Y.

⁴ Sometimes Aristotle complains that the Platonists' forms are *thises* (*tode ti*) (Z.14.1039a30–3). I am not here concerned with the question of whether his treatment of the Platonists is fair.

⁵ Most scholars take the passage, as I do, to state Aristotle's proposal about the unity of form. Halper 1989, 182, who thinks that H.6 focuses exclusively on the unity of material composites, takes it to be part of that solution. See Harte 1996, 281 for objections to Halper's interpretation. On Harte's own view (291) this statement is the framework for Aristotle's solution to the unity of form – which she takes to be the main issue of the chapter – and the solution comes, not in the discussion of the unity of the composite (as is usually thought), but in a later passage on the unity of categorical items (1045a36–b7). My main objection to this proposal is that the later passage proves too much. If Aristotle is solving the problem of the unity of form, it is odd that he spends most of the paragraph talking about non-substantial properties – qualities, quantities, and so on. His focus suggests that the passage serves a purpose other than the one Harte attributes to it.

⁶ Ross 1924, II.238 thinks that the analysis of the bronze sphere is analogous to that of genus and differentia. Rorty 1973, 411 thinks the two problems are literally the same: the genus animal is the stuff out of which a member of that genus is made. Ultimately I will argue that the two cases are analogous, but unlike Ross and others, I take the direction of the analogy and clarification to go from the unity of form to the unity of the composite, not vice versa.

before we turn to that, let us consider what he goes on to say, and why it fails to throw light on his proposal about the unity of form.

THE BRONZE SPHERE

Immediately after proposing his solution to the unity of form Aristotle says in H.6:

For (*gar*) this difficulty is the same, even if the definition of cloak is the “spherical bronze” (*ho strongulos chalkos*). For let this name [“cloak”] signal the account, so that the question is “What is the cause of the sphere and the bronze being one thing?” There no longer appears to be a difficulty, because the one is matter, the other form. So what is the cause of this, of the thing in potentiality being in actuality (*energeiai einai*), except the maker (*to poiēsan*), in those things for which there is generation? For there is no other cause (*aition*) of the sphere in potentiality being a sphere in actuality (*energeia einai sphairan*), but this (*tout'*) was the essence (*to ti ēn einai*) of each of the two. (1045a25–33)

This passage argues that a bronze sphere is one thing, because its components are related to each other as matter (the bronze) to form (the spherical shape). Notice that Aristotle does not explicitly say, as he did in the previous passage, that the matter is the thing in potentiality, the form the thing in actuality. Instead he asks “What is the cause of the thing in potentiality being in actuality?” The thing in potentiality is the matter, but the thing in actuality appears to be the composite – what the matter becomes when acted upon by an appropriate agent. Although Aristotle does not explicitly say so in this passage, the form can also be specified as the thing in actuality. At the end of the chapter he gives the following summary:⁷

But, as we have said, the proximate matter and the form are the same and one, the one in potentiality (*dunamei*), the other in actuality (*energeiai*). (1045b17–19)

The form and the composite are both properly designated as something in actuality: the form is the actual feature the matter potentially has, and the composite is the actual object the matter potentially is – the object the matter will become if it acquires the formal feature. Aristotle asks: “What is the *cause* of the thing in potentiality (the matter) being in actuality (the composite)?”⁸ His answer is the form, but his statement is puzzling.

The final sentence announces that there is no other cause of the potential sphere’s being an actual sphere, but this was the essence of each of the two.

⁷ Cf. H.2, which focuses on form as actuality (*energeia*).

⁸ For the question and Aristotle’s reply, cf. Z.17.1041a21–b9.

What is the referent of “this”? What essence is he talking about? And what are the two things the referent of “this” is the essence of? Given the grammar of the sentence, the antecedent of “this” should be the cause (*aition*), which Aristotle also calls the maker (*to poiēsan*).⁹ Scholars resist this identification, because they assume that the maker is the agent (e.g. a sculptor), and the agent is the wrong sort of thing to be an essence. But the maker need not be an agent. In *Metaphysics* Z.7 Aristotle says: “Indeed the maker (*to poioun*) and that from which the motion of becoming healthy begins, if the process is from art, is the form in the soul” (1032b21–3), and the same chapter identifies the form in the soul of the agent as the essence of the product (1032a33–b2).¹⁰ We can therefore take the maker to be the form in the soul of the agent – the spherical shape, the blueprint or plan, which guides the sculptor’s production.¹¹ If the sculptor’s production succeeds, that form is later realized in the finished product, the bronze sphere.¹² We can now understand the spherical shape as the essence of both the composite bronze sphere and its matter, the bronze: the shape is the essence of the finished bronze sphere, since that shape makes the object what it is, a sphere. The shape is also the essence of the bronze, insofar as the bronze potentially has a spherical shape. The spherical shape is the goal of the potentiality and determines what the potentiality is a potentiality for. If this interpretation is correct, the definition of a bronze sphere mentions two things, bronze and sphere, but the two are intimately related, since the spherical shape is the essence of both the potential and actual sphere. The sphere once generated is one thing, a bronze sphere, and its definition is one, because the object defined is one. Thus the problem of unity dissolves.

But the problem does not in fact dissolve. The bronze has various potentialities grounded in its own nature as bronze (bronze is a hard, malleable stuff, which can be made into a sword, a plowshare, a triangle, and so forth, as well as a sphere). The bronze is a sphere in potentiality, but it is also actually bronze, and its essence as bronze is distinct from the spherical shape it potentially has. So the definition of the sphere as “the spherical bronze” mentions two distinct things after all, which are logically prior to the concrete whole. The notions of potentiality and actuality have simply been mapped onto a more basic hylomorphic framework, and they

⁹ Cf. Charles 1994, 87–93 and 87 n. 21, though he would disagree with my identification of the cause and the maker.

¹⁰ Cf. Z.7.1032b11–14; Λ.4.1070b22–35; *Ph.* 3.2.202a9–12.

¹¹ I have made this suggestion before, Gill 1989, 169–70. Aristotle sometimes calls the form/art responsible for change a first (unmoved) mover, something that moves other things, without itself being moved: *GC* 1.7.324a24–b14.

¹² This idea is well discussed by Modrak 2007, 113–14.

mask the problem.¹³ If we ignore the supplemental machinery, Aristotle's proposal matches his treatment of matter and form in *Metaphysics Z*: the bronze which composes a sphere is a definite subject (*hupokeimenon*), and the spherical shape, which makes the bronze into a sphere, is a property (*pathos*) of it.¹⁴ Since the shape can be stripped away, leaving the bronze intact, and can be realized in other materials, the shape is an *accidental* property of the bronze: the shape belongs to the bronze, but the bronze and the shape are defined independently of each other.¹⁵ So the account of a bronze sphere mentions two components, sphere and bronze, the first predicated of the second, as *this in that (tod' en tōide)*, form in matter.¹⁶ In Platonic language, the matter *partakes* of the form.¹⁷

Some scholars think that Aristotle's real interest in H.6 is the unity of form and the *functional* matter of a living organism – a body organized in such a way as to support the psychic functions.¹⁸ Although living organisms are doubtless Aristotle's central concern, he has a good reason to focus on a bronze sphere in H.6.¹⁹ Organic compounds are subject to the same problem as bronze spheres, though less obviously. The situation is more complicated, because Aristotle thinks that organic matter lasts only as long as the composite it constitutes: if the form is removed, the matter is destroyed together with the composite. As he puts it, organic matter separated from the whole exists in name only:²⁰ a severed hand is not a real hand, because it can no longer operate as a hand does. Because the organic

¹³ For the mapping, see *Metaph.* H.2.1043a14–21. This point is made by Loux 1995b, 251.

