

Mary Katrina Krizan\*

# Aristotle's Compositional Hierarchy in *Parts of Animals* II 1, 646a12-24

<https://doi.org/10.1515/apeiron-2025-0067>

Received June 22, 2025; accepted September 7, 2025; published online September 24, 2025

**Abstract:** In *Parts of Animals* II 1, 646a12-24, Aristotle identifies three compositions, arranged from simple to complex. Although the passage clearly indicates that non-uniform parts are constructed from uniform parts, two ambiguities in the passage call the status of uniform compounds into question. Both ambiguities point toward divergent interpretations of (1) the relationship between uniform parts of living things and their inanimate or inorganic counterparts, and (2) the relationship of uniform compounds to their own material causes. The objective of this paper is to identify and resolve the two ambiguities in *PA* II 1, 646a12-24, with an eye toward the consequences for uniform materials in Aristotle's natural philosophy. In doing so, this paper argues that for Aristotle, uniform parts of living things, while they are parts of living bodies, are structurally as well as functionally distinct from inorganic and non-functional compounds.

**Keywords:** Aristotle; matter; homoeomers; parts of animals; composition

For Aristotle, the natural world is characterised by a variety of substances and materials that exhibit varying degrees of simplicity and complexity. At one extreme, the corporeal elements (fire, air, water, and earth) are especially simple: each is identified by two tangible qualities, and does little other than move upward and downward.<sup>1</sup> At another extreme, living organisms are especially complex: they are constructed from a variety of uniform and non-uniform materials, and are able to engage in complex psychic activities such as nutrition, reproduction, and (in the case of animals) sensation. Uniform materials and non-uniform parts of organisms fall

---

1 See *GC* II 3, 330a30-b7, *GC* II 4, 331a13-b2, *pH* VIII 4, 255a24-b12, and *DC* IV 3–5. Although elements do not move by themselves, there is controversy on the nature of a corporeal element as it relates to motion; see Gill (1989, 236-9, 1994, 31-2, and 2009), Cohen (1994), Bodnár (1997), and Katayama (2011). For the purpose of this paper, I use the phrase 'corporeal element' in reference to the simple sublunary bodies (fire, air, water, and earth); while the superlunary element aether is also a corporeal element, it does not function as a part of sublunary entities.

---

**\*Corresponding author: Mary Katrina Krizan**, Philosophy, Bilkent University, Ankara, Türkiye, E-mail: marykatrinakrizan@gmail.com

somewhere in between; they are more complex than the corporeal elements, but are less complex than the organisms and artefacts that they constitute.

In Aristotle's natural world, formal and final causes provide a source of unity for complex entities such as organisms. They ensure that an organism is something more than a juxtaposition of material parts, and in turn, explain the functions that are necessary for uniform and non-uniform parts of organisms to qualify as genuine members of their kinds.<sup>2</sup> Within Aristotle's system of the natural world, the priority of form over matter implies that complex entities are closer to essence and definition than their physical parts.<sup>3</sup>

Nonetheless, the varying degrees of simplicity and complexity in Aristotle's natural world also point toward what I call a 'compositional hierarchy' – that is, a hierarchy that is arranged from the bottom up. Within this hierarchy, complex entities are constructed from simpler entities, and simpler entities are material causes of complex entities. Specifically, organisms are constructed from non-uniform parts, non-uniform parts are constructed from uniform materials, and ultimately, uniform materials are constructed from the elements. This implies that the simple and complex entities have different causal histories and different proximate material causes. It also means that the matter – what is directly given its function or shape – will be of a different order of simplicity or complexity for entities that are more or less complex.

Aristotle demonstrates his commitment to a compositional hierarchy of this kind in *Parts of Animals* II 1, 646a12-24. Here, he identifies three compositions, arranged from simple to complex. Although the passage clearly indicates that non-uniform parts are constructed from uniform parts, two ambiguities in the passage call the status of uniform compounds into question. Both ambiguities point toward divergent interpretations of (1) the extent to which compound materials may be more or less complex than others, and (2) the proximate material causes of compound materials such as the uniform parts of organisms.

The objective of this paper is to identify and resolve the two ambiguities in *PA* II 1, 646a12-24. In Section 1, I set out Aristotle's compositional hierarchy, as presented in the text of *PA* II 1. In Section 2, I identify the two textual ambiguities and their possible solutions. In Section 3, I defend one solution to the first textual ambiguity, which concerns the scope of the compositions set out in *PA* II 1, 646a12-24. Then, in Section 4,

---

<sup>2</sup> See *GC* I 5, 321a29-32, *PA* I 1, 640b18-641a5, *GA* II 1, 734a24-735a4.

<sup>3</sup> This relationship is explained in *Mete* IV.12, 389b28-390a2. One might suppose that complex organisms are substances more so than their constituents, though cf. *Cat* 5, 2b23-7. The discussion in this paper is restricted to Aristotle's natural philosophy; thus, I will not consider whether (for example) the central books of the *Metaphysics* offer the same theory of parts and wholes. I do, however, assume that Aristotle's science of the sublunary region is a single, consistent project; see Falcon (2005, 1–30), and *Mete* I 1, 338a20-339a9.

I defend a solution to the second textual ambiguity, which concerns the relationship of the compositions to one another.

The solution to the first textual ambiguity in *PA* II 1 shows that for Aristotle, uniform parts of living things, while they are parts of living things, are structurally as well as functionally distinct from their homonymous counterparts as well as inorganic compounds.<sup>4</sup> Inanimate and inorganic compounds exhibit physical characteristics that are less complex than those of the functional parts of living things, and accordingly, their properties and persistence conditions are different. Nonetheless, non-living compounds are structurally more complex than the sublunary elements. Non-living compounds occupy an intermediate level of composition, in between the simple sublunary bodies and the uniform parts of living things.

The solution to the second textual ambiguity shows that although the uniform parts of living things are structurally distinct from non-living compounds, their proximate material causes are the same. Uniform compounds, whether parts of organisms or not, are formed from the primary contraries and sublunary elements. Ultimately, this means that the further operations of formal and final causes upon materials makes parts of living things structurally or compositionally – not just functionally – different from inorganic compounds.<sup>5</sup>

## 1 Compositions in *Parts of Animals* II 1, 646a12-24

In *Parts of Animals* 2.1, Aristotle introduces three compositions. He writes:

[T1] Since there are three compositions, [1] anyone would suppose the first to be [1a] composition from what some call 'elements,' that is, earth, air, water, and fire. Perhaps it is even better to say [1b] composition from the powers, and not from all of these, but as was described in an earlier work. For moisture, dryness, heat, and cold are the matter of the composite bodies. [1c] The other differentiae follow from these, such as heavy and light, dense and rare, rough and smooth, and other such affects of bodies. [2] The second composition from the primary things is the nature of uniform parts in animals, such as bone and flesh and other such materials. [3] Third and finally in number is the nature of the non-uniform parts, such as face and hand and similar parts (646a12-24, my enumeration).<sup>6</sup>

<sup>4</sup> This contrasts with an interpretation according to there is a functional but not compositional difference between living and non-living materials; see for example Whiting (1992, 79–81), Lennox (2014), Mirus (2001), and Cohen (1989, 265–9). The interpretation I advance has an affinity with that of Frey (2015).

<sup>5</sup> Although the interpretation of this paper may have consequences for how one might respond to problems regarding the homonymy of a living body, I will focus on lower-level materials and thus will not discuss the consequences. For the initial problem, see Ackrill (1972); see also discussion in Whiting (1992), Mirus (2001), and Frey (2007).

<sup>6</sup> Translations in this paper are my own.

Τριῶν δ' οὐσῶν τῶν συνθέσεων [1] πρώτην μὲν ἂν τις θείη [1a] τὴν ἐκ τῶν καλουμένων ὑπὸ τινων στοιχείων, οἷον γῆς ἀέρος ὕδατος πυρός. Ἔτι δὲ βέλτιον ἴσως [1b] ἐκ τῶν δυνάμεων λέγειν, καὶ τούτων οὐκ ἐξ ἀπασῶν, ἀλλ' ὥσπερ ἐν ἐτέροις εἴρηται καὶ πρότερον. Ὑγρὸν γὰρ καὶ ξηρὸν καὶ θερμὸν καὶ ψυχρὸν ὅλη τῶν συνθέτων σωμάτων ἐστίν· [1c] αἱ δ' ἄλλαι διαφοραὶ ταύταις ἀκολουθοῦσιν, οἷον βάρος καὶ κουφότης καὶ πυκνότης καὶ μανότης καὶ τραχύτης καὶ λειότης καὶ τᾶλλα τὰ τοιαῦτα πάθη τῶν σωμάτων. [2] Δευτέρα δὲ σύστασις ἐκ τῶν πρώτων ἢ τῶν ὁμοιομερῶν φύσις ἐν τοῖς ζώοις ἐστίν, οἷον ὁστοῦ καὶ σαρκὸς καὶ τῶν ἄλλων τῶν τοιούτων. [3] Τρίτη δὲ καὶ τελευταία κατ' ἀριθμὸν ἢ τῶν ἀνομοιομερῶν, οἷον προσώπου καὶ χειρὸς καὶ τῶν τοιούτων μορίων.

[T1] introduces a division of materials into three compositions, as follows:

- [1] Composition from [1a] the so-called elements (earth, air, water, and fire) or perhaps [1b] the primary powers (moisture, dryness, heat, and cold);
- [2] The nature of uniform parts (such as bone and flesh);
- [3] The nature of non-uniform parts (such as face and hand).

In the passage, Aristotle begins with materials that are less structured and closer to matter, then builds up to materials that are more complex and more readily characterised by form.<sup>7</sup> This is the reverse of a teleological or formal arrangement: an organism is prior in substance and form to its parts, and its organs and tissues exist for the sake of the organism.<sup>8</sup> Although uniform parts and their further constituents are posterior with respect to form and function, they are necessary for biological explanation because some of them are prior in time and are formed earlier in the generative process.<sup>9</sup>

In [T1], composition [1] is the simplest type of *composite* material. According to the passage, materials in [1] are formed from [1a] the corporeal elements, or perhaps [1b] the primary powers.<sup>10</sup> Aristotle's reference to 'an earlier work' points back to *On Generation and Corruption* II 1–4.<sup>11</sup> In *GC* II 2, Aristotle argues that the primary tangible qualities are two pairings of contraries, heat-cold and moist-dry.<sup>12</sup> Then, in

7 For a description of materials as closer to matter or form, see *Mete* IV 12, 390a3–7. Following Furley (1983), I assume that Aristotle is the author of *Meteorology* 4.

8 Generally, organs and tissues correspond to non-uniform and uniform parts; however, see Ogle (1912, n. 3 on 646a21) for a difficulty in the division. See also Furth (1988, 80–1).

9 Quarantotto (2022, 234), notes that the prior compositions in *PA* II 1 646a12–24 are prior in time in biological generation; see also *PA* II 1, 646b1–10 and *GA* II 6, 742a32–b37. *GA* II 6 points out that in biological generation, not all simpler materials are prior in time to complex parts. Quarantotto takes the *GA* II account to be a revision or qualification of the *PA* account.

10 I call heat, cold, moisture, and dryness 'primary powers' to highlight their status as abilities to act upon materials (heat and cold) or be acted upon (moisture and dryness). For this description, see *Mete* IV 1, 378b10–25 and *GC* II 0.2, 329b24–32.

11 ἐν ἐτέροις καὶ πρότερον in lines 15–16 refers to *GC* II 2; see Ogle (1912, n. 2 on 646a16). Lennox (2001, 180), marks a reference to *GC* II 1–4.

12 Aristotle concludes at *GC* II 2 330a24–6 that other tangible contraries 'reduce' to heat, cold, moisture, and dryness.

*GC* II 3, Aristotle shows that each of the corporeal elements consists of two primary contraries: fire is hot-dry, air is hot-wet, water is cold-wet, and earth is cold-dry. Finally, in *GC* II 4, Aristotle demonstrates that each of the corporeal elements can change into each of the others through the interactions of their primary contraries. Materials in composition [1], then, are bodies formed from the corporeal elements or primary powers that were discussed in *GC* II 1–4.

In [T1], composition [2] includes uniform parts of animals. In addition to his discussion of uniform parts in the biological works, Aristotle explains uniform parts in *GC* II 7–8 and *Meteorology* IV. In *GC* II 7, Aristotle argues that uniform parts can be produced from the corporeal elements because their primary contraries can mix.<sup>13</sup> Then, in the opening of *GC* II 8, he concludes that compound materials existing in the middle region, or the area closest to the earth, must contain the four corporeal elements. In *Meteorology* IV, Aristotle resumes his discussion of sublunary composites, now focusing on materials that, like the uniform parts of plants and animals, are formed primarily from earth and water.<sup>14</sup> Here, he describes the processes through which composite materials acquire features such as solidity and malleability, which in a biological context, are necessary for their functions within organisms.<sup>15</sup>

In [T1], Aristotle maintains that [1] and [2] are each constructed from something else: materials in [1] are constructed from the corporeal elements or primary contraries, and materials in [2] are constructed from the primary things (τῶν πρώτων).<sup>16</sup> The organs in [3] are also constructed from something else: specifically, they are constructed from materials in [2]. In *History of Animals* I 1, Aristotle writes:

[T2] All the non-uniform parts are constructed from the uniform parts, as hand is constructed from flesh, sinews, and bones (*HA* I 1, 486a13–14).<sup>17</sup>

Πάντα δὲ τὰ ἀνομοιομερῆ σύγκειται ἐκ τῶν ὁμοιομερῶν, οἷον χεῖρ ἐκ σαρκὸς καὶ νεύρων καὶ ὀστέων.

<sup>13</sup> It is unclear whether the mixing of corporeal elements in *GC* II 7 can or should be reconciled with Aristotle's account of chemical mixture in *GC* I 10; see Cooper (2004, especially 148–160), Krizan (2018), and Anagnostopoulos (2021).

<sup>14</sup> See Popa (2010) for an interpretation according to which compounds may be produced from one or two corporeal elements rather than all four. I assume that *GC* II 8 shows that Aristotle requires all four corporeal elements in any compound, and *Meteorology* 4 emphasises the contributions of earth and water, which are properly located in the lower half of the sublunary region rather than the upper atmosphere.

<sup>15</sup> Furley (1983, 90–2), and Lennox (2014, 292–301) make explicit connections to the biological works.

<sup>16</sup> See also *Meteorology* IV 12, 389b26–8.

<sup>17</sup> For the full description, see *HA* I 1, 486a4–14. Aristotle contends that parts such as flesh are non-composites (ἀσύνθετα) because they can be divided into parts that are uniform, whereas parts such as faces are composites (σύνθετα) because cannot be divided into parts that are also faces.

Here, Aristotle remarks that non-uniform parts are constructed out of (σύνκειται ἐκ) uniform materials: a hand is an organised, non-uniform part of a human being, and it is put together out of uniform materials such as flesh, sinews, and bones. In general, the non-uniform parts in [3] are constructed from uniform parts in [2].

[T1] and [T2] show that materials in [1], [2], and [3] are all constructed from something simpler, in the sense that it is closer to matter than to form. One final passage suggests that the simpler materials are somehow parts of the materials they constitute. In *Generation of Animals* I 1, Aristotle writes:

[T3] We have spoken about the other things (for the *logos* and that for the sake of which, as end, are the same, and the matter is the parts in animals: for the non-uniform parts are in the whole animal, the uniform parts are in the non-uniform parts, and the so-called elements of bodies are in these) (*GA* I 1, 715a7-11).

περὶ μὲν οὖν τῶν ἄλλων εἴρηται (ὁ τε γὰρ λόγος καὶ τὸ οὗ ἕνεκα ὡς τέλος ταῦτόν καὶ ἡ ὅλη τοῖς ζώοις τὰ μέρη· παντὶ μὲν τῷ ὅλῳ τὰ ἀνομοιομερῆ, τοῖς δ' ἀνομοιομερέσι τὰ ὁμοιομερῆ, τούτοις δὲ τὰ καλούμενα στοιχεῖα τῶν σωμάτων).

[T3] shows that simpler materials and entities are parts or constituents of more complex materials and entities. In the text, Aristotle uses dative expressions to indicate that simpler materials and entities exist *in* materials and entities that are more complex: corporeal elements are in uniform parts, uniform parts are in non-uniform parts, and finally, non-uniform parts are in whole animals.

[T1], as further clarified by [T2] and [T3], demonstrates that Aristotle is committed to a compositional hierarchy of natural materials. First, it introduces a commitment to natural compositions with varying degrees of simplicity and complexity. For lack of a better term, I will call the different orders of composition ‘levels’, and following Aristotle’s arrangement of compositions in [T1], I will identify materials and entities as belonging to lower and higher levels.<sup>18</sup> Functionally, higher-level materials and entities have increasingly complex activities. They are also more complex structurally: they have more complicated physical properties and are made out of increasingly complex parts. A hand is structurally more complex than a bone because it is constituted by complex, uniform materials such as flesh and bone and has a variety of properties throughout; bone is structurally less complex because it is constituted by simpler materials, perhaps the primary contraries or corporeal elements, and is organised around a narrower range of physical properties.<sup>19</sup> In general,

<sup>18</sup> I follow Furth (1988, 76–85) in referring to ‘levels’, although I number the levels differently.

<sup>19</sup> I am primarily thinking of ‘physical properties’ as the abilities to be acted upon that Aristotle describes in *Meteorology* IV 8–9, which include features such as the ability to be melted, malleability, and the ability to be fragmented.

the higher and lower compositions in [T1] exhibit greater and lesser degrees of physical complexity, in addition to more and less complex functions.<sup>20</sup>

Second, [T1], as further clarified by [T2] and [T3], demonstrates that the compositions, or levels, are hierarchically arranged. Within Aristotle's arrangement, higher-level materials are formed from lower-level materials, and lower-level materials are parts of higher-level materials.<sup>21</sup> The arrangement implied by these passages is asymmetric: lower-level materials are constituents of higher-level materials, but higher-level materials are not constituents of lower-level materials.<sup>22</sup> The hierarchy, however, is the reverse of one organised by form and function. The higher-level entities in the compositional hierarchy, which ultimately culminates in living beings, are ontologically prior to their parts. In contrast, the lower-level entities in the compositional hierarchy are closer to the fundamental layer or layers of matter.<sup>23</sup>

## 2 Two Interpretative Problems in *PA II 1*, 646a12-24

In *PA II 1*, Aristotle explicitly identifies three compositions or 'levels'. Beyond the three compositions explicitly listed, two additional levels are needed for a complete characterisation of entities in the sublunary region. First, as noted in [T3], the non-uniform parts are in the whole animal: thus, the whole animal or living organism is

---

**20** One might suppose that within the hierarchy, only the parts of organisms have functions, though I take this interpretation to be ruled out by *Meteorology* IV 12, 390a10-b2. Since my topic is primarily concerned with the physical complexity (rather than functions) of various materials, I do not think denying functions to sublunary elements and non-living materials makes a difference to the argument of the paper.

**21** Not all lower-level materials are potentially parts of higher-level materials and entities; certain uniform materials, such as gold, may lack the relevant dispositions that are hypothetically necessary for the generation of an organism.

**22** One exception to an asymmetric relationship between material causes and products may be found in Aristotle's theory of the elemental transformations in *GC II* 4–5. This issue does not factor into the compositional hierarchy as set out in *PA II 1*; however, it points toward a further question about what, if anything, lies below corporeal elements and primary contraries.

**23** Schaffer (2003) addresses the question about a fundamental layer of reality within a hierarchical conception of levels. At the risk of anachronism, one might view the bottom level in Aristotle's compositional hierarchy as the most fundamental layer of matter; however, this does not imply that it is ontologically prior, since for Aristotle, form is prior to matter. In this paper, I will not be able to address the further question about the fundamental layer of matter in Aristotle's natural philosophy. For a discussion of the interpretative difficulties, along with an early version of my own view, see Krizan (2013).

an additional, more complex level [4].<sup>24</sup> Second, the materials in [1] are compositions and are constructed from (ἐκ) something, just like other compositions. Thus, Aristotle is implicitly committed to a level [0], which includes the materials or entities from which materials in [1] are constructed.<sup>25</sup> Since materials in [1] are constructed from [1a] the corporeal elements or perhaps [1b] the primary contraries, [0] must include [0a] the corporeal elements or [0b] primary contraries.

The implicit level [0] highlights two interpretative problems in [T1]. First, the scope of levels in [T1] is ambiguous. Specifically, it is unclear whether the materials in [1] are uniform materials, the corporeal elements, or perhaps both. Depending upon how one responds to this ambiguity, there are three plausible ways to at understand the scope of Levels [0], [1], and [2]. Second, the relationship between levels in [T1] is unclear. The most obvious interpretation of the text would imply that the items in [2] are constructed from the primary *composition*, or items in [1]. However, since Aristotle elsewhere identifies both corporeal elements and primary contraries as ‘primary’, he could also mean that the items in [2] are constructed from the primary *things* – that is, the entities in [0].

Both ambiguities, in conjunction, raise questions about how Aristotle understands the uniform parts of organisms and their relationship to the layers of matter below them. The first ambiguity raises a question about whether there is a middle ground between uniform parts of organisms and corporeal elements: depending on how the ambiguity is resolved, one may suppose that uniform parts of organisms, when removed from life, either remain identical with their living counterparts or reduce to unstructured configurations of corporeal elements. The second ambiguity raises a more general question about relationships of composition within Aristotle’s sublunary ontology. In particular, it introduces a problem for how one should understand the constituents and proximate material causes of the uniform parts of organisms; this, in turn, has implications for how to best understand the role of form and function in the construction of a uniform compound.<sup>26</sup>

---

<sup>24</sup> See Ogle (1912, note on 646b10). Ogle notes that while most plants and animals attain their completion in a fourth composition, certain very simple organisms may be completed in the third composition.

<sup>25</sup> Among commentators, Peck (1961, 29–30), seems to overlook Aristotle’s implicit commitment to a level from which the first composition originates: he includes the primary powers in [1]. In fairness to Peck, this is consistent with the idea that primary powers are necessary for an explanation of the uniform parts in [2]. However, it does not make sense of the ἐκ + genitive constructions in [1a] and [1b], which are used elsewhere in both [T1] and [T2] to indicate that one thing is composed or constructed from something else.

<sup>26</sup> For a start toward filling out the details, see Kress (2024)

## 2.1 The Scope Problem

The first interpretative issue for [T1] concerns the scope of Level [1]: hereafter, I refer to this issue as the 'Scope Problem'. The problem arises from a further question about the scope of Level [0], and has implications for how to understand the scope of [2]. In contrast with [2] and [3], Aristotle does not explicitly list any of the materials or entities in [1]. Instead, he states what they are from: first, he says that they are from [1a] the corporeal elements, and then, he says that perhaps they are from [1b] the primary contraries. [1b] introduces a complication because there are two ways to understand its relation to [1a]. First, Aristotle might mean that items in [1] are constructed from both primary contraries *and* corporeal elements: in other words, primary contraries and corporeal elements amount to the same thing. This implies that [1] includes *compounds* of corporeal elements and excludes the corporeal elements themselves. Second, Aristotle might mean that items in [1] are constructed from the primary contraries *rather than* the corporeal elements. This implies that [1] includes, at minimum, the corporeal elements.

On the most natural reading of the passage, [1] includes *compounds* of corporeal elements, not the corporeal elements themselves.<sup>27</sup> This reading is plausible if [1b] is intended as a clarification of [1a], rather than a corrective. On this interpretation, which I call *Scope-A*, Aristotle does not mean to exclude corporeal elements as constituents of materials in [1]: rather, he wants to emphasise the contribution of primary contraries to the production of a compound.<sup>28</sup> This is supported by Aristotle's qualified introduction of the primary contraries, indicated by 'perhaps' (ἴσως). It is also consistent with Aristotle's discussion of compounds in *GC* II 7, where he emphasises the abilities of contraries to mix and form intermediates.

There is an immediate problem for *Scope-A*. If *Scope-A* is correct, then [0] includes primary contraries, or synonymously, primary contraries, and [1] includes compounds of corporeal elements. However, [T1] explicitly states that the uniform parts in animals belong to [2]. Thus, *Scope-A* implies that there must be two different types of compound materials: in addition to the uniform parts of living things in [2], there must exist other composite materials that are not parts of organisms and belong to [1].

For Aristotle, there are at least two kinds of materials that are composites of corporeal elements yet differ from uniform parts as they exist within living organisms. First, parts of organisms such as bone and flesh are arguably homoeomers, at

<sup>27</sup> See Ogle (1912, n. 2 on 646a17) and Furth (1988, 76–80).

<sup>28</sup> Solmsen (1950, 459–460), argues that against the Hippocratic background, the primary powers are more helpful to an explanation of uniform parts than the corporeal elements.

least for some time, after they are removed from an organism.<sup>29</sup> Although such compounds are ‘bone’ and ‘flesh’ only homonymously, one might expect that such ‘inanimate compounds’, as I shall call them, retain physical structures that distinguish them from other compounds and the elements. Second, Aristotle identifies inorganic compounds such as gold and stone as homoeomers (ὁμοιομερῆ).<sup>30</sup> While these compounds do not perform an explicit role in biological explanation, they are frequently listed alongside the homoeomers that function as the parts of plants and animals. Like organic compounds, inorganic compounds are found in nature; they differ from organic compounds because they tend to be used in the production of artefacts, rather than the generation, growth, and persistence of organisms.<sup>31</sup>

*Scope-A* is a plausible interpretation if [2] is restricted to the *functional* parts of living organisms, which I call ‘animate compounds’, and [1] includes compounds that are not functional parts of living organisms. In [T1], this means that [2] should be restricted to compound materials that are in living things and have the appropriate nature (φύσις). With this restriction on [2], [1] would include inanimate compounds that no longer have the nature (φύσις) and function of a living thing, as well as inorganic compounds such as gold and stone that are constructed from the elements or primary contraries, but do not function as parts of living things.<sup>32</sup> The remaining challenge for *Scope-A* is to explain why it is not possible for an animate compound to be even physically identical with its inanimate counterpart. If the position is correct, then the loss of a biological function and nature implies a change in a compound’s physical characteristics.