¹⁴ This conception of the relation between matter and form is rooted in Aristotle's treatment of change in *Ph.* 1.7, where he argues that all changes involve a continuant, a subject that persists while losing one property and acquiring another. Aristotle relies on that model in his discussion of generation in Z.7–9 and H.1–5.

¹⁵ In *APo.* 1.4, to be discussed below, Y is an accident of X, just in case Y is predicated of X, but Y need not be mentioned in the account of what X is, nor need X be mentioned in the account of what Y is.

¹⁶ See, e.g., Z.8.1033a24–34, 1033b12–16, 1034a5–8; Z.11.1037a29–33; H.2.1043a4–7. See also passages cited in nn. 22 and 23 below.

¹⁷ Loux 1995b, 271 attributes to Aristotle an attractive Fregean conception of predication according to which the subject and predicate fit together without a predicative link. So Loux would disagree with me that Aristotelian predication can be reformulated in terms of participation. But in fact Aristotle sometimes uses Platonic terminology, especially when contrasting some other relation to accidental predication, e.g. at Z.4.1030a11–14 and Z.12.1037b13–21 (I will discuss both passages below). Usually Aristotle speaks not of the relation of subject to predicate, but of that of predicate to subject: the predicate is *said of (legetai)* or *predicated of (katēgoreitai)* or *belongs to (huparchei)* the subject. He often uses prepositions: the predicate is *of* the subject (*kata* + genitive) or *in* (*en* + dative) the subject.

¹⁸ Halper 1989, 188–94; Kosman 1984, 136; Lewis 1995, 244–9.

¹⁹ In his response to Halper 1989 and Kosman 1984, Loux (1995b, 253–6, 261–5) emphasizes Aristotle's use of this example.

²⁰ See, e.g., *Metaph.* Z.10.1035b24–5; *GA* 1.19.726b22–4; *Met.* 4.12.389b31–390a2, 390a10–13.

body depends for what it is on the soul of the organism, the human soul is an *essential* property of the human body, and the body ceases to be a human body when the soul is removed.²¹ Despite the difference between functional matter and ordinary stuff such as bronze, functional matter is itself an accidental compound:²² the functional properties belong to some lower-level matter, which persists when the animal dies. If the account of the composite must mention the form and the persisting matter, the composite is defined with reference to two more basic entities.²³ Aristotle says different things in different places about the precise level of the continuant. Non-uniform parts such as hands and feet are realized in uniform stuffs such as flesh and bone, and these are ultimately made of the four elements, earth, water, air, and fire (*PA* 2.1.646a12–24). *Z.10* twice says that a human being perishes into flesh and bones (1035a17–19; 1035a31–3), suggesting that these uniform parts can outlast the organism. *Generation of Animals* 2.1, on the other hand, includes flesh with parts that are destroyed when the organism dies (*GA* 2.1.734b24–31). Flesh is the organ of touch, and it loses that capacity when removed from a living system. These complications do not affect the main point: at *some* level of hylomorphic analysis – whether at the level of flesh and bone, or at the level of the four elements – there is a subject to which the organic form belongs as an accident, and that subject survives its removal.²⁴ So the problem of unity is relocated at a lower level. Aristotle focuses on a bronze statue in *H.6* to highlight the fact that both the problem and its solution concern the *continuant*, the persisting matter, whatever its level. Organisms are no better off than bronze spheres, when we consider the matter that constitutes them and survives their destruction.

The analysis of a bronze sphere resembles that of a white man, Aristotle's favorite example of an accidental compound.²⁵ In *Z.4* he uses the same label “cloak” for a white man and asks whether cloak has an essence and

²¹ As we shall see below, Y is an essential property of X, just in case Y is predicated of X and must be mentioned in the account of what X is. For the classic discussion of the different relation between form and matter in organisms and artifacts, see Ackrill, 1972/3.

²² See *Z.11.1036b21–32*, where Aristotle criticizes a proposal by Socrates the Younger. In *Metaphysics Z* he defines composites as *this in that*, form in matter, even when the matter has a functional characterization.

²³ Aristotle claims that the composite bronze sphere is defined with reference to two things, form and matter, at *Metaph. Z.7.1033a1–5*; he extends the claim to living organisms and their kinds at *Z.8.1033b24–6*; and he denies that such kinds – universal composites – are substances at *Z.10.1035b27–30*.

²⁴ On this issue, see Lewis 1994, 273. For a critique of Lewis's position, see Rhenius 2005, 83–111.

²⁵ See Bostock 1994, 282. As Loux 1995b, 250 rightly points out, the machinery of potentiality and actuality, which we are ignoring, can be superimposed here too: a man, whatever his color, is potentially white, and when he has that property, he is actually white. Furthermore, whiteness, the color, is actually white.

definition. He gives the compound a single name, “cloak,” but argues that the object lacks an essence and that its account is not strictly a definition.²⁶ Only those entities are strictly definable, he claims, which are said “not by predicating one thing of another” (*mē tōi allo kat’ allou legesthai*) (1029b22–1030a11). A bronze sphere, like a white man, violates this rule, because it consists of two entities, which are logically independent of each other, and one of which is predicated of the other – the spherical shape of the bronze. Thus a bronze sphere is defined with reference to two more basic entities.

Far from explicating the unity of genus and differentia, analogy with a bronze sphere puts Aristotle squarely in the Platonic position he was trying to avoid, that genus and differentia are two distinct entities, one (biped) predicated of the other (animal), as the spherical shape is predicated of the bronze.²⁷ Calling biped animal by the single name “man” conceals the problem, just as does calling a bronze sphere or a white man “cloak.” This comparison does not solve the problem of the unity of form.²⁸ We should look again to Z.4: Aristotle explicitly distinguishes species of a genus from accidental compounds, saying that only species of a genus have an essence. Species, unlike accidental compounds, do not involve the participation (*ou kata metochēn*) of an object in an accidental property (*pathos*) (1030a11–14). Since Z.4 drives a wedge between the species of a genus, which have an essence and definition, and accidental compounds such as a white man or a bronze sphere, which do not, the assumption that H.6 clarifies the unity of genus and differentia by appeal to such a compound is a mistake.

Aristotle investigates the unity of definition in *Metaphysics Z.12*, and that is the place to look for help with the unity of form in H.6. Here he explicitly distinguishes genus–differentia combinations from accidental compounds. After we have considered Z.12, we will bring our conclusions to H.6 and then reassess the passage about the bronze sphere and its relation to the proposed solution for biped animal.

²⁶ There may be some extended sense of “essence” and “definition” which allows us to call the account of a white man a definition (Z.4.1030a17–b13).

²⁷ See Bostock 1994, 282.

²⁸ Loux 1995b interprets H.6.1045a25–33, as I just have (though we differ on the question of a predicative link), but because he ignores the first puzzle about the unity of biped animal he does not discuss how the puzzle about the bronze sphere relates to it or what Aristotle means by calling the puzzles “the same” (1045a25). Lewis 1995 recognizes the first puzzle but does not address the difficulty it poses for his view. See n. 46 below. Bostock 1994, 282–3 takes the problem as evidence that Aristotle abandons genus–differentia definitions. For objections to Bostock’s proposal, see Harte 1996, 282–4.