---

<sup>29</sup> They at least appear to remain the same; see *GC* II 5, 321b30-2.

<sup>30</sup> *Mete* IV 8, 384b30-4 and 4.10, 388a13-16. It is unclear whether all such ‘homoeomers’ are genuinely homogeneous throughout; see Popa (2022). Hereafter, I will use ‘inorganic compound’ to refer to materials such as metal and stone that are potentially parts of living things and ‘inanimate compound’ to refer to materials that are potentially parts of living things or, more frequently, were once part of a living thing but have been disconnected from its functions.

<sup>31</sup> Inorganic compounds make an appearance in parallel with materials such as flesh and bone in *Meteorology* IV 12, in which Aristotle introduces the functions of homoeomers as a prelude to his biological works. For discussion of the relationship between inorganic compounds and artefacts, see Gill (1997) and (2014).

<sup>32</sup> Furth (1988, 78-9), includes such materials in a level distinct from the uniform parts of animals. In theory, there are two possible version of *Scope-A*, which I identify as *Scope-A.1* and *Scope-A.2*. *Scope-A.1*, which I defend, places inorganic and inanimate compounds in Level [1]. *Scope-A.2* places inorganic compounds in Level [1], and inanimate compounds in Level [2] along with animate compounds. I do not think that *Scope-A.2* is plausible because it requires expanding the scope of [2] to include some materials that are not in animals and do not have the relevant nature, and it is unclear how to do this without also allowing inorganic compounds in [2]. If inorganic compounds belong to [2], then the interpretation becomes the alternative, *Scope-B*.

There are two different kinds of objection to *Scope-A*, which motivate two versions of an alternative interpretation. First, one might argue that *Scope-A* has an unacceptable consequence because it implies that there is a structural difference between animate and inanimate compounds. If *Scope-A* is correct, then animate compounds are not simply inanimate compounds with a function added on; they are somehow materials with distinctive physical structures. Furthermore, the evidence that inanimate (and inorganic) compounds have distinctive physical structures may require an overreading of [T1]; it requires treating the nature of a compound as determining something about its physical construction and not just its function. Second, one might suppose that *Scope-A* has an unacceptable consequence because it allows inanimate and inorganic compounds to have a structure that is more complex than the corporeal elements. One might have expected that such compounds are nothing more than arbitrary mixtures of contraries or elements when they occur outside of living things; *Scope-A*, in contrast, implies that they have their own, independent criteria for identity.

A different reading of [T1], which I will call *Scope-B*, provides the common foundation for two alternative interpretations. In [T1], it is possible to understand [1b] as a corrective to [1a], rather than a clarification.<sup>33</sup> If this is the case, then Aristotle is claiming that composition [1] is *really* from the primary contraries, *not* the corporeal elements: the primary contraries are genuinely simple, and the corporeal elements are not. Since the corporeal elements are not genuinely simple, they belong to [1]: they are the simplest composites, and have been constructed from the primary contraries.<sup>34</sup> Level [0] includes *only* the primary contraries, not the corporeal elements.

*Scope-B* requires that the primary contraries, not the corporeal elements, are really 'elements' or simple constituents, and [T1] provides two indications that this may be the case. First, in [1a], Aristotle refers to earth, air, water, and fire as 'what some call the elements' (τῶν καλουμένων ὑπὸ τινων στοιχείων). A similar locution is frequent in Aristotle, and some readers interpret this to mean that earth, air, water, and fire are not really simple, but are compounds of the more fundamental primary contraries.<sup>35</sup> Second, Aristotle's reference to his discussion 'in another place and earlier' (ἐν ἑτέροις καὶ πρότερον) in [1b] provides evidence that corporeal elements are not really simple. When Aristotle constructs the corporeal elements from the primary contraries in the opening of *GC* II 3, he identifies the primary contraries as

<sup>33</sup> Aristotle may be employing a similar corrective in *GC* II 7 334b16-20; see Krizan (2018, 210–211) for discussion.

<sup>34</sup> The thesis that Aristotle's corporeal elements are composite is a widely held view; see Crowley (2013, 161, and *n.* 2) for references to the literature.

<sup>35</sup> See Crowley (2008, 223-5, and *n.* 1) for references to those who (in contrast with Crowley) accept this interpretation.

‘elements’ (330a30-b7) and remarks that fire, air, water, and earth are ‘apparently simple bodies’ (τοῖς ἀπλοῖς φαινομένοις σώμασι).<sup>36</sup>

If *Scope-B* is correct, then only the primary contraries are simple. Thus, corporeal elements are the simplest composite entities, and belong to Level [1]. However, *Scope-B* permits two different ways of filling out Levels [1] and [2], and hence, two related but divergent interpretations. First, one might suppose that the corporeal elements (and nothing else) are the proper entities of Level [1]. This interpretation, which I call *Scope-B.1*, responds to the first objection to *Scope-A*: it implies that all other composites – whether animate, inanimate, or inorganic – belong to Level [2].<sup>37</sup> Second, one might suppose that inorganic and inanimate compounds belong, along with corporeal elements, in Level [1]. This interpretation, which I call *Scope-B.2*, responds to the second objection to *Scope-A*. *Scope-B.2*, like *Scope-A*, implies that inorganic and inanimate compounds are structurally less complex than animate compounds. Unlike *Scope-A*, it denies that inorganic and inanimate compounds are more complex than the corporeal elements: they are mixtures of primary contraries, and do not belong to a compositional level distinct from that of the elements.<sup>38</sup>

One might suppose that Aristotle’s introduction of additional contraries in [1c] can support a decision in favour of *Scope-A* or *Scope-B*. In [1b], Aristotle says that the first composition is not from all of the powers, but only moisture, dryness, heat, and cold. Then, he adds that [1c] other differentiae, such as heavy-light, dense-rare, and rough-smooth, follow from these, the primary four. On a standard interpretation of [1c], ‘the other differentiae’ and ‘other such affects of bodies’ (τὰ τοιαῦτα πάθη τῶν σωμάτων) include the various non-primary tangible contraries discussed in *GC* II 2,

<sup>36</sup> See Crowley (2013) offers an alternative interpretation of *GC* II 3, 330a30-b7: he argues that the passage does *not* imply that primary contraries, rather than corporeal elements, are the *genuine* elements. His interpretation thus seems to rule out [I-B]: corporeal elements cannot be the first composition.

<sup>37</sup> Lennox (2001, 180), notes that this arrangement would make sense of 646a12-24. See also Lennox (2014, 277). However, Lennox concedes that for Aristotle, the causal powers, rather than the elements, are relevant to an explanation of uniform parts; see also Quarantotto (2022, 234 n. 4). Mirus (2006, 48 and 60-1) suggests that organic and inorganic materials belong to the same class, consistent with the *Scope-B.1* interpretation of [2]. The position of Peck (1961, 29–30) can also be characterised as a *Scope-B.1* interpretation, albeit one that eliminates [0] and places primary contraries in [1]. Gotthelf (2012, 158), summarises the three levels of composition as ‘of elementary powers into simple compounds, of these into the uniform parts of animals, of these into the non-uniform parts’. This summary likely implies a *Scope-B.1* interpretation, depending on how one understands ‘simple compounds’.

<sup>38</sup> This position may be implied by Gill (2014) and (1997), who treats inorganic compounds as having functions only when they exist as actual parts of artefacts: inorganic compounds outside of artefacts, along with inanimate compounds outside of living organisms, appear to be unstructured mixtures. This position may also be implied by Fine (1995), who denies that combinations of corporeal elements (or mixtures in general) can form entities that exist at a higher ontological level: see especially 299–306 for discussion.

such as soft-hard, fine-coarse, and viscous-brittle. These qualities do not belong to all of the corporeal elements: water, for example, is not soft. So, the presence of non-primary qualities in [1c] may offer an initial case in favour of *Scope-A* and against *Scope-B*; Level [1] materials seem to possess additional characteristics, which corporeal elements frequently lack.

It is unclear that the standard interpretation of [1c] is correct; at any rate, additional argumentation would be needed to defend it. First, Aristotle claims in *GC* II 2 that qualities such as soft-hard and viscous-brittle ‘reduce’ (ἀνάγονται) to the four primary contraries. In [1c], he offers a different description: powers such as heavy-light and rare-dense ‘follow from’ (ἀκολουθοῦσιν) the primary contraries. Similar uses of the verb elsewhere indicates a different relationship: when x follows from y, y is necessary and sufficient for x, whereas when x reduces to y, y is necessary (but not sufficient) for x.<sup>39</sup> Second, Aristotle’s chosen examples indicate that he may be thinking about qualities that all bodies have, rather than those that belong only to compounds of the corporeal elements. All bodies, including corporeal elements, can be characterised as heavy-light, dense-rare, and rough-smooth, or a blend of the two extremes.<sup>40</sup> If this is the case, then Aristotle can allow corporeal elements in Level [1]; his point is merely that characteristics such as their heaviness and lightness are not the matter from which they are constructed.

*Scope-A*, *Scope-B.1*, and *Scope-B.2* offer three initially plausible ways to understand the levels of composition that Aristotle sets out in *PA* II 1, 646a12-24; they are presented in Table 1 below.

## 2.2 The Relationship Problem

The second interpretative issue for [T1] concerns the relationship between Levels [0], [1], and [2]; hereafter, I refer to this issue as the ‘Relationship Problem.’ In [T1], it is unclear whether the proximate material causes of compounds in [2] are materials in [1] or materials and entities in [0]. In [T1], Aristotle states that the second composition is from the primary things (ἐκ τῶν πρώτων). The reference of ‘the primary things’ is ambiguous, and there are two possible interpretations. Depending on how one decides the issue, there are two different ways of understanding that from which uniform parts of living things are constructed, as proximate material causes.

<sup>39</sup> For relevant uses of ἀκολουθέω, see *APr* I 13, 32a34, *Cael* I 12, 282b6-10, and *Cael* IV 4, 311a34-5.

<sup>40</sup> This is consistent with Aristotle’s identification of rough-smooth and rare-dense as belonging to quantity, not quality (*Cat* 8, 10a18-24). Heavy and light, while tangible, are features that explain locomotion (*pH* III1, 201a4-8). In *GC* II 2, Aristotle remarks that heaviness and lightness cannot make for an element because they are not mutually active and passive (329b19-23), but does not, in the course of the chapter, explicitly demonstrate that they ‘reduce’ to heat, cold, moisture, and dryness.

**Table 1:** *Scope-A*, *Scope-B.1*, and *Scope-B.2*.

| <i>Scope-A</i>                                 | <i>Scope-B.1</i>                                                    | <i>Scope-B.2</i>                                                     |
|------------------------------------------------|---------------------------------------------------------------------|----------------------------------------------------------------------|
| Level scope                                    | Level scope                                                         | Level scope                                                          |
| [0] Corporeal elements<br>Primary contraries   | [0] Primary contraries                                              | [0] Primary contraries                                               |
| [1] Inorganic compounds<br>Inanimate compounds | [1] Corporeal elements                                              | [1] Corporeal elements<br>Inorganic compounds<br>Inanimate compounds |
| [2] Animate compounds                          | [2] Inorganic compounds<br>Inanimate compounds<br>Animate compounds | [2] Animate compounds                                                |
| [3] Non-uniform parts of animals<br>and plants | [3] Non-uniform parts of animals<br>and plants                      | [3] Non-uniform parts of animals<br>and plants                       |
| [4] Complete organisms                         | [4] Complete organisms                                              | [4] Complete organisms                                               |

First, on the most natural reading of the passage, ‘the primary things’ refers to materials in [1]. On this interpretation, which I call *Relationship-A*, the primary things are the first or primary *composition* just mentioned. This is a natural reading of the passage because it takes τῶν πρώτων in 646a21 to pick up πρώτην in 646a16. It is also a natural interpretation because it preserves the reasonable idea that inputs at one level always produce outputs at the same level: inputs at Level [1] produce outputs at Level [2], and inputs at Level [0] produce outputs at Level [1].<sup>41</sup>

Second, ‘the primary things’ could refer to the materials or entities that are *really* primary, rather than the primary *composition*. On this interpretation, which I call *Relationship-B*, the primary things are the primary *entities* in Level [0], not the primary compositions in Level [1]. If the proximate material causes of compounds in [2] are the primary entities in [0] rather than the primary compositions in [1], then the relationship between levels is different. In this case, inputs at Level [0] can produce outputs at both Level [1] and Level [2]; Level [0] inputs do not sufficiently determine the level of the output.

*Relationship-B* may seem to be an unnatural interpretation. Aristotle, however, frequently refers to corporeal elements and primary contraries as ‘primary’ (πρῶτος), both in reference to his own position and in the positions of his predecessors. In *de Caelo* III 3, 302a11-14, Aristotle identifies ‘elements’ as the primary constituents of bodies; here, he is thinking of the corporeal elements, which are the primary bodies

<sup>41</sup> I am especially grateful to an anonymous referee for the language of inputs and outputs.

from which other bodies are composed.<sup>42</sup> Likewise, Aristotle identifies the contraries hot-cold and moist-dry as primary in *GC* II 2, 329b16, and takes them to be the basic qualities of body *qua* body. While there is significant controversy surrounding the question of *ultimate* primary constituents in Aristotle's philosophy, there is evidence that he thinks primary contraries and corporeal elements are primary things of some kind.<sup>43</sup>

The difference between *Relationship-A* and *Relationship-B* is represented in the italicised Row 2 in Table 2 below.

While often overlooked, the second interpretative issue has consequences for how one should understand the relationship between lower-level materials and organisms in Aristotle's natural philosophy. If *Relationship-A* is right, then at least some materials in [1] are potentially the uniform parts of organisms in [2]. If *Relationship-B* is right, then materials in [1] are *not* potentially the uniform parts of organisms in [2]. Instead, materials in [1] and [2] are both constructed from materials and entities in [0], and there is no mechanism whereby a material in [1] is developed into a uniform part of an organism without first being destroyed.

### 2.3 Interpretative Options and Strategy

Aristotle's introduction of compositions or levels in *PA* 2.1 is subject to two interpretative difficulties, which I have called the Scope Problem and the Relationship Problem. These two interpretative difficulties are relatively independent: *Scope-A*, *Scope-B.1*, and *Scope-B.2* are at least *prima facie* compatible with both *Relationship-A*

**Table 2:** *Relationship-A* and *Relationship-B*.

| <i>Relationship-A</i> : 'Primary things' refers to [1] | <i>Relationship-B</i> : 'Primary things' refers to [0] |
|--------------------------------------------------------|--------------------------------------------------------|
| [1] Constructed from [0]                               | [1] Constructed from [0]                               |
| [2] Constructed from [1]                               | [2] Constructed from [0]                               |
| [3] Constructed from [2]                               | [3] Constructed from [2]                               |
| [4] Constructed from [3]                               | [4] Constructed from [3]                               |

<sup>42</sup> See also *GC* II 3, 330b6, and *Metaph* V 3, 1014a26-35 and 1014b14-15; also *GC* II 1, 329a5-6. Aristotle also identifies primary bodies in his predecessors; see, for example, *GC* I 8, 325b17-23.

<sup>43</sup> Perhaps the best description of the ultimate primary entities from which others are composed is in *GC* II 1, 329a24-b3. Various interpretations identify the ultimate primary principle in the passage as prime matter, the corporeal elements, and the primary contraries.

and *Relationship-B*.<sup>44</sup> [T1] does not provide conclusive evidence in favour of a particular solution to either interpretative problem, nor do Aristotle's additional comments in [T2] and [T3].

A solution to both problems has implications for how to best understand physical simplicity and complexity in Aristotle's sublunary ontology. An answer to the Scope Problem will identify the kinds of levels, or layers, of material simples and compounds that lie below the uniform parts of animals. Thus, it will enable one to identify whether Aristotle thinks that there is a middle ground between the simple corporeal elements and the uniform parts of living things, and furthermore, whether there exist compounds that are not connected with life yet are more than mere compounds of elements. An answer to the second question will identify the materials from which parts of organisms are constituted, as their proximate material causes. Depending on how the question is answered, the processes of heating and cooling needed to construct an organism may be more distinct from similar, inorganic processes than sometimes recognised.

If the solutions to the Scope Problem and the Relationship Problem are relatively independent, then there are six possible interpretations of Aristotle's compositional hierarchy in *PA* II 1. To prevent an unwieldy interpretative strategy, I shall not discuss them all; rather, I proceed as follows. First, in Section 3, I focus on the Scope Problem. I defend *Scope-A* by an appeal to textual evidence in *Meteorology* 4. Then, in Section 4, I focus on the Relationship Problem. I will compare two versions of *Scope-A* that accept *Relationship-A* and *Relationship-B*; then, I defend an interpretation that conjoins *Scope-A* and *Relationship B* by examining the processes through which animate compounds are formed.

### 3 Solution to the First Problem: A Defence of *Scope-A*

The Scope Problem introduces a question about the place of inanimate and inorganic compounds in Aristotle's sublunary ontology. Such compounds are clearly different

---

<sup>44</sup> Of the six possible options, I take the combination of *Scope-B.1* and *Relationship-A* to be the most difficult to reconcile with Aristotle's claims that uniform compounds are formed from primary contraries. While I agree with Frey (2015) about the status of blood as an animate compound and Frey (2007, 189-90) that 'mixtures' or combinations of primary contraries have a 'unitary nature', I think the difference between animate and inorganic or inanimate materials is even stronger than he suggests. I read the account in Frey (2015, 388) as a combination of *Scope-A* and *Relationship-A* that proposes a difference in how animate materials are produced. I go further in supposing that the difference in their production is necessary because they have the same kinds (though not necessarily proportions) of ingredients.

from animate compounds, since they exist outside the teleological structure of an organism. It is less clear whether they are structurally distinct, in the sense that they have properties and powers that differ from those of animate compounds. If they are structurally distinct, it is, furthermore, unclear whether they are unified materials – or if, instead, they are mere mixtures or juxtapositions of corporeal elements.

This section will argue that inanimate and inorganic compounds have a unique place in Aristotle's compositional hierarchy, and will do so by defending *Scope-A*. First, I argue that *Scope-A* makes better sense of the relationship between Levels [0] and [1], which implies that inanimate and inorganic compounds, not corporeal elements, properly belong to Level [1]. Then, I argue that *Scope-A* can avoid the objections from *Scope-B.1* and *Scope-B.2*: inanimate and inorganic compounds are not structurally similar to animate compounds, nor do they reduce to mere configurations of corporeal elements.

### 3.1 The Scope of Levels [0] and [1]

The first half of the Scope Problem concerns the scope of Levels [0] and [1]. For Aristotle, uniform compounds are formed from the primary contraries,<sup>45</sup> and furthermore, primary contraries are (in some sense) matter for uniform compounds;<sup>46</sup> thus, *Scope-A* and both versions of *Scope-B* must agree that Level [0] includes the primary contraries. *Scope-A*, unlike both versions of *Scope-B*, must demonstrate that for Aristotle, primary contraries and corporeal elements perform synonymous or nearly synonymous roles in the construction of uniform compounds. Otherwise, one could maintain that [0] primary contraries are the material causes for [1] corporeal elements and [2] various uniform compounds, as in *Scope-B.1*, or that [0] primary contraries are the materials causes for, at minimum, [1] corporeal elements, inanimate compounds, and inorganic compounds, as in *Scope-B.2*.

---

<sup>45</sup> In *GC* II 7, 334b24-7 and 334b10-14, Aristotle argues that uniform compounds can be formed because the primary contraries can mix and form an intermediate. Cf. Frede (2004, 309–310): she suggests that the view of *Meteorology* IV, according to which water and earth are material causes of homogeneous bodies, represents a departure from the *GC* II 7 view that uniform compounds are formed from primary contraries. This interpretation, I think, is ruled out by [T4] and [T5] below.

<sup>46</sup> It is well-established that for Aristotle, primary contraries are matter for uniform compounds: see *Meteor.* IV 1, 378b33-4, IV 2, 379b19-20, IV 8, 384b26-30, IV 10, 388a21-2, IV 11, 389a28-9, and *Juv* 5, 466a20-2. There is disagreement about which primary contraries are matter in various texts: Lennox (2014) takes all four primary contraries to be matter in *Meteorology* IV, Lewis (1996, 22-5) takes only the passive qualities to be matter in *Meteorology* and Henry (2019, 96 and 101-2) treats passive qualities as matter in *Meteorology* IV, but does not think this is incompatible with Aristotle's identification of heat, cold, moist, and dry as matter in *PA* II 1 or *Juv* 5.

The text of *Meteorology* 4 provides evidence that for Aristotle, primary contraries and corporeal elements perform synonymous or nearly synonymous roles in the explanation of uniform compounds.<sup>47</sup> In the text, Aristotle describes the reactions of compounds to heat and cold, and in doing so, appeals to their construction from the elements. In his explanations in *Meteorology* IV, Aristotle identifies the formation of various compounds from corporeal elements and primary contraries; in addition, he establishes that they are synonymous or nearly synonymous explanatory principles.

First, Aristotle explicitly identifies corporeal elements and primary contraries as performing the same role in the formation of a compound material. The relationship between corporeal elements and primary contraries is introduced in *Meteorology* IV 4, where Aristotle writes:

[T4] And therefore, the determined body is from both. But of the elements, earth is most properly called ‘dry’, and water is most properly called ‘moist’. Therefore, all of the determined bodies around here cannot exist without earth and water, but each body displays the capacity of the one that is greater in it (382a2-6).<sup>48</sup>

καὶ διὰ τοῦτο ἐξ ἀμφοῖν ἐστὶν τὸ ὀρισμένον σῶμα. λέγεται δὲ τῶν στοιχείων ἰδιαίτατα ξηροῦ μὲν γῆ, ὕγρου δὲ ὕδωρ. διὰ τοῦτο ἅπαντά τε τὰ ὀρισμένα σώματα ἐνταῦθα οὐκ ἀνευ γῆς καὶ ὕδατος ὁποτέρου δὲ πλεόν, κατὰ τὴν δύναμιν τούτου ἕκαστον φαίνεται.

Aristotle further clarifies this relationship in *Meteorology* IV 10. Here, he states:

[T5] The matter from which these [the homoeomers] come about is the dry and the moist, that is, water and earth (IV 10, 388a21-2).<sup>49</sup>

<sup>47</sup> GC II 7, 334b16-17 comes close to giving such evidence, as Aristotle states that ‘the others’, that is, uniform compounds, come about from (ἐκ) the mixing of the contraries or the elements (τῶν ἐναντίων ἢ τῶν στοιχείων). Here, ἢ must not be an exclusive disjunction: this would conflict with Aristotle’s claims, just a few lines later, that uniform compounds are from the mixing of primary contraries. It is less clear whether τῶν στοιχείων are primary contraries or corporeal elements. The second option would support *Scope-A*; however, the first option is preferred by Joachim (1922, 242-3) and Krizan (2018).

<sup>48</sup> I translate ἐνταῦθα loosely as ‘around here’. Aristotle means the ‘place around the middle’, or the region closest to the centre of the universe: given that determined bodies (τὰ ὀρισμένα σώματα) are primarily constructed from earth and water, their proper places are in the lower half of the sub-lunary region. This explains why water (and not air) is properly identified as moist in *Meteorology* 4: air remains moist *simpliciter*, as Aristotle states in GC II 3 331a1-6, but it is not a primary constituent of inorganic materials, plants, and animals (*Mete* IV 4, 382a6-8): air is higher in the atmosphere and it is characterized by its indeterminate boundaries.

<sup>49</sup> Louis prints ὥς τε instead of ὥστε. The decision does not significantly affect the meaning (or translation) of the passage.

ἐξ ὧν δὲ ταῦτα ὅλη μὲν τὸ ξηρόν καὶ ὑγρόν, ὥστε ὕδωρ καὶ γῆ (ταῦτα γὰρ προφανεστάτην ἔχει τὴν δύναμιν ἐκότερον ἐκατέρου).

[T5] introduces a close relationship between the primary contraries and corporeal elements. As he does elsewhere in *Meteorology* IV, Aristotle identifies moisture and dryness as the matter from which the homoeomers are constructed. Here, he takes this to imply that water and earth are *also* the matter for homoeomers. The reason for this relationship is put more clearly in [T4]. In [T4], Aristotle indicates that determined bodies in the area around here, by which he means the lower region of the universe closer to the earth, must be formed from both moisture and dryness. Among the corporeal elements that naturally occur closer to the earth, water is properly moist, and earth is properly dry. Therefore, determined bodies in the lower region must be formed from both water and earth; water and earth, like moisture and dryness, appear as proximate material causes.