THE UNITY OF FORM IN Z.12

Metaphysics Z.12 presents itself as Aristotle's first attempt to explain the unity of definition (Z.12.1038a34–5), and here he explicitly denies that a genus is related to its differentia in the way that a particular white man is related to whiteness. Again he uses the example of man defined as “biped animal”:

I mean this difficulty. Why is the thing one whose account we call a definition – for instance, man whose account is “biped animal”? Let that be its account. Why is this [man] one and not many, animal and biped? For in the case of a man and white they are many when one item does not belong to the other, whereas they are one when it does belong, and the subject, the man, is somehow qualified (*pathēi ti hypokeimenon, ho anthrōpos*) (for then the white man comes to be and is one thing). But in the other case [biped animal] one item does not partake of the other: the genus does not seem to partake of its differentiae (because [in that case] the same thing would at the same time partake of opposites, since the differentiae which mark off the genus are opposites). (1037b10–21)

If the genus partook of its differentiae, it would have incompatible properties – for instance, plane figure would be both round and square.²⁹ So the relation between a genus and differentia is not that between a subject and a property it has. Aristotle contrasts genus–differentia combinations with a white man, but he could equally have used the example in H.6, a bronze sphere. Both a white man and a bronze sphere feature two distinct items, a subject and a property, which constitute one object when the subject partakes of or has the property. The two components are logically independent of each other, and the property is an accident of the subject.

What, then, is the relation between a genus and a differentia, if the genus does not partake of the differentia? Aristotle discusses definition by division and then mentions two possibilities:

We must first consider definitions by division. For nothing else is in the definition except the so-called first genus and the differentiae. The other genera are the first and the differentiae taken together with it – for example, the first [genus] is animal, and the next is biped animal, and again wingless biped animal; and similarly even if it [the definition] is stated through more [terms]. And in general it makes no difference whether it is stated through many [terms] or few; so it also makes no difference whether it is stated through few or through two. Of the two, one is the differentia, and the other is the genus – for example of biped animal, animal is the genus and the other <biped> is the differentia. So if (1) the genus simply does not

²⁹ Cf. Z.14.1039b2–6, for a similar objection to the Platonic account.

exist apart from the species (*eidē*) of a genus, or (2) if it exists but exists as matter (for sound is a genus and matter, and the differentiae make the species (*eidē*) and elements (*stoicheia*) from this), it is evident that the definition is an account from the differentiae. (1037b27–1038a9)

Consider the two alternatives. The first recalls the *Categories*: the genus is simply more general than its species, so mentioning it adds no information that is not already contained in the species (*Cat.* 5.2b7–14). If one asks of a primary substance – say, a particular man – what it is, it is more informative to mention the species man than the genus animal, since man contains more information. *Metaphysics* Δ.28 offers a similar conception: plane is the genus of plane figures (square, circle, etc.), and solid is the genus of solid figures (cube, sphere, etc.). Aristotle says that the genus is the subject (*to hypokeimenon*) for its differentiae (*Metaph.* Δ.28.1024a36–b4), but presumably – if the account in Δ matches Z.12 – the subject-genus does not partake of them. Think of the genus as an indefinite determinable, which the differentia determines into a determinate species. On this conception the genus does not exist at all apart from the species of a genus, since its content is simply more general than theirs.

Aristotle's second alternative compares the genus to matter. Since this option is distinct from the other, the genus is apparently something over and above its species. He gives a helpful example: sound is genus and matter, and the differentiae produce the species and elements from this. The example recalls Plato's *Philebus*, where sound is used to clarify a certain type of division. The analytical method proposed in the *Philebus* is not the familiar method of division used in Plato's *Sophist* and *Statesman*. Those dialogues practice dichotomous division, the division of a kind into two sub-kinds (for instance, knowledge into practical and theoretical) in order to define some definite kind, such as statecraft, at the bottom of a genus–species tree. The *Philebus*, by contrast, analyzes a kind into its parts and features in order to clarify the kind itself, which is divided.³⁰ The investigator aims to figure out precisely how many (*hoposa*) units the kind is divided into and of what sorts (*hopoia*) they are (*Phlb.* 16c5–17e6).

Plato's Socrates gives two examples, both concerned with sound. Sound which comes through the mouth is one thing, but it is also unlimited in plurality (*Phlb.* 17b3–4). Our job is to determine how many and of what sorts the sounds are (*Phlb.* 17b6–9). A page later he returns to the same example, voiced sound, and this time treats it initially not as a single entity, as he did at the start of the previous passage, but as an unlimited

³⁰ I discuss the *Philebus* passage in Gill 2009.

plurality – a stream of undifferentiated vocal sound, which someone might experience. Socrates says that the Egyptian god Theuth discovered the letters by recognizing in the stream of vocal sound a spectrum voiced–unvoiced. He grouped together similar sounds into smaller and smaller ranges, until he singled out the indivisible letters, some voiced (the vowels), some intermediates (semi-vowels and others), and some unvoiced stops (the consonants) (*Phlb.* 18b6–d2). Thus he worked out how many indivisible sounds there are and of what sorts they are. In both versions of the example sound is grasped by one of its features, voice.

Socrates gives a second example, again to do with sound, but this time from a different perspective. Sound can be grasped by its pitch, and in this case the continuum is high, medium, and low tone. That continuum can be divided into smaller and smaller continua and finally into individual musical notes and intervals (*Phlb.* 17b11–e6).

Plato's examples reveal that sound can be considered from various perspectives. In focusing on one feature – pitch – we ignore other features of the kind, such as voice, volume, and rhythm.³¹ Each feature is a range which admits a more and a less, and indivisible units are located somewhere within that range. The continuum is never used up: it can be extended indefinitely in either direction and can be divided into units in more than one way. The twenty-four letters of the Greek alphabet do not exhaust the spectrum of voiced sound,³² nor do the notes and intervals in Greek music exhaust the continuum of pitch. Furthermore, the original choice of differentia (say pitch) ignores other features of the genus (voice, volume, rhythm). Thus the genus conceived as matter contains information not captured by any one division. So on the second conception the genus is something more than any one species of the genus.

In Z.12 Aristotle insists that proper procedure takes a differentia of a differentia, say biped as a differentia of footed, perhaps cloven biped as a differentia of biped, and so on down to indivisible forms of footed. He calls the final differentia the substance (*ousia*) of the thing (1038a19–20, 25–6). Once the differentiation is complete, all intermediate differentiae can be ignored: mention of footed is redundant once the lowest differentia is singled out.³³ Mention of the genus, on the other hand, is not redundant, since the content of the genus is not used up in any single line of division.

³¹ Plato calls attention to these other features at *Phlb.* 17d4–6 and 25c9.

³² The international phonetic alphabet includes more than a hundred possible sounds, of which ancient Greek recognizes only some.

³³ Cf. *Phlb.* 16c10–e2.

How, then, do we make sense of the unity of genus and differentia on the second conception?

Consider a division of sound into the letter alpha. The first genus is sound, which is immediately conceived under one aspect, voice, a spectrum marked off as voiced–unvoiced. That spectrum can be subdivided into smaller continua, voiced–intermediate–unvoiced. The letter alpha is located somewhere on the voiced end of the spectrum, distinguished from all other voiced sounds, perhaps by the openness of the mouth in voicing it.³⁴

In the terminology of *Metaphysics H.6*, a genus such as sound is potential because it can be determined in various ways, in terms of voice, pitch, volume, and so forth. The feature selected at the outset, say voice, limits sound to one parameter. Although other features of sound, such as pitch, speed, and volume, characterize instances of a lowest kind, those other features stand outside the division of voice and are accidental features of individual voiced sounds. Sound is a nice example, because the indivisible kinds – for instance, the letters – can be adequately defined by a single line of division. Pitch, volume, and speed are not essential features of the phoneme alpha, the indivisible kind, though they characterize individual expressions of it.

Examples that particularly interest Aristotle – biological kinds such as man – are much more difficult, since they are determined as what they are by many aspects of the genus, not just one.³⁵ Scholars often point out that Aristotle's account in *Metaphysics Z.12* and *H.6* is overly schematic, suggesting as it does that the species of a kind can be fully determined by a single line of division. *Parts of Animals 1.3* announces that correct procedure requires division straightaway by many differentiae (*PA 1.3.643b9–26*) – not merely by mode of locomotion, but by other functions as well, such as mode of feeding, reproduction, perception, and cooling.

Experts on Aristotle's biology now generally agree that his project was not to classify animal kinds into sub-kinds and species but to collect and explain animal differentiae, grouped under the general headings “ways of life (*bioi*), activities (*praxeis*), character-traits (*ēthē*), and parts (*moria*)” (*HA 1.1.487a11–12; 491a8–11*).³⁶ Given his procedure, a single type of animal will turn up in many distinct divisions, because it shares features with animals in different groups. Differentiae shared by groups of animals are explained

³⁴ See Smyth 1984, §7.

³⁵ On definition in Aristotle's biology, see Balme 1987; Lennox 1987b, and 2010. On intricacies of the problem, see Gotthelf 1985b, 1987, and 1997a.

³⁶ Pellegrin 1982; Balme 1987; Lennox 1987a.

(e.g. blooded animals have lungs because they are land-dwellers), and anomalies are singled out for special attention (e.g. whales and dolphins have lungs but are water-dwellers).³⁷ What is striking about Aristotle's procedure from the perspective of Z.12 is that different lines of division apparently yield separate building-blocks.³⁸ These elements are correlated in groups of animals, and the task is to explain why they occur together.³⁹ At the stage of mere division, before explanation is undertaken, features of the same creature which are singled out in different divisions are logically independent of one another. This is so, even if a necessary connection between those features is later established. If this observation is correct, it explains why different axes of division can be investigated separately, and why building-blocks can be combined in such a variety of ways in different sorts of creatures. At the same time it explains why mention of the genus adds no information beyond that contained in the final differentia – the genus adds no information, because it is immediately considered from the perspective relevant to that division, as in the *Philebus* example of sound and voice: all other generic information stands outside that division.

Differentiae can be investigated independently, but eventually they need to be integrated. In *PA* 1.5.645b14–20 Aristotle says that each of the parts of the body exists for the sake of some action (*praxis tis*), and that the whole body is constituted for the sake of some complex action (*praxeōs tinos heneka polumerous*).⁴⁰ A saw is constituted for the sake of sawing; similarly a body is constituted in a way (*pōs*) for the sake of its soul (*PA* 1.5.645b17–19). This passage suggests that an organism's various functions and parts are organized and coordinated, some subordinate to others, for the sake of the

³⁷ *PA* 3.6.668b33–669a1, 669a2–13. On this topic, see Lennox 1987a, 110–11.

³⁸ Cf. Pellegrin 1985, 106, who claims that parts of animals serve as a sort of alphabet: they can be combined in numerous different ways in different animals, and the combination promotes survival in different environments.

³⁹ A central passage for Pellegrin 1985, 98, 103–4 is *Pol.* 4.4.1290b25–38, which compares governments to animals. Both sorts of entities have many parts, and there are as many species of each as the combinations (*suzeuxeis*) of the necessary parts. Pellegrin claims that, whereas the *Politics* holds out the possibility of defining biological species, the biological works never actualize the possibility. In his view Aristotle's zoology is primarily moriology, the study of parts. Lloyd 1990, in a critique of Pellegrin (9–15), marshals evidence, especially from the *Metaphysics*, to show that Aristotle regards whole animals as substances and downgrades their parts, e.g. at *Metaph.* Z.16.1040b5–16 and 1041a3–5. Lloyd's criticism is fair, but Pellegrin has uncovered an important facet of Aristotle's biological project. Prior to investigating the unity of a species the biologist must locate the building-blocks, different combinations of which occur in different sorts of animals. To discover the unity of a species, one must explain why certain building-blocks are present and not others. Whether or not Aristotle carried out the further step of establishing the unity of species, he was evidently serious about the possibility, as witnessed by the passage in *Pol.* 4.4.

⁴⁰ Or *plērou*: complete. On this passage see Lennox 2001a, 176–8.

animal's way of life (*PA* 1.5.645b28–646a1).⁴¹ The organization is in a way for the sake of the soul, because the soul controls the animal's characteristic behavior. Discovering the unity of a species is a teleological project: the features, first studied apart from one another, are together *hypothetically necessary* for the life of the organism they serve – they are jointly necessary *if* there is to be a creature that lives a certain sort of life.

Division, which precedes such an investigation, has a more modest aim, to identify functions and associated parts shared by groups of animals. Those animals may be quite diverse in other respects. This project can be carried out piecemeal without knowing how or why functions fit together as they do in particular sorts of animals. *Z.12* gives a schematic account relevant only to division. The chief point is that on either conception of the genus a mention of it adds no information that is not contained in the final differentia. On the first conception the genus is nothing over and above its species; on the second conception, though the genus is something more, it is immediately conceived from a point of view relevant to the division undertaken, and that is the only aspect of the genus relevant to that division.

Aristotle does not decide between the two conceptions in *Z.12*, but in *Metaphysics H.6* he claims that the puzzle about the unity of genus and differentia is solved by regarding the genus as matter and the differentia as form. Thus he takes up the second interpretation – genus as matter, like sound.⁴² He now adds that the one is in potentiality, the other in actuality. The new machinery is not merely superimposed onto the old hylomorphic framework, as we originally thought. On either conception of the genus, the genus is potential because it is a determinable kind. On the second conception, the genus is immediately considered under one of its aspects, say mode of locomotion, and other determinations stand outside that line of division. Since only that aspect of the genus is considered which is relevant to the selected axis, the genus and differentia are one, even though the genus contains information not actualized by that division.

⁴¹ On this topic, see Lennox 2010. See also Charles 2000, esp. ch. 12; Halper 1989, 114–18; and Modrak 2001, 189–94. The account is likely to be highly complex, as Gotthelf (1997b) shows in his analysis of the elephant's trunk.

⁴² My current interpretation revises my previous view of the unity of form in *H.6* (in Gill 1989, 138–44, and 168, and Gill 2008), in which I took Aristotle to invoke the first notion of the genus in *Z.12*. Given that view, I found a significant disanalogy between his treatment of genus and differentia and his treatment of matter and form in the next part of *H.6*. On my current understanding, the analogy is much closer.