Second, Aristotle's descriptions of processes brought about by heat and cold implies that corporeal elements and primary contraries perform the same explanatory role in determining a compound's reactions to heat and cold. In *Meteorology* IV 5–7, Aristotle examines a number of processes that occur when compounds are acted upon by heat and cold, such as drying, solidifying, thickening, and softening. Throughout his discussion, Aristotle broadly classifies compound materials as 'from earth,' 'from water,' or 'from both,' a classification that he reiterates in *Meteorology* IV 10.<sup>50</sup> The construction of a material from earth, water, or both determines its reactions to heat and cold: for example, a material primarily formed from water melts when heated, whereas a material primarily formed from earth solidifies when heated.<sup>51</sup>

In *Meteorology* IV 5–7, Aristotle does not explicitly appeal to the construction of compounds from primary contraries: he only focuses on their construction from earth and water. Nonetheless, the primary contraries derived from earth and water determine how a compound will react to heat and cold. Most of the materials that Aristotle describes are primarily formed from water and earth; thus, they are more cold than warm. Watery and earthy materials are primarily cold-moist and cold-dry, respectively; their variations in moisture (rather than temperature variations) explain why they react in different ways to heat and cold. One exceptional case, oil, is moist like

<sup>50</sup> In each case, Aristotle appeals to the genitive forms, γῆς and ὕδατος, to indicate that earth and water are the elements from which the compound is derived. Aristotle identifies earth, water, or a combination of both as the elements of compounds at *Meteorology* IV 4, 382a3-5; IV 5, 382b3; IV 6, 382b32, 383a26-7; IV 7, 384a3; IV 8, 384b30-1; IV 10, 388a21-2, 25-6, 388a29-31, 388b32-389a2, 389a7-9, 389a11-13, IV 11, 389a26-8, 389b12. Exceptions include compounds formed out of air and water such as olive oil (IV 7, 383b21-5; IV 8, 385b4-5; IV 10, 388a31-2) and quicksilver (4.8, 385b4-5) and compounds formed out of air and earth, such as wood (IV 7, 383b21-5, IV 8, 384b15-19; IV 10, 388a30-1).

<sup>51</sup> Lennox (2014, 285-8), argues that the construction of compounds out of earth, water, or both allows them to be characterised as kinds, which are then subject to the equivalent of natural laws.

watery materials, but does not react in the same way to heat and cold.<sup>52</sup> This occurs because it is formed from water and air; it possesses more heat than watery materials due to its formation from air, which in turn, explains why its reactions to heat and cold differ from those of materials formed primarily from water.

Thus, Aristotle's explanations in *Meteorology* IV show that primary contraries and corporeal elements perform synonymous roles in explanations of the formation of compounds and the reactions of compounds to heat and cold. This relationship rules out *Scope-B.2*. If corporeal elements, inorganic compounds, and inanimate compounds belong in Level [1], and primary contraries belong in Level [0], it will not be possible for corporeal elements and primary contraries to perform synonymous roles in the formation of compounds in [1]: elements will form an entity at the same level, whereas primary contraries will combine to produce something more complex. The relationship also threatens the plausibility of *Scope-B.1*. If *Scope-B.1* is correct, then corporeal elements in [1] form compounds in [2] in virtue of their primary contraries in [0]. While this avoids the difficulty faced by *Scope-B.2*, it remains difficult to see why Aristotle seems to identify primary contraries and corporeal elements as synonymous explanations; one would expect a rather asymmetrical relationship, in which primary contraries act because they are ontologically dependent upon corporeal elements, and corporeal elements act because they are physically, or constitutionally, dependent upon primary contraries.

Compared with *Scope-B.1* and *Scope-B.2*, *Scope-A* makes better sense of the relationship between primary contraries and corporeal elements implied by Aristotle's discussions of compounds in *Meteorology* 4. Materials can be identified by the bodies, or corporeal elements, from which they were constructed, and the bodies from which they were constructed determine their reactions to heat and cold. Materials can also be identified as mixtures of primary contraries, where the mixture of moisture and dryness, along with heat and cold, determines the reaction of a body to heat and cold. Since primary contraries and corporeal elements perform synonymous roles as an explanation of how a compound is formed and how it reacts to heat and cold, there is no reason to suppose that, for the purpose of explaining compounds, one is physically or ontologically prior or posterior to the other. Thus, *Scope-A* stands as a more plausible interpretation of the scope of Level [1] as it relates to Level [0]. In [T1], primary contraries and corporeal elements amount to the same thing, and both belong to the foundational Level [0] relevant for biological explanation.<sup>53</sup>

<sup>52</sup> *Meteorology* IV 7, 383b20-384a2.

<sup>53</sup> I do not think that this result implies anything about whether there are additional 'levels' that may be relevant in contexts such as chemistry, physics, or first philosophy. It is tempting to read *GC* II

### 3.2 The Scope of Levels [1] and [2]

Even if *Scope-A* makes better sense of Level [1] as it relates to Level [0], it is not clear that it can adequately explain Level [1] as it relates to Level [2]. *Scope-A* implies that there are certain compounds – namely, inanimate and inorganic compounds – that are structurally less complex than the uniform parts of living things, but are structurally more complex than the corporeal elements. This is a difficult position to maintain. It is subject to objections from two sides, both of which threaten the plausibility of a Level [1] that includes inanimate and inorganic compounds but excludes corporeal elements.

First, a defender of *Scope-B.1* might object that animate compounds are not structurally different from inanimate or inorganic compounds, and thus, the difference between materials in Levels [1] and [2] implied by *Scope-A* cannot be correct. Evidence in *Meteorology* 4.12 seems to support the objection by confirming that there is no structural difference between animate, inanimate, and inorganic compounds. In the chapter, Aristotle suggests that animate homoeomers such as flesh, bone, hair, and sinew can be formed by heat and cold; furthermore, they are differentiated by additional affects formed by heat and cold, such as the ability to be fragmented (390b2-9).<sup>54</sup> Then, he notes that inorganic compounds, such as copper and silver, can be formed by heat and cold (390b11-12); they are also differentiated by their abilities to be acted upon. Since animate and inorganic compounds are formed in the same way, and are differentiated by similar kinds of qualities, they do not exhibit the structural differences needed to show that they belong to different compositions.

While it is uncontroversial that there is *some* difference between animate compounds and their inanimate or inorganic counterparts, a defender of *Scope-B.1* can maintain that the difference is functional, not structural. Living and dead flesh are functionally distinct: living flesh can perform its function as the medium of touch, and dead flesh cannot. The functional difference in living and dead flesh is enough to confirm that dead flesh is 'flesh', in name alone. However, the functional difference between living and dead flesh does not imply that dead flesh must be structurally or physically distinct: one may suppose, instead, that dead flesh has all and only the same essential properties as living flesh.<sup>55</sup> In general, inanimate and inorganic compounds can, at least in theory, be physically indistinguishable from animate

---

1–6 as a story about additional layers of complexity that are confined to Level [0] or (if one accepts *Scope-B.1* or *Scope-B.2*) possibly Levels [0] and [1].

<sup>54</sup> See also *GA* II 6, 743a3-8 and 743a36-b5. *GA* II 6, 743a36-b5 suggests that nature forms homogeneous parts both 'from necessity' (ἐξ ἀνάγκης) and 'for the sake of something' (ἐνεκά τινος).

<sup>55</sup> See Frey (2015, 388–391) for a description of this view (with which he disagrees) and especially 388-9 n. 20 for references to the literature. Frey aptly describes this kind of view as a 'prison model',

compounds. There are no additional physical features required for them to become parts of living things; any physical features (such as heat) that are added when they are parts of living organisms are accidental, not essential, to their physical structures.

Although *Meteorology* IV 12 provides initial evidence that animate, inanimate, and inorganic compounds are not structurally different, a passage in *Meteorology* IV 11 calls this conclusion into question. Here, Aristotle writes:

[T6] As many as are both [earth and water] have heat: for most of them are constructed by heat through concoction (πεψάσης). Some are putrefied, such as waste products. Therefore, blood, semen, marrow, fig juice, and all such things have heat in their nature, but when destroyed and displaced from their nature, they are no longer hot. For what remains is the matter, which is earth or water (*Mete* IV 11, 389b7-12).

ὅσα δὲ κοινά, ἔχει θερμότητα· συνέστη γὰρ τὰ πλεῖστα ὑπὸ θερμότητος πεψάσης. ἓνια δὲ σήψεις εἰσίν, οἷον τὰ συντηκτά· ὥστε ἔχοντα μὲν τὴν φύσιν θερμὰ καὶ αἷμα καὶ γονὴ καὶ μυελὸς καὶ ὅπως καὶ πάντα τὰ τοιαῦτα, φθειρόμενα δὲ καὶ ἐξιστάμενα τῆς φύσεως οὐκέτι· λείπεται γὰρ ἡ ὕλη, γῆ οὐσα ἢ ὕδωρ·

In [T6], Aristotle focuses on materials that are formed from both earth and water, and specifically, those formed by heat through concoction or putrefaction. The materials formed through concoction include blood, semen, marrow, and fig juice, and are produced within living bodies.<sup>56</sup> As Aristotle notes, these materials have heat in their natures, and fail to be hot when displaced from their natures.

[T6] provides evidence that animate compounds are structurally distinct from inanimate and inorganic compounds. It suggests that heat is necessary and sufficient for animate compounds to have their natures: if the material has its nature, it is hot, and if it no longer has its nature, it is not hot. Thus, heat introduces a physical – structural – difference between an animate compound and an inanimate compound: even if all else is the same, living flesh is physically different from dead flesh because living flesh is hot, and dead flesh is cold. In general, Level [2] materials that have ‘the nature of uniform parts in animals’ are hot; Level [1] materials that lack this nature are cold.<sup>57</sup>

One might object that heat is insufficient to mark a structural difference between animate compounds and inanimate or inorganic compounds. Earlier in *Meteorology*

---

calling attention to the (incorrect) thesis that animate compounds ‘possess the same tangible *dunamis* for movement that inanimate bodies possess’ (389, n. 20).

<sup>56</sup> Aristotle’s list of examples here is somewhat puzzling. In particular, the inclusion of blood is odd: while blood is formed through concoction, it is often considered to be an inanimate compound. This issue will be addressed in further detail in Section 4.2 below.

<sup>57</sup> For a similar point, see also *Juv* 4, 469b5-10.

IV 11, Aristotle identifies heat and cold as the forces that produce inorganic compounds, such as lye and ashes, and organic byproducts, including waste products such as urine. Although he recognises that bodies formed primarily from water are generally cold unless they possess external (ἄλλοτρίαν) heat (IV 11, 389a26, 389b1), he also notes that materials formed primarily from earth are hot because they were formed by heat (IV 11, 389a27-8). Thus, one might suppose that certain inorganic compounds formed from earth – which here, include lime and ashes – are also hot. If this is the case, then heat does not mark a structural difference between animate and inorganic (or inanimate) compounds.

Although Aristotle notes that compounds such as lime and ashes are hot, there are two reasons why heat is not a *structural* feature of these compounds in the same way that it is for animate compounds. First, compounds such as lime and ashes are formed predominantly from earth, rather than a combination of earth and water. At IV 11, 389b1-3, Aristotle points out that materials formed primarily from either water or earth are predominantly cold unless they have external heat. The heat of materials such as lime and ashes is external, not internal.

Second, the inanimate and inorganic compounds introduced in *Meteorology* IV 11 and discussed throughout *Meteorology* IV 4–11 do not require external heat for their continued existence. [T6] suggests that when heat is removed from a compound formed by concoction, the physical structure is destroyed: such compounds become earth and water. This implies that the continued presence of heat is required for the persistence of such compounds: without heat, they fall apart.<sup>58</sup> Inorganic and inanimate materials, in contrast, can retain their structures without the continued presence of heat. Inorganic materials such as ashes, pottery, and various alloys of metals, which are formed by heat, can retain the same physical structure once external heat is removed. Flesh begins to decompose when removed from heat, whereas the iron of a sword and the clay of a vase do not.<sup>59</sup>

[T6] thus provides evidence that animate compounds are structurally distinct from inanimate and inorganic compounds because heat is, at minimum, a quality

---

58 To this extent, I agree with Freudenthal (1995, 43). It is not clear to me that a particular sort of heat, vital heat, is necessary for the continued persistence of an animate compound; for the argument in favour of vital heat, see Freudenthal (1995, especially 22–47).