THE UNITY OF THE COMPOSITE IN H.6

We observed that the passage on the bronze sphere, though often taken to clarify the unity of form, presents the wrong conception for that purpose. As Aristotle has construed the relationship between matter and form until now, the matter partakes of the form. That is the model he rejects for genus and differentia in Z.12. Given what he says about participation in Z.12, it is noteworthy that later in H.6 he criticizes those who appeal to participation to explain the unity of concrete composites:

Because of this difficulty [about the being and unity of material composites such as bronze spheres and of non-substantial properties such as whiteness], some people speak of participation and are puzzled as to what the cause of participation is and what participation is; and others speak of communion, as Lycophron says that knowledge is [the communion] of knowing and soul; others speak of living as a composition or binding together of soul with body. In fact, the same argument applies to all – for indeed being healthy will be either a communion or binding together or composition of soul and health, and bronze being a triangle will be a composition of bronze and triangle, and being white will be a composition of surface and whiteness. The reason is that they seek a unifying account of potentiality and actuality (*entelecheias*) and a difference [between them]. (1045b7–17)

As I interpreted the example of the bronze sphere before, the analysis invites Aristotle's own criticism.⁴³ Indeed, he calls attention to the problem by mentioning a bronze triangle as one example of the wrong analysis (1045b14–15). On the view to be discarded, being a bronze triangle is a composition of bronze and triangle, two distinct things bound together by a unifying relation. On this conception, as we saw, the notions of potentiality and actuality are simply mapped on to the more fundamental matter–form framework without helping to solve the problem. True, a lump of bronze is potentially spherical, but it is also something actual in its own right. The actual identity of bronze makes it a hard, malleable

⁴³ I concur with Bostock 1994, 286, who takes the passage to discuss ordinary predication. The various designations – “participation,” “composition,” etc. – are different names for one basic relation. There has been an extraordinary effort on the part of commentators to interpret the passage in such a way that Aristotle's criticism does not apply to his own usual treatment of matter–form composites. I agree with Witt 1989, ch. 4 (and for a distinctive view along similar lines: Scaltsas 1994), that Aristotle's explication of matter and form in terms of potentiality and actuality in H.6 and Θ cannot be reduced to predication. But unlike others I take Aristotle's potentiality–actuality model in H.6 and Θ to replace the predication model used to explicate composites in Z and H.1–5.

stuff suited to take on the shape of a sphere: its actual identity grounds its potentiality.⁴⁴

What, then, is going on in the passage about the bronze sphere in H.6? Notice that Aristotle speaks of the “spherical bronze” (*ho strongulos chalkos*) – an unusual phrase, which specifies the form with an adjective, and the matter with a noun⁴⁵ – rather than his more usual “brazen sphere” (*hē chalkē sphaira*), which specifies the composite with a noun and the matter with an adjective. “Spherical bronze” could recall the designation of an accidental compound, like “white man,” but more likely it highlights the similarity with “biped animal” just discussed. I have argued that the passage about the bronze sphere does not spell out Aristotle’s proposal about the unity of genus and differentia. He has already clarified the unity of genus and differentia in his second proposal about the genus in Z.12, which he recalled in H.6, elaborating it by appeal to potentiality and actuality. On my view he *extends* that proposal to the case of concrete material composites and will extend it again to the unity of categorial properties. We are to understand the unity of the composite on analogy with the unity of form.

An objection to my proposal is Aristotle’s use of the particle γάρ (“for”) at H.6.1045a25.⁴⁶ He turns from the puzzle about the unity of form to the puzzle about the unity of the composite, saying: ἔστι γὰρ αὐτῆ ἡ ἀπορία ἢ αὐτῆ κἂν εἰ κτλ. (“For this difficulty is the same even if the definition of cloak should be ‘the spherical bronze’ . . .” [1045a25–6]). Given the γάρ, readers expect the upcoming discussion of the composite to clarify the preceding discussion of form. But as we saw, if that is the point of the discussion of the bronze sphere, his solution is no more successful than that of the Platonists, whose view he rejects. Since he denies that the genus partakes of its differentiae (Z.12.1037b18–19), and since H.6 itself faults explanations in terms of participation, we should look for some other way to interpret the passage.

⁴⁴ Cf. H.4.1044a27–9, where Aristotle tells us that a saw cannot be made out wool or wood – the matter must be of a suitable kind to be made into the product. See also *de An.* 2.5.417a26–8: a subject has a first-level potentiality to have some property, if it is of a suitable kind to have it.

⁴⁵ Cf. Z.8.1033a32–3.

⁴⁶ The objection has been put to me by Lewis 1995, 258 n. 39, and Harte 1996, 282 n. 15. Lewis himself faces a problem in light of the *gar*. He says that the problem of the unity of form has a counterpart at the level of the compound material substance (234–5) and takes the *gar* to indicate that the solution for the composite explains the unity of form (258 n. 39). As he understands composites in his paper, at some level form is an accident of matter. Similarly, then, the differentia will be an accident of the genus. But that is precisely the idea Aristotle rejects in Z.12 when he denies that the genus partakes of its differentiae (1037b18–21). The unity of the genus and its differentiae is not clarified by comparing it to an accidental compound.

For a start, we need not read γάρ at 1045a25:⁴⁷ the sequence γ-α-ρ in the manuscripts can be reconstrued as γ' ἄρ, formed from γε ἄρα, with two elisions (the second before the initial vowel in αὔτη). This revision calls for no emendation of the transmitted text, but simply a different word division.⁴⁸ Denniston in his *Greek Particles* lists several examples of γ' ἄρ and γ' ἄρα in Plato, one in Democritus, as well as examples from poetry.⁴⁹ If the letters are construed here as I suggest, Aristotle is making an inference from his previous point, not clarifying or explaining it. He uses the unusual phrase, “spherical bronze,” to spotlight the analogy with “biped animal”: “spherical” specifies a differentia, and “bronze” a genus.

Consider again the passage I quoted earlier, this time reading γ' ἄρ:

This difficulty is then (γ' ἄρ) the same, even if the definition of cloak should be the “spherical bronze.” For let this name [“cloak”] signal the account, so that the question is: “What is the cause of the sphere and the bronze being one thing?” There no longer appears to be a difficulty, because the one is matter, the other form. So what is the cause of this, of the thing in potentiality being in actuality, except the maker, in those things for which there is generation? For there is no other cause of the sphere in potentiality being a sphere in actuality, but this was the essence of each of the two. (1045a25–33)

This passage claims that the problem of unity for concrete composites disappears. As I previously interpreted the passage, the problem did not disappear, because the continuant, bronze, was not only potentially a sphere, but also actually bronze, a definite subject. So the bronze sphere was defined

⁴⁷ In fact, even if read *gar*, the word can be construed as a confirmatory adverb, “in fact,” “indeed,” rather than as a causal conjunction. See Smyth 1984, §2803. I thank Trent Dougherty for reminding me of this possibility. Cf. Gill, 1995, 516 n. 7.

⁴⁸ Word division and diacritical marks are the work of Hellenistic editors; they were not used by the Classical authors.

⁴⁹ Denniston 1966, 43. It is generally agreed that γάρ was derived from γε and ἄρ (Denniston 1966, 56; cf. LSJ s.v. γάρ). There is often disagreement among the manuscripts between γάρ and γ' ἄρ, γ' ἄρα, or simple γε or ἄρα. Consider some examples of γε ἄρα: *Phlb.* 46a12: Σύμμεικτον τοῦτό γ' ἄρ, ὧ Σώκρατες, ἔοικε γίγνεσθαι τι κακόν (“That really seems to be a mixed experience *then*, with a bad component, Socrates”); *Tht.* 171c10–d1: Ἀλλά τοι, ὦ φίλε, ἔδηλον εἶ καὶ παραθέομεν τὸ ὀρθόν. εἰκός γε ἄρα ἐκείνον πρεσβύτερον ὄντα σοφώτερον ἡμῶν εἶναι (“But it is not at all clear, my dear Theodorus, that we are running off the track. Hence it is likely that Protagoras, being older than we are, really is wiser as well”). Cf. *Phlb.* 35b6. For discrepancy in the MSS, cf. *Chrm.* 159d4. Diels in earlier editions of *Fragmente der Vorsokratiker* printed the last sentence of Democritus, Fr. 191 with γ' ἄρ: ταύτης γ' ἄρ' ἐχόμενος τῆς γνώμης εὐθυμώτερόν τε διάξεις καὶ κτλ. (“When you keep to this mind, *then*, you will both carry on in better spirits and . . .”) but the present edition (1951–2) prints γάρ. To the passages in Denniston should be added *Tht.* 152c2–3: οἷα γ' ἄρ' αἰσθάνεται ἕκαστος, τοιαῦτα ἐκάστω καὶ κινδυνεύει εἶναι (“So it looks like things are for the individual such as he perceives them”). McDowell 1973, 110 adopts this reading from Badham in his translation and commentary, as does Levett in Burnyeat 1990, 272. See also Lee 2005, 80 n. 7. The new Oxford Classical Text of Plato, vol. 1 (Duke *et al.* 1995) retains γάρ.

with reference to two more basic components, the bronze and the spherical shape.

We can keep the main contours of the previous interpretation: the form (spherical shape) explains why a sphere in potentiality is a sphere in actuality, and it is the essence of both the potential and actual sphere. But I modify the previous interpretation in one fundamental respect. What makes the problem of unity disappear is the treatment of matter and form on analogy with the treatment of genus and differentia in the preceding passage. That difficulty vanished, because the genus is a determinable kind, like sound, which the differentia determines into a determinate kind, like the letter alpha. The genus does not partake of its differentiae but is actualized in a particular way by a single line of division. Although the genus contains information not captured by a single dimension, other features of the genus stand outside the species viewed from that perspective (e.g. man considered in his locomotive dimension). The analogous solution for a material composite is to treat the *matter* of the spherical bronze in the way one treats the *genus* of man. The bronze that constitutes the sphere is then not a definite subject to which the shape belongs. Instead, the bronze is something determinable, which the spherical shape differentiates into a sphere, much as biped differentiates animal into man (*qua* locomotive). Call this determinable matter the *generic matter*. To understand the import of Aristotle's analogy, we need to look at his discussion of matter and potentiality in *Metaphysics* $\Theta.7$.

But first we should consider Aristotle's further extension of the genus-differentia model to non-substantial properties in *H.6*.⁵⁰

UNITY OF NON-SUBSTANTIAL PROPERTIES

Aristotle turns to categorial properties – substantial kinds, qualities, quantities, and other properties.⁵¹ In contrast to material composites,⁵² entities that have no matter are, he says, straightaway some one thing. Each categorial item is some one thing, just as it is some being, whether a substantial

⁵⁰ In the final lines of the section on composites Aristotle extends his point about matter and form to mathematical objects, such as circles, which contain intelligible matter (1045a33–5). His solution applies to anything that contains matter, whether perceptible or intelligible. Cf. *Z.10*.1036a9–12, on intelligible matter. Harte 1996, 287–9 argues convincingly against Ross 1924, 11.238, that intelligible matter is the abstracted matter of mathematical objects, such as two-dimensional magnitude, not a genus.

⁵¹ Like Halper 1989, 184–6, and Harte 1996, 289–90, I take Aristotle to be discussing the unity of items in the categories, not the unity of the categories themselves, contrary to Ross 1924, 11.238.

⁵² Including intelligible composites. See n. 50 above.

kind (*tode*),⁵³ a quality (*to poion*), or a quantity (*to poson*) (1045a36–b7). The claim about non-substantial properties is surprising for readers of *Metaphysics Z*. In Z.1 Aristotle declared that qualities such as white and other non-substantial properties are defined with reference to something in the category of substance.⁵⁴

Aristotle's view in Z appears to rely on a distinction in *Posterior Analytics* 1.4 between two sorts of predicates that belong to a subject in virtue of itself (*kath' hauto*) (*APo.* 1.4.73a34–b5).⁵⁵ A predicate Y belongs to a subject X *kath' hauto* in one way, if Y is predicated of X, and Y must be mentioned in the account of what X is. For instance, animal belongs in this way to man, since animal is predicated of man and must be mentioned in the definition of man; and heat belongs in this way to fire, because heat is predicated of fire and must be mentioned in the definition of fire. Let us call Y an *essential* predicate of X. More precisely:

Y is an *essential* predicate of X, if and only if Y is predicated of X, and Y must be mentioned in the account of what X is.

A predicate Y belongs to a subject X *kath' hauto* in a second way, if Y is predicated of X, and the subject X must be mentioned in the account of what Y is. For instance, female belongs to animal *kath' hauto* in the second way, because female is predicated of animal, and animal must be mentioned in the account of what female is. Similarly, odd belongs to number *kath' hauto* in the second way, because odd is predicated of number, and number must be mentioned in the account of what odd is. To invoke Aristotle's favorite example of a *kath' hauto* predicate of the second sort, snubness belongs *kath' hauto* to nose, because snubness is predicated of the nose, and the nose must be mentioned in the account of what snubness is. Snubness (a quality) is defined as "concavity in a nose," as "this in that" (Z.5.1030b14–20). Let us call Y a *special* predicate of X.⁵⁶ More precisely:

Y is a *special* predicate of X, if and only if Y is predicated of X, and X must be mentioned in the account of what Y is.

⁵³ Substantial kinds, such as the species man and horse and the genus animal, were treated in *Metaphysics Z* as universal composites, which contain form and matter taken universally. See passages cited above in n. 23.

⁵⁴ Z.1.1028a20–9; Z.4 and 5 are largely devoted to non-substantial properties and their secondary status; see esp. Z.4.1030a17–b13; Z.5.1030b14–28 and 1031a1–14.

⁵⁵ For the distinction, see also *Metaph.* Δ.18.1022a14–19, 1022a24–32. The whole investigation of categorial being in Z–H is the study of kinds of *kath' hauto* being. See Δ.7.1017a22–4, to which Aristotle refers in the opening sentence of Z.1 (1028a10–13).

⁵⁶ I owe the label to Paul Coppock.

According to the *Analytics*, Y is an *accidental* predicate of X, just in case Y is predicated of X, but Y need not be mentioned in the account of what X is, nor need X be mentioned in the account of what Y is. Whiteness is a special predicate of surface, but an accidental predicate of a man.

According to *Metaphysics Z* every non-substance is a special predicate of some definite entity in the category of substance, which is its primary recipient, and with reference to which the non-substance is defined and understood. Thus health is a special predicate of living thing, and justice is a special predicate of man. In Z.5 Aristotle claims that snubness and things like it are defined “from addition,” because their account must mention the sort of subject in which the property is always realized (Z.5.1030b23–8). Non-substances, though not themselves composites of matter and form or substance and property, are nonetheless defined with reference to something outside their own category in the category of substance. In Z.4 and 5 Aristotle argues that these entities lack the requisite unity of primary things and so are not strictly definable.