59 There is still a difficulty, highlighted by an anonymous reviewer, about the status of an *inanimate* (as opposed to inorganic) compound. If flesh begins to decompose when removed from a living body, then one would expect the inanimate analogue (homonymous flesh) to decompose in precisely the same way, which would imply that there is no structural difference between the two. I can not provide a full reply here, but I take it that inanimate compounds remain like inorganic compounds because they can be preserved such that they resist decay. The production of artefacts exploits this fact: leather is a kind of homonymous flesh that is drier than living flesh, but also does not require the continued presence of heat in order to retain its shape.

required for the continued existence of a compound.<sup>60</sup> In addition, [T6] points toward a second, albeit more speculative, structural difference between animate materials and inorganic compounds. The compounds listed in [T6] are formed by the specific biological process of concoction; in addition, they are formed from a combination of earth and water. In this respect, concoction requires more specific proportional inputs in order to produce its products: only certain limited proportions of earth and water allow for the type of heating that thickens and perfects a material. Heating random combinations of earth and water is not enough to produce an animate compound; animate compounds only result when the right proportional combinations of earth and water, or dryness and moisture, are present.<sup>61</sup>

While [T6] provides evidence that animate compounds are structurally distinct from inorganic and inanimate compounds, it points toward a different objection to *Scope-A*, now from the side of *Scope-B.2*. In the final line of the passage, Aristotle explains what happens when an animate compound is removed from its nature and is no longer hot. If *Scope-A* were correct, one might expect Aristotle to say that it becomes a different homoeomer, one that is structurally distinct from the animate compound but is nonetheless a compound of corporeal elements. This is not what Aristotle says: instead, he writes that what remains is the matter, which is earth or water. This suggests that the destruction of a Level [2] animate compound results in corporeal elements.

The final line of [T6] thus provides support for *Scope-B.2* over *Scope-A*: it supports the conclusion that inanimate and inorganic compounds belong to Level [1], which on either version of *Scope-B*, is the same level as the corporeal elements. The matter of an animate homoeomer is earth and water; so, when it is destroyed, earth and water are the products. There are certainly cases in which it appears that something structurally more complex than the elements survives the destruction of a uniform part: flesh and bone, for instance, retain certain shapes and tangible qualities for some time after the death of an organism. However, if *Scope-B.2* is right, these shapes and qualities do not imply that such leftover materials have any additional structure. Inorganic and inanimate compounds are more like bundles or loosely arranged mixtures of primary contraries; they do not occupy a different, higher level in the compositional hierarchy.

*Scope-B.2* remains problematic because Aristotle thinks that certain qualities can differentiate inorganic and inanimate materials from one another, and

---

<sup>60</sup> Given Aristotle's examples in [T6], the implication that heat is essential would conflict with Aristotle's claim in *PA* II 3, 649b20-7 that the heat of blood is external.

<sup>61</sup> This point is explicit in Popa (2020): he takes it that the production of (what I call) an animate compound requires a certain ratio of ingredients, generally earth and water or dryness and moisture, along with the proper balance between internal or proper heat and heat in the environment. See especially pp. 208-9.

furthermore, these qualities belong to compounds of elements, rather than the elements themselves. First, in *Meteorology* IV 8, Aristotle suggests that certain abilities to be acted upon are ‘most proper’ (οικειοτέροις) to compounds, and differentiate natural homoeomers including flesh, wood, and stone (*Mete* IV 8, 385a4-385a10). These characteristics, which include abilities to be softened by heat, fragmented, and moulded, are sufficient for sorting the various compounds into kinds (γένη).<sup>62</sup> This means that inanimate and inorganic compounds are distinguished by their additional qualities to be acted upon, not merely by their proportional blends of earth and water.<sup>63</sup>

Second, while a few of the characteristics that sort inorganic and inanimate homoeomers into kinds can arguably occur in corporeal elements, the majority cannot. None of the corporeal elements can be soft, and thus, none of the corporeal elements are softened by heat or able to be moulded; likewise, water can arguably be fragmented once it becomes ice, but it is not clear whether it remains elemental water or becomes something else when it is solidified.<sup>64</sup> In general, compound materials have abilities to be acted upon that are more complex than those of the corporeal elements; this points toward their proper position in a higher level of composition, distinct from that of the sublunary elements.

The final line of [T6] remains troubling for *Scope-A*, but is less problematic if decomposition into earth and water is the final outcome for inanimate compounds, rather than an immediate result. Unlike both animate and inorganic compounds, inanimate compounds are unstable, and their dispositions will change over time. However, they can be stabilised in much the same way as inorganic compounds, as is apparent in crafts that work with inanimate materials such as leather and wood. This also avoids the implication of *Scope-B.2*, which is that homonymy, at least for uniform compounds, is a purely epistemic matter.

### 3.3 Section Conclusion

This section has argued, on the basis of textual evidence in *Meteorology* IV, that *Scope-A* provides a better solution to the Scope Problem than *Scope-B.1* or *Scope-B.2*. The solution implies that inanimate and inorganic compounds occupy their own

---

<sup>62</sup> Aristotle lists 18 such characteristics and their opposites in *Meteorology* IV 8, 385a5-18. His reference to kinds in *Meteorology* IV 12 389b25-6 seems to refer to these characteristics.

<sup>63</sup> Lennox (2014) identifies these qualities as ‘emergent dispositions’. Popa (2020, 203-4), and Mirus (2006, 47), go so far as to characterise such properties as ‘forms’.

<sup>64</sup> It is not clear to me that elemental (as opposed to ordinary, domestic water) can solidify. Even if it can, this may imply that it is a kind of ‘stuff’ – a homoeomer – that would belong in Level [1], not Level [0]. For an argument to this effect, see Popa (2010).

unique level in Aristotle's constitutional hierarchy, distinct from that of corporeal elements or animate compounds. Inanimate and inorganic compounds are structurally more complex than corporeal elements because they exhibit passive qualities, not shared by corporeal elements, that allow them to be divided into kinds. However, they remain structurally less complex than animate compounds because they do not require heat for their continued existence, and furthermore, require precise proportions of earth and water as ingredients. Animate compounds represent a more complex – and more fragile – level of composition: the physical requirements for their production are narrower, as they require the right blends of ingredients, and their persistence conditions are fragile because they cannot survive with the same properties intact without a continued connection with heat.

## 4 Solution to the Relationship Problem: A Defence of *Relationship-B*

The second interpretative issue for [T1], which I call the 'Relationship Problem', concerns the relationship between Levels [0], [1], and [2]. To briefly recall, it is unclear whether Aristotle thinks that materials in Level [2] are constructed from the primary *composition*, which are the materials in [1], or the primary *things*, which are the materials and entities in [0]. *Relationship-A* favours the first option, and *Relationship-B* favours the second.

In this section, I will assume that *Scope-A* is the most plausible solution to the Scope Problem. Assuming *Scope-A*, the difference between *Relationship-A* and *Relationship-B* can be filled in as follows.<sup>65</sup> First, if *Relationship-A* is correct, then [1] inorganic and inanimate compounds are constructed from [0] primary contraries and corporeal elements, and [2] animate compounds are constructed from [1] inorganic and inanimate compounds. Thus, inanimate and inorganic compounds are the proximate materials causes of animate compounds: they are already formed from the corporeal elements and primary contraries, and can be worked up to become the functional parts of living bodies.<sup>66</sup> Second, if *Relationship-B* is correct, then [1] inorganic and inanimate compounds are constructed from [0] primary contraries

---

<sup>65</sup> For the remainder of the paper, I use '*Relationship-A*' to mean *Relationship-A* in conjunction with *Scope-A*, and '*Relationship-B*' to mean *Relationship-B* in conjunction with *Scope-A*. *Relationship-A* may be more plausible if one accepts *Scope-B.1* or *Scope-B.2*; I do not think this is sufficient to favour either of these answers to the Scope Problem, as they create additional difficulties for the role of primary contraries (as opposed to corporeal elements) as 'matter' for animate compounds.

<sup>66</sup> This does not imply that all inorganic and inanimate compounds can develop into functional parts of organisms: they must also be materially adequate. See for example *GA* II 6, 743a20-3.

and corporeal elements, but [2] animate compounds are also constructed from [0] primary contraries and corporeal elements. In this case, inanimate and inorganic compounds are not the proximate material causes of animate compounds: they *cannot* be worked up to become the functional parts of living bodies, but first, must be further decomposed.<sup>67</sup>

An evaluation of *Relationship-A* and *Relationship-B* requires a closer look at nutrition, which is the primary process through which Aristotle thinks animate compounds are generally formed. In nutrition – which includes growth as well as maintenance – an organism changes food so that it can be integrated into one of its pre-existing homogeneous parts.<sup>68</sup> In growth, the addition of a material increases the magnitude of the animate compound, while in non-growth maintenance, it does not.<sup>69</sup>

If *Relationship-A* is correct, then nutrition must, in at least some cases, result in the construction of an animate compound out of an inanimate compound. In other words, an inanimate material, other than the corporeal elements or primary contraries, must be the proximate material cause of an animate compound. In this section, I defend *Relationship-B* by arguing that an inanimate compound cannot be the proximate material cause of an animate compound. In 4.1, I argue that the food consumed by an organism, though an inanimate compound, is not the proximate material cause of an animate compound because it is destroyed during digestion. In 4.2, I argue that blood (and its analogue in bloodless organisms) is a proximate material cause for animate compounds developed through nutrition, but is not an inanimate compound that fulfils the requirements of *Relationship-A*.

## 4.1 Nutrition and the Construction of Animate Compounds

The process of nutrition may initially seem to provide support for *Relationship-A*. Animals, including human beings, use inanimate compounds as food: when animals nourish themselves, they use parts of other animals and plants that have been separated from life, such as flesh, the leftover milk of a different species, and fruit.<sup>70</sup>

---

<sup>67</sup> Inanimate compounds may appear in the causal history of an animate compound, but they are not properly the matter or material cause.

<sup>68</sup> Connell (2016, 132-3), notes that nutrition includes the maintenance of life as well as growth. On the difference between mere nutrition (which includes bodily maintenance without growth) and growth, see also Sprague (1991, 227-9), and Thorp (2012).

<sup>69</sup> I will briefly turn to biological generation, a second process through which compounds are formed, in Section 4.2 below.

<sup>70</sup> Leaving aside controversies regarding the anthropocentric commitments of the passage, *Politics* 1.8 1256b15-22 clearly conveys the idea that animals eat plants and human beings eat animals. Connell

The corporeal elements are not food for animals; food consists in compounds that are already constituted by the primary contraries and corporeal elements.<sup>71</sup> Although what functions as food for plants is less clear, several passages suggest that even plants are nourished by mixtures of corporeal elements rather than the elements alone.<sup>72</sup> Thus, one might conclude that inanimate compounds are proximate material causes for animate compounds: even if they are restructured in the process of nutrition, something of their inherent chemical structure remains.<sup>73</sup>

A closer look at the nutritive process shows that, against *Relationship-A*, the inanimate compounds consumed by animals are not the proximate material causes of growth or maintenance: instead, the nutritive process destroys the inanimate compound. First, in *de Anima* II 4, Aristotle identifies two senses of ‘food’ (τροφή). He writes:

[T7] If [food is] both, that is, the undigested and the digested, then it would be possible to say both things about food: for insofar as food is undigested, it is opposite to what is fed, but insofar as it is digested, it is like what is fed (*DA* II 4, 416b4-7).

εἰ δ' ἄμφω, ἀλλ' ἢ μὲν ἀπεπτος ἢ δὲ πεπεμμένη, ἀμφοτέρως ἂν ἐνδέχοιτο τὴν τροφήν λέγειν· ἢ μὲν γὰρ ἀπεπτος, τὸ ἐναντίον τῷ ἐναντίῳ τρέφεται, ἢ δὲ πεπεμμένη, τὸ ὁμοίον τῷ ὁμοίῳ.

This passage marks a distinction between the undigested or raw food, which is contrary to what is fed, and the digested, concocted food, which is like what is fed. The undigested or raw food is not yet suitable to become part of an animate compound through either growth or non-growth maintenance. The digested food, in contrast, has been made like the compound to which it will be added.

Second, the two senses of ‘food’ indicate that nutrition and growth are processes with multiple stages. In the first stage, the raw food is acted upon by the heat of an organism, and undergoes a change in contraries. Then, in later stages, the digested food is further concocted and becomes an actual part of an animate compound.<sup>74</sup> Through the operations of the nutritive soul, the food acquires the same form as the

---

(2016, 145-8), points out that the milk provided by a mother to her offspring is different from the food enjoyed by adult animals because it has already been digested by the mother.

71 The properties sweet and bitter contribute to nutrient, but elements lack both flavour and odour: see *de Sensu* 4, 441b24-7 and 5, 443a8-11.

72 See *GC* II 8, 334a10-14, *Sens* 5, 445a18-23, and *PA* II 10, 655b33-6; as Cohen (1989, 260) points out, the food for plants is already concocted. However, there is a sense in which earth is the proper ‘food’ for plants; see Connell (2016, 140), and Sprague (1991, 221–224).

73 See Sokolowski (1970, 274–275), referenced in Frey (2015, 390).

74 For more detailed descriptions of digestion in Aristotle, see Boylan (1982, 97–103) and Bubb (2020, 143-5).

animate compound to which it is added. Aristotle points out that this is much like the process through which moist becomes dry, and thus, like grows by like in one sense, but by unlike in another (*GC* II 5, 321b35-322a3).