He still holds something like that view at the beginning *Metaphysics Θ*, where he sums up the discussion in Z–H before turning to the main topic of that book, potentiality and actuality:

We have talked about *what is* in the primary sense and to which (*pros ho*) the other predicates of being are referred, namely, substance (for the other beings are stated according to [*kata*] the account of substance – quantity and quality and the other things said in this way – for all will contain the account of substance, as we said in our first remarks). (Θ.1.1045b27–32)

If H.6 is consistent with Θ.1, the claim about the unity of non-substances is not that they can be defined apart from substance. Female is still defined with reference to animal, and whiteness with reference to surface. The passage that follows in H.6, in which Aristotle criticizes people for their appeal to participation and the like (1045b7–17), bears directly on the discussion of non-substances. The passage mentions not only a bronze triangle, thus recalling the discussion of material composites. The main examples are manifestations of non-substances, such as being healthy and being white. On the model to be rejected, being healthy (*to hugiainein*) is a binding together of soul and health, and being white (*to leukon einai*) is a composition of surface and whiteness.⁵⁷

⁵⁷ Bostock 1994, 286 complains that the definitions that Aristotle states look somewhat circular (e.g. being white is a composition of surface and whiteness). That problem is mitigated, if Aristotle is talking about the manifestation of non-substances – the equivalent in the non-substance categories of concrete composites in the first category.

Aristotle's proposal about the manifestation of categorial properties again extends his solution for the unity of form. Occurrences of whiteness and snubness, which are defined with reference to some subject in the category of substance, involve a subject conceived of as matter and a predicate conceived of as form, the one in potentiality, the other in actuality. The subject is a determinable kind, and the outcome of differentiation is the manifestation of some categorial item. Thus being white (an occurrence of whiteness) is surface (a determinable kind) differentiated by whiteness (a quality). Surface has many potentialities (to be hard or soft, rough or smooth, white or black), but all aspects of surface other than the potentiality to be white or black are external to the differentiation of surface into an instance of whiteness.⁵⁸ Any such instance will occur in a surface which is also smooth or rough, hard or soft, and so on, but those features merely coincide with the whiteness in the surface. Again, being female is defined with reference to animal, but the only aspect of animal internal to its differentiation as female is the reproductive capacity. All other features of animal – mode of feeding, locomotion, perception, and so forth – are external to being female, even though every instance of female occurs in an animal which has features of those sorts as well. So interpreted, the genus, though it contains information not actualized in a differentiation, does not undermine the unity of the item differentiated. The definition of a non-substance still mentions a substantial kind, but the reference does not add information, since the kind is immediately considered from the perspective of that feature.

MATTER AND POTENTIALITY

H.6 ends with a summary of Aristotle's proposals:

But, as we have said, the proximate (*eschatē*)⁵⁹ matter and the form are the same and one, the one in potentiality (*dunamēi*), the other in actuality (*energeiai*), so

⁵⁸ Note that at Z.4.1029b21–2, Aristotle supposes that a white surface can be defined as a smooth surface. He is relying on Democritus' view, which he criticizes at *Sens.* 4.442b11–19.

⁵⁹ The Greek *eschatē* can be translated either "proximate" or "ultimate," depending on whether one is counting up from the bottom or down from the top. I have vacillated in my translation of it in this passage, rendering it with most translators as "proximate" in Gill 1989, 143, but as "ultimate" in Gill 2008. I became dissatisfied with "proximate," because the proximate (or highest-level) matter in organisms is the functional matter, which is not the issue in H.6. The relevant matter in H.6 is the matter which is potentially the product, in the sense that it can be turned into the product without further changes of it (Θ.7: see below). This is the proximate matter, as opposed to lower-level matter, which must first be transformed into suitable stuff. Although organisms have functional matter, they also have proximate matter, which separates out when the organism dies. That is the sort of matter Aristotle is talking about in H.6.

that it is like seeking what is the cause of oneness and of being one; for each thing is some one thing, and the thing in potentiality and the thing in actuality are somehow one, so that the cause is nothing else unless there is something that moves it from potentiality to actuality. And all those things that have no matter are simply just some one thing. (1045b17–23)

This passage indicates that Aristotle has in mind some difference between a pure form such as man, defined by genus and differentia, and a concrete material composite such as a bronze sphere, since he says that the latter is *somehow* one (*hen pōs estin*), whereas things without matter – evidently including non-substantial properties – are *simply* some one thing (*haplōs hoper hen ti*). What is the difference? To answer this question and to understand more fully Aristotle’s proposal about composites, we need to look at his treatment of matter and potentiality in *Metaphysics* Θ.7.

Metaphysics Θ as a whole seeks to clarify the notions of potential and actual being, and Θ.7 focuses on matter and potentiality. The chapter breaks into two main parts.⁶⁰ The first part asks when an entity is properly called potential and argues that something is potentially in some end-state when it is sufficiently worked up that it can be in that state without further changes to it – nothing needs to be added to the subject, subtracted from it, or otherwise changed (1049a5–12). Earth is not yet potentially a sphere, because it must first be combined with water and worked up into bronze, but once the combination has been transformed into bronze, there is stuff of a suitable kind to be a sphere. The potentiality to be in the end-state is grounded in what the subject is, its own actual identity.

The second part of the chapter focuses on the product, and the question is this: “Does the entity designated as potential in the first part of the chapter persist in the product as something *actual* as well as *potential*?” Aristotle answers that it depends on what sort of continuant and what sort of change we are talking about. If we are talking about a man who comes to be healthy, musical, or white, then the persisting subject, the man, remains actually a man when his potentiality to be healthy or musical or white is realized. The complex, say a white man, is a subject – man – characterized by an accidental property (*tois pathesi to hupokeimenon anthrōpos*, 1049a29). The subject has some actual identity in its own right: it is a *tode ti*, a particular thing of a definite sort (1049a27–30).

⁶⁰ I discuss Θ.7 in more detail in Gill 2008.

But the situation is different in the case of matter and form. Aristotle characterizes the form–matter relation as follows:

In cases not like that [i.e. not like a physical object and its non-substantial properties], but the thing predicated (*to katēgoroumenon*) is some form (*eidos ti*) and *this* (*tode ti*), the proximate [subject] (*to eschaton*) is matter (*hylē*) and material substance (*ousia hulikē*). And calling [a thing] “that-en” (*ekeininion*) with reference to its matter and its properties (*kata tēn hulēn kai ta pathē*) turns out to be quite correct, since both are indefinite (*avorista*). (1049a34–b2)

Form–matter predication is not ordinary predication. The item predicated is said to be some form and *this* (*tode ti*), and the matter of which it is predicated is variously described as *indefinite* (1049b2), *potential* (1049a18–24), and *not a this* (1049a24–9). We specify the product adjectivally (as “that-en”) with reference to it.