There is a difficult question about what happens to the raw food in the process of nutrition. On the one hand, the raw food is contrary to what is fed, and must change in a way similar to the process in which moist becomes dry. However, this process is different from the kind of process that results in the unqualified generation of an element. In the unqualified generation of an element, as when air is generated from water, one quality (cold) is destroyed and gives rise to its opposite (heat). On the other hand, growth and non-growth maintenance are distinct from mixing, at least in the technical sense explained in *GC* I 10.<sup>75</sup> In growth, the food comes together with what is fed, but does not result in the production of a new material distinct from both the food and the animate compound (as would be the case if the food and the animate compound were mixed). This indicates that result of digestion must be similar enough to the animate compound that it can be added to it; the food does not destroy the compound or produce a material distinct from both the food and the animate compound.

Since the raw food must undergo a change in contraries, but does not change contraries in the same way that (for example) water changes its contraries when it becomes air, an alternative explanation is required. One possibility is that the first stage of nutrition is a destructive change that separates opposite qualities from one another. Inanimate compounds (including raw food) are characterised by intermediate blends of heat, cold, moisture, and dryness; in the particular case of nutrition, I suggest, the nutritive soul uses heat to separate the moisture and dryness present in the raw food. By separating moisture and dryness, it is then able to concoct a material with the proper blend of moisture and dryness and discard the rest.

Aristotle's explanation of flavour provides initial evidence that the first stage of nutrition separates out unlike qualities from an inanimate compound, namely, the food. In *De Sensu* 4, Aristotle identifies sweet and bitter as the contraries proper to flavour; bitter and salty flavours are nearly the same (*Sens* 4, 442a13-18).<sup>76</sup> Although animals are nourished (τρέφεται) by the sweet, the food (τροφή) is a mixture of sweet and bitter as well as moisture and dryness (*Sens* 4, 441b24-442a2). In the process of growth, the heat of an animal draws up the sweet nutrient, which is light, and expels

<sup>75</sup> Joachim (1922, 133). See *GC* I 5, 322a8-16.

<sup>76</sup> See also *DA* II 10, 422b10-14.

the bitter and salty portion of the food, which is heavy. Thus, heat causes the sweet to be separated from some, if not all, of the bitter and salty elements in the food.<sup>77</sup>

Similarly, Aristotle introduces an analogy with animal digestion in order to explain sea water in *Meteorology* II 2–3. Here, he explains that in animal digestion, natural heat takes up the sweet nutrient within food; in the same way, the heat of the sun causes sweet water to evaporate, leaving behind saline water. Likewise, just as the urine of an animal is a fluid mixed with the salty, undigested matter, the salty water that returns to the sea through condensation is a mixture of water and salty, earthy components. As in *De Sensu* 4, sweet and bitter (or salty) are associated with nutrient and residue and light and heavy; they are also associated with the watery and earthy, or generally moist and dry, constituents of a compound material.<sup>78</sup>

Both *De Sensu* 4 and *Meteorology* II 2–3 indicate that in the first stage of digestion, an inanimate compound – the raw, undigested food – is broken down into portions associated with opposite qualities. Raw food is a mixture of sweet and bitter; in digestion, the food is separated into portions that contain unequal ratios of sweet nutrient and bitter or salty residue. Moreover, the relationship between sweet-bitter/salty and water-earth, or moist-dry, suggests that the heat of an animal body acts primarily upon the moisture and dryness of the food, thus producing portions that contain unequal ratios of moisture and dryness. The role of heat in this process is consistent with Aristotle's definition of heat in *GC* II 2; there, he defines heat as a power to combine like with like, resulting in separation of unlike, and here, heat gathers sweet nutrient and expels salty byproducts.

This means that although organisms consume inanimate compounds, those inanimate compounds are not the proximate material causes of growth and nutrition. Instead, inanimate compounds are deconstructed in the process of digestion, which produces the useful material and the non-useful residue. In separating out the useful material, the heat of an organism acts upon the moisture and dryness of the food, thus producing its product through an interaction with the primary contraries. The inanimate compound consumed by an organism is not the proximate material cause of an animate compound; the first stage of the nutritive process does not support *Relationship-A*.

There is, however, an additional way that the first stage of digestion may seem to support *Relationship-A*. One might suppose that although the initial inanimate compound – the food – does not survive the first stage of digestion, the products of separation are *other* inanimate compounds. These materials seem to have additional

---

<sup>77</sup> See also *GA* III 11, 762a15–18.

<sup>78</sup> See Bubb (2020, 144–7), for an additional connection between digestion and the exhalations discussed in *Meteorology* 1–3.

qualities, such as sweet and bitter, which implies that they are inanimate compounds. Furthermore, the processes of separation involved in digestion are often imperfect; as Aristotle recognises, imperfections in the process can lead to illness.<sup>79</sup> Finally, it is odd to suppose that digestion results in the separation of pure elements rather than compounds with different ratios of moisture and dryness: elemental earth is not obviously removed from the body as a waste product, and unmixed elemental water is not obviously present in a living body. Thus, the materials separated out during the first stage of digestion seem to fall into Level [1]; they do not belong to Level [0], as *Relationship-B* must suppose.

Despite the appeal of the objection, it does not seem to be Aristotle's view. For Aristotle, blood (or its analogue in bloodless animals) is the final stage of nutrition, and is produced by the body following the earlier stages of the digestive process.<sup>80</sup> In this role, it is the proximate material cause of an animate compound, and is the matter from which a living body and its parts are constructed.<sup>81</sup> Furthermore, Aristotle says that blood is formed from corporeal elements, citing earth, water, and sometimes air.<sup>82</sup> He does not mention an intermediate compound that enters into the formation of blood, and goes so far as to say that blood is mixed (μικτὸν) from both earth and water (*PA* III 5, 668b8-10).<sup>83</sup> Thus, it is reasonable to conclude that the proximate material cause of blood is the corporeal elements or primary contraries, just as in the case of naturally occurring inanimate and inorganic compounds.<sup>84</sup>

If the proximate material cause of blood is the corporeal elements, then the first stage of digestion seems to require actually separating out the pure, elemental versions of earth and water. Although the view sounds rather odd, it is possible to

---

<sup>79</sup> *GA* I 18, 726a11-15

<sup>80</sup> *PA* II 3, 650a33-5, *PA* II 4, 651a14-15, *GA* I 19, 726b2-6, *Somn* 3, 456a32-456b1, *Juv* 4, 469a1-2, *Resp* 8, 474b3-4. Hereafter, 'blood' should be read as 'blood or its analogue in bloodless organisms'. Freudenthal (1995, 146) points out that bloodless animals possess a fluid that fulfils a similar role; see *HA* I 4, 489a20-4, *PA* I 5, 645a8-10, and *PA* III 5, 668a4-5.

<sup>81</sup> *HA* I 19, 521a9-10, *PA* II 6, 651b25-7, *PA* III 5, 668a3-5. See also *Somn* 3, 456a33ff.

<sup>82</sup> Aristotle claims that blood is constructed from earth and water at *Mete* IV 7, 384a16-17 and at *Mete* IV 10, 389a19-22, he notes that blood and semen are constructed from earth and water as well as air.

<sup>83</sup> In his discussions of both technical and non-technical mixtures, Aristotle refers to the proximate matter of a mixture (e.g., copper and tin at *GC* I 10, 328b8-14, water and wine at *GC* I 10, 328a28-9, water and ashes at *PA* II 3, 649b14-15) rather than the ultimate constituents that are mixed. Thus, there is reason to suppose that he thinks earth and water are the proximate matter from which blood is formed, rather than ingredients further back in the causal chain.

<sup>84</sup> Artificial mixtures, such the bronze alloy formed from mixing copper and tin, appear rather different – especially if one maintains that copper and tin are not decomposed or otherwise destroyed in the process of mixing. These mixtures are arguably artefacts, and belong to a non-natural Level [2] that diverges from the natural Level [2] because the efficient, formal, and final causes come from art rather than nature. See also Frey (2015, 385-8).

reframe it in a more charitable way.<sup>85</sup> The useful (and non-useful) residues that result from the first stage of digestion do not look like the pure elemental versions of earth and water; they seem to be combinations of moisture and dryness (as well as heat and cold). However, it is possible for the residues to be just that – mere mixtures or even juxtapositions of components – without possessing the passive capacities, such as the abilities to be fragmented or moulded, that allow the mixture to be identified as an inanimate or inorganic compound of a particular kind.<sup>86</sup> Thus, when the heat of the body acts upon the residue to produce blood, it unifies moisture and dryness into a single compound; that compound, in turn, can be thickened and perfected so that it can be assimilated into an animate compound.

## 4.2 Blood, Nutrition, and Generation

For *Relationship-A* to succeed, the proximate material cause of at least some animate compounds must be an inanimate compound. Since the raw, undigested food does not survive the first stage of nutrition, the food is not a proximate material cause of an animate compound. Furthermore, since the separated residues that result from the first stage of digestion are either corporeal elements or aggregates of primary contraries that lack the further structure and passive qualities of homeomers, the residues do not qualify as inanimate compounds. However, *Relationship-A* remains plausible if blood is itself an inanimate compound. Thus, a decision between *Relationship-A* and *Relationship-B* turns on the question of whether blood is inanimate or animate. If blood is inanimate, it belongs to Level [1], which supports *Relationship-A*; if blood is animate, it belongs to Level [2], which supports *Relationship-B*.

The status of blood in Aristotle is contentious, for it appears to be both animate and inanimate.<sup>87</sup> In a number of passages, Aristotle identifies blood as a homeomer,

---

<sup>85</sup> The view is not obviously unintuitive: Thorp (2012, 26–27) assumes that elements emerge in the digestive process.

<sup>86</sup> That is to say, the mere mixture is a kind of aggregate with no additional structure. In contrast with gold, living flesh, or even dead flesh, it does not have the passive properties ‘most proper’ to homeomers. To be fair, the useful residue has some non-tangible qualities; it is presumably sweet rather than bitter. It is an additional (and difficult) question to see whether sweet and bitter are emergent properties that only occur in Level [1] and higher compounds, which would support *Relationship-A*, or if they can be derived from corporeal elements, which would support *Relationship-B*.

<sup>87</sup> Frey (2015) defends this position. In what follows, I shall largely emphasise the animate aspect of blood – thus presenting a stronger thesis, which I think is nonetheless compatible with Frey’s conclusion. In contrast, Connell (2016, 153–154), denies that compositional levels can characterise blood. However, her main objective is to deny that blood is a mere mixture of elements, something with which I agree. See Cohen (1989, 259–262) for an argument that blood is inanimate.

and lists it alongside animate homoeomers such as flesh and bone.<sup>88</sup> Furthermore, like animate compounds, blood is subject to the homonymy principle: that is, only blood in a living body is genuine blood, whereas blood that is removed from a living body is blood in name alone.<sup>89</sup> Nonetheless, blood remains physically distinct from the typical animate homoeomers within living bodies; it is not continuous with flesh, nor does it grow together (συμπεφυκός) with flesh (*PA* II 3, 650b6-8). It also lacks the capacities typical of animate homoeomers; it contrasts with flesh, for example, because it does not have a capacity for sensation.<sup>90</sup>

Although the blood of a living organism remains physically distinct from the typical animate homoeomers and lacks their specific capacities, there are several reasons why blood is better understood as an animate compound. First, blood is already flesh and body in potentiality (*PA* III 5, 668a23-24).<sup>91</sup> Its potentiality is relatively narrow because a particular quantity of blood is not potentially the body of any organism whatsoever. Blood is species-specific, and since different species possess different kinds of blood, the blood produced by one species of organism is not potentially the flesh and body of a different species.<sup>92</sup> Furthermore, blood is specific to an individual: the blood of one individual organism cannot – at least for Aristotle – become part of a different organism. Inanimate compounds are not potentially flesh and body in the same way as blood: intact raw food is *not* potentially flesh, let alone the flesh of a particular species.

Second, blood is a useful residue, characterised by a function and final cause.<sup>93</sup> Blood exists for the sake of (ἔνεκα) nutrition and the parts of an animal (*PA* II 3, 650b11-13); different animals have different kinds of blood for the sake of what is better (*PA* II 2, 647b29-30). Although inanimate and inorganic materials may also have functions and final causes, the final cause of blood is different because it is explicitly dependent upon the existence of a particular species of living thing.<sup>94</sup> Blood is useful for the sake of life in a way that inorganic and inanimate materials are not.

<sup>88</sup> *Mete* IV 12, 390b15-17, *HA* III 2, 511b1-3, *PA* I 1, 640b18-20, *PA* II 2, 647b10-14

<sup>89</sup> Frey (2015, 376-7) argues that blood is subject to organic homonymy; see also *n.* 4 for textual references.

<sup>90</sup> *HA* III 19, 520b14-16, *PA* II 3, 650b4-6, 651b4-7; also *PA* II 10, 656b19-22 (excised by Peck).