The important idea is that the matter is present in the product only potentially and not actually. In *On the Heavens* 3.3 Aristotle defines a corporeal element as that into which other bodies are divided, which is present in the complex either potentially or actually, and he adds that it remains disputable in which of the two ways this occurs (*Cael.* 3.3.302a15–18). These two alternatives – matter as actual and matter as potential – reflect the distinctive treatments of matter in *Metaphysics* Z and H.1–5 and in H.6 and Θ. In *Generation and Corruption* 1.10, he pursues the second idea in his analysis of mixture and argues that the ingredients of a mixture exist actually before they are combined but are only potentially present in the compound (*GC* 1.10.327b19–31). Ingredients of the original sort can be extracted by destroying the mixture, and in that sense they are potentially present, but they are not actually there in the compound.⁶¹ Aristotle was not an atomist. A physical analysis of compounds will not uncover particles of the stuffs that went into the mixture. Even so, the presence of those stuffs is felt in the mixture, because the compound has certain properties owing to its ingredients. Bronze, a compound of copper and tin, has the color, the strength, the malleability, and other dispositional properties it has because

⁶¹ For a different interpretation of mixture, see Lewis 1994, 272–5. Loux (1995a, 500 and 1995b, 260–1) raised objections to my interpretation (in Gill 1989, 168–70) and I replied in Gill 1995, 517–19. I would now add to my earlier response that Loux’s objection assumes that some *thing* (“it”) persists throughout a substantial generation but goes shadowy while it composes a higher composite. That is not what I think. On my view, the original stuff is gone, transformed into the higher composite. When the higher composite is destroyed, matter of the original sort is left behind. This is not numerically the same stuff that was there at the outset, but merely stuff of the same sort (cf. *GC* 2.11.338b16–19: my use of the word “recreated” [1989, 170] was misleading). The higher composite is connected to the matter from which it was generated, because certain properties of that matter characterize it.

of the metals used in its composition. It shares some properties with its ingredients, but its own essential features, which differentiate it from them, are not the same as theirs. If constituent matter is not a definite and actual subject to which the form belongs, but something merely potential, this also justifies Aristotle's claim that it is not a *tode ti* – not a definite thing of a certain sort.

What is the nature of matter's indefiniteness? Aristotle claims that a thing is specified adjectivally with reference to both its non-substantial properties (*pathē*) and with reference to its matter. Thus we call a sphere "white," not "whiteness," and we call it "brazen," not "bronze." This usage is correct, he claims, because both are indefinite (1049a36–b2). Non-substances have categorial content and so are quite definite in that respect. Their indefiniteness is rooted instead in their dependence on some definite object for their instantiation. Whiteness when it occurs is a property of some definite thing, say a man. Matter as conceived of in $\Theta.7$ resembles non-substantial properties in its indefiniteness. The bronze which can be made into a sphere has its own character as bronze, but once it is worked up into a sphere, the bronze depends for its existence on the object whose matter it is. The material properties of a sphere, which connect it with its simpler origins, are not properties of the constituent bronze as an independent actual subject, but properties of the sphere it constitutes. That is why Aristotle approves of Greek usage, which prefers adjectives to nouns in specifying an object with reference to its matter.⁶²

Very important to understanding matter in $\Theta.7$ is Aristotle's claim that an object is called "that-en" with reference to the matter at only the next level down, not with reference to anything lower (1049a18–24). For instance, a box is called "wooden," but not "earthen," even though wood is itself a compound of earth and water. This claim corresponds to the thesis in the first half of the chapter, that matter is potential only once it has been sufficiently worked up to be in the end-state without further changes of it. If matter were an ordinary subject, the essential properties of the lower-level matter should also apply to stuffs and objects further up the series. It should therefore be acceptable to call a box "earth-en," since

⁶² It is instructive to compare Aristotle's discussion of the same linguistic practice at $Z.7.1033a5-23$. There he gave a not very convincing story about why people use adjectives instead of nouns to specify an object's matter. In fact ordinary usage conflicts with the account of matter he was exploring and apparently defending in *Z. Metaphysics Z* treated the relation between form and matter on the ordinary predication model. If bronze is a definite and actual subject of which a spherical shape is predicated, it should be quite correct to call the statue "bronze," just as we call a musical man "man." In $Z.7$ Aristotle was trying to rationalize a practice that was at odds with his theory. In $\Theta.7$, by contrast, he commends the practice which properly reflects his theoretical proposal.

earth is an elemental constituent of a box. If Aristotle were an atomist, he should have no objection to calling a box “earth-en,” or for that matter even “earth.” Atoms combine to form molecules; molecules combine to form more complex structures. The atoms are still there in the complex structure. This is not Aristotle’s view, as is evident from his denial that a box is specified adjectivally with reference to matter more remote than its own proximate matter. At each stage the lower-level matter, which is potentially something at the next level up, is transformed into the entity at the next higher level. So it is correct to specify the product adjectivally with reference to the matter at the first level down, but incorrect to specify it adjectivally with reference to any matter below that.

An advantage of Aristotle’s proposal in $\Theta.7$ is that a statue is not *two* things with different persistence conditions, the bronze and the statue, but just *one* thing: the statue. The generic matter of the statue is a collection of properties that belong to the statue. The material properties that connect an object with its simpler origins account for certain aspects of its behavior. For instance, a statue’s constitution from bronze explains its heaviness, solidity, and meltability. But those material properties do not contribute to its essence: the essence of a composite is its form.⁶³

At the end of H.6 Aristotle says that material composites are *somehow* one in contrast to forms and categorial properties, which are *simply* one. The difference is that material objects contain matter, whereas forms and categorial properties do not (1045b23). How do material properties weaken the unity of the object to which they belong?

I have argued that the proximate matter of an object resembles an ordinary genus on Aristotle’s second conception in Z.12. An ordinary genus, too, has features not captured by a particular differentiation, and those features characterize the differentiated object, though they are accidental to it insofar as it is conceived from the perspective of that determination. A material genus is similar, since features of the matter are either hypothetically necessary (hence explained by the form) or accidental to the object as the thing that it is. Even so, an object’s material properties differ in a fundamental respect from its other properties, because the material properties can essentially characterize a simpler stuff into which the higher object

⁶³ Jim Lennox reminds me that Aristotle often defines animals with reference to their matter as well as their form. But I believe that Aristotle’s arguments in H.6 and $\Theta.7$ enable him to define animals with reference to their form alone. Material properties of an object are either hypothetically necessary, and so follow from the form, or accidental. In either case they need not be mentioned in the animal’s definition. Aristotle may of course sometimes define animals with reference to their material parts (“biped animal” is a good example), but such definitions can be reformulated in terms of psychic functions (e.g. locomotive capacity).

degenerates. For instance, coldness and dryness are essential properties of earth, and coldness and wetness are essential properties of water. So the material features tend to undermine the unity of the object to which they belong. The elements are worked up into complex material objects, but they tend to separate out of the whole and to behave in the manner of those simpler stuffs.⁶⁴

Given that material properties undermine the unity of the object to which they belong, does Aristotle overstate his case in saying that composites are *one*, even if only in a way (*pōs*)? As I understand his view, material composites are genuine unities, but their unity is unstable, and remaining a unified whole demands considerable work. Material objects have characteristic activities (animals nourish themselves, grow, reproduce, perceive, move about in their environment as they do) and these activities are controlled by their form. An object's characteristic activities are not merely expressions of what it is; those activities also maintain and renew it, preserving it from degeneration, destruction, and loss of form. Any material object composed of Aristotle's four elements eventually wears out, degenerates, and is destroyed into simpler stuffs. That is why material composites, though genuine unities while they last, are only somehow one. Their unity is temporary and eventually gives way.

⁶⁴ On the undermining role of matter, see *Metaph.* Θ.8.1050b6–28; *Cael.* 1.12.283b19–22, and *Cael.* 2.6.288b15–18.