<sup>91</sup> Frey (2015, 377-8) introduces this point, and offers an extensive defence. See also *GC* I 5, 322a5.

<sup>92</sup> See also Frey (2015, 381-2), and Connell (2016, 144-6). Thorp (2012, 27) makes the even stronger claim that blood is potentially a particular *part* of an organism: for example, some blood is potentially the flesh of a nose, and other blood is potentially the bone of a hand.

<sup>93</sup> Aristotle distinguishes useful and useless residues at *GA* I 18, 725a4; blood is specifically differentiated from useless residues at *GA* II 4, 738a7-8. See Ebrey (2015, 62-8), for an argument that blood (in its developed state) is matter and is for the sake of something.

<sup>94</sup> Gill (1997 and 2014) and Mirus (2001 and 2006) have defended different interpretations of *Meteorology* 4.12 that permit functions for inorganic materials. Even if Gill is right that the function of an inorganic compound depends upon its presence in an existing artefact, a significant difference

Finally, blood – like animate compounds and unlike inanimate compounds – can only exist as itself when it is present in a living body. Aristotle holds that the natural condition of blood is moist. Blood only retains its distinctive moisture when it is present in a living organism; when it is removed from the heat of an organism, it begins to lose its moisture and eventually dries out.<sup>95</sup> By identifying the natural condition of blood as present only when it is in a body, Aristotle aligns blood with animate compounds, such as flesh and bone, rather than inanimate compounds, which are generally homonymous instances of previously existing animate compounds.

Thus, blood is already animate; it properly belongs to Level [2], not [1]. Inanimate compounds are not potentially living bodies, can exist as themselves outside of living bodies, and – while they might be useful for some functions – their uses do not contribute to the structure of a living body. Blood, in contrast, is potentially the body of a specific organism, exists for the sake of the organism's nutrition, and cannot exist outside of a living body. Although it is formed from the elements or primary contraries, it is not an inanimate compound.

There are several immediate objections to the conclusion that blood is an animate compound. First, one might object that even if blood can only survive while it exists within an animate body, it remains fundamentally different from animate compounds because it is *accidentally* hot.<sup>96</sup> In *Meteorology* IV 11, 389b7-12, [T6] above, Aristotle includes blood among materials that retain their natures while they are hot. His inclusion of blood there may appear to be problematic; in *PA* II 2, Aristotle notes that as a substratum, blood is cold (649a14-20), and in *PA* II 3, he explains that although heat is essential to the *definition* of blood, it is not essential to blood in itself because its heat is derived from an external source (649b20-27). Thus, one might conclude that blood is an inanimate compound, distinguished from animate compounds because it is actually but not essentially hot.<sup>97</sup>

---

between living and non-living materials is preserved because inorganic compounds do not 'cross over' and become parts of living things.

<sup>95</sup> See *HA* I 1, 487a2-5, I 3, 489a20-3, III 19, 520b21-6, *PA* II 2, 647b10-15, II 3, 649b28-35, II 4, 651a9-12, II 9, 654b9-11. While Aristotle notes that blood generally coagulates or solidifies when removed from the heat of the body, he notes that some blood fails to coagulate because it lacks fibres: see *PA* II 4, 650b14-18, *HA* III 6, 515b28-516a6.

<sup>96</sup> The appeal of this objection depends on how one reads *PA* II 3, 649b10-20. Here, Aristotle suggests that a material can be actually but accidentally dry while essentially moist, and applies the same distinction to heat and cold. Thus, it is possible that blood *as such* is actually and accidentally hot but essentially cold.

<sup>97</sup> Lennox (2001, 197-8) takes this to mean that blood is essentially hot as a functional part of an organism.

Even if animate compounds such as flesh and bone *are* essentially hot – and this is by no means clear – it does not follow that if blood is only accidentally hot, it must be inanimate. Although blood (as a substratum) is accidentally hot, the existence of external heat is necessary for the continued existence of blood: without external heat, blood separates into its moist and dry constituents. The dependence of blood upon an external source of heat explains why heat is part of its definition, even if it is accidental to the substratum of blood. Although the substratum of blood is cold, blood does not exist without heat: like other animate compounds, blood begins to decompose when external heat is removed.

The dependence of blood upon heat for its continued structural integrity can also avoid a second objection. One might object that the status of blood as a useful residue with a function and final cause does not distinguish it from similarly constituted inanimate and inorganic compounds. Indeed, it is often supposed that the difference between *any* animate compound and its inorganic or inanimate analogues is functional, not structural: the function and final cause of an animate compound is accidental to the compound itself, even though it is essential to the compound's role in a living body. Thus, an animate compound remains constitutionally the same when removed from an organism, but is a homonymous instance of its kind because it loses its function.

Since blood is dependent upon external heat for its continued structural integrity, the difference between the blood in a living organism and the homonymous blood removed from an organism is compositional as well as functional. For blood to perform its function for the sake of nutrition, it must possess certain physical features, which ultimately have their origins in a certain ratio of moisture and dryness. When blood is removed from heat, its ratio of moisture and dryness changes, and it loses the physical features necessary for it to perform its function.<sup>98</sup> At this point, it decomposes into a cold material that possesses different tangible qualities: it ceases to have not only the function of blood, but also the tangible qualities of blood, as it exists in an organism.

Thus far, I have ignored biological generation, which might be considered a second process through which animate compounds are formed.<sup>99</sup> Biological generation produces the heterogeneous parts of an organism as well as the homogeneous

---

<sup>98</sup> Blood loses its physical features through the processes of thickening and evaporation, which cause it to become dry.

<sup>99</sup> Though not necessarily. Quarantotto (2022, 242-5), suggests that nutrition and embryogenesis are the same kind of process; both take a material (blood in the case of nutrition) and transform it into a uniform part.

compounds that are their constituents; although the token instances of such parts and compounds do not exist prior to generation, they are formed following the pattern provided by the seed and the potentiality in the matter. For Aristotle, the matter – the contribution of the female – is already an animate compound; it is a further useful residue of the final stage of nutrition, which is blood.<sup>100</sup> Since the matter for biological generation is already animate, biological generation is not a case in which animate compounds are formed from inanimate compounds.<sup>101</sup>

### 4.3 Relationship-B: Additional Evidence

The argument of this section has primarily been negative. If *Relationship-A* is correct, then there must exist processes in which an animate compound is formed from an inanimate compound as its proximate material cause; this section has argued that no such process exists. In nutrition, the raw food is a pre-existing inanimate compound, but it is decomposed into its constituent elements in the first stage of digestion. Through the concoction of ingredients, blood becomes the final nutrient and the proximate material cause of compounds such as flesh. Blood, however, is already animate and belongs to Level [2], even though it is formed from the entities in Level [0]. Thus, inanimate compounds are part of the causal history of an animate compound, but are not its proximate material cause.

There are two additional pieces of textual evidence that offer positive support for *Relationship-B* over *Relationship-A*. First, a passage near the opening of *Meteorology* IV 12 clearly states that homoeomers are formed from the elements. Here, Aristotle writes:

---

**100** See *GA* I 19, 726b2-4, 727a1-4, 727a31-2. There is a significant question as to whether Aristotle thinks that the female contribution of menstrual fluid is a seed like the male contribution; on this debate see Connell (2016), Chapter 3. Connell suggests that the female menstrual fluid is seminal (103) and contains ‘vital powers’ (104). See also discussion in Henry (2019), Chapter 5. Even if this is not the case, whatever holds good of blood will also hold good of the menstrual fluid: if menstrual fluid is simply *blood* as in, for example, O’Connor (2015, 66-8), then if blood is already an animate compound, biological generation does not involve the construction of an animate compound from an inanimate compound.

**101** Spontaneous generation may appear to present a case in which animate compounds are formed from inanimate compounds. Even if the materials in which spontaneous generation occurs are themselves inanimate, the process appears to be more like digestion in that spontaneous generation requires the separation of useful and useless materials by putrefaction alongside concoction. Gotthelf (1989, 187), following Balme (1962, 99), suggests that the materials of spontaneous generation already contain *pneuma*, or vital heat. Kress (2020, 179) identifies the relevance of separation in concocting and putrefying; see also Stavrianeas (2008).

[T8] The homoeomers are from the elements, and the complete works of nature are from these as matter (*Meteor.* IV 12, 389b26-8).

ἐκ μὲν γὰρ τῶν στοιχείων τὰ ὁμοιομερῆ, ἐκ δὲ τούτων ὡς ὅλης τὰ ὅλα ἔργα τῆς φύσεως.

In the first phrase of the passage, Aristotle claims that the homoeomers are from the elements.<sup>102</sup> Although ‘elements’ is ambiguous, the context of *Meteorology* IV mildly favours including the primary contraries within its reference.<sup>103</sup> Then, Aristotle claims that the complete works of nature are from ‘these’, that is, the homoeomers.

By ‘complete works of nature’, Aristotle means either complete organisms or their complex, non-uniform parts.<sup>104</sup> In either case, Aristotle is referring to the functional bodies or complex organs of living things. Functional bodies and complex organs are formed from the homoeomers as their matter; since they are living things, their uniform parts are, by definition, animate. However, the passage indicates that those homoeomers – the ones that form functional bodies or complex organs – are from the elements. Just as living things or uniform parts have homoeomers as their matter, the homoeomers have the elements as their matter.

The passage offers evidence that for Aristotle, the elements are proximate material causes of homoeomers, rather than constituents further back in the causal chain. In one sense, it is true that all sublunary bodies are constituted out of the corporeal elements: corporeal elements and primary contraries are part of the causal history of all sublunary bodies, including the bodies of organisms and their non-uniform parts. [T8], however, does not explain that fact. Instead, Aristotle identifies homoeomers, not elements, as the matter from which organisms or their non-uniform parts are formed: this indicates that he wants to explain the proximate material causes of the complete works of nature, rather than their ultimate constituents. Following the same reasoning, the proximate material causes of homoeomers should be the entities that they are from. Since homoeomers are from

<sup>102</sup> I take τούτων to pick up τὰ ὁμοιομερῆ, rather than τῶν στοιχείων. While the alternative does not seem plausible, given the structure of the sentence, I mention it to avoid the objection that Aristotle may be claiming that the complete works of nature are formed from the elements, not the homoeomers.

<sup>103</sup> In the next line, Aristotle states that everything is from matter in the way that was said; in *Meteorology* IV, ‘matter’ regularly indicates the primary contraries, though sometimes corporeal elements as well (as in [T5] above). However, it is instructive that Aristotle refers to corporeal elements as ‘elements’ in the opening of *Meteorology* IV 1.

<sup>104</sup> Lennox takes ‘complete works of nature’ to refer to complete organisms; Düring (1944, 102-3), also includes non-uniform parts.

the elements in [T8], it is reasonable to conclude that the elements are the proximate material causes of homoeomers.

Second, *GC II 7* provides additional – albeit somewhat weaker – evidence in favour of *Relationship-B*. In *GC II 7*, Aristotle explains how compound materials are formed from the elements and primary contraries. Although the chapter is not explicitly concerned with biological explanation – Aristotle does not appeal to formal or final causes – the only materials discussed in the chapter are ones generally found in biological contexts, such as flesh and bone. The chapter indicates that flesh and bone are formed through the combination of elements and primary contraries, and in this context, does not indicate that there is a further proximate material cause. While I think that [T8] offers stronger evidence that homoeomers – whether animate or not – are formed from the corporeal elements and primary contraries as their proximate material causes, *GC II 7* also suggests that animate compounds are formed directly from the elements.

## 5 Conclusion and Implications

This paper has identified two interpretative issues for Aristotle's introduction of a compositional hierarchy in *PA II 1* and offered an interpretation that resolves both. Section 3 argued that *Scope-A* provides a better solution to the Scope Problem, which implies that inorganic and inanimate compounds occupy a compositional level distinct from that of the corporeal elements or animate compounds. Section 4 argued that *Relationship-B*, in conjunction with *Scope-A*, provides a better solution to the Relationship Problem. This implies that animate compounds, like inorganic and inanimate compounds, are constituted by corporeal elements and primary contraries. Although inanimate compounds are part of the causal histories of animate compounds, they are not their proximate material causes.

The interpretation of Aristotle's compositional hierarchy developed in this paper has implications for how one is to understand the relationship between materials and the objects they constitute, at least in Aristotle's natural philosophy. First, the relationship between materials and the objects they constitute looks to imply a strict ordering: that is, it is an irreflexive, asymmetric, and transitive relation.<sup>105</sup> Higher-level materials are always constructed from lower-level materials and not the

---

<sup>105</sup> In this sense, the relationship between materials and the objects they constitute bears some similarity to a grounding relation; as Bliss and Trogon (2021) point out, the 'prevailing view' of grounding accepts that it is irreflexive, asymmetric, and transitive, though a number of philosophers have introduced objections. Nonetheless, the explanatory role of form and function introduce additional complications; a further examination of these complications may prove an interesting topic for further research.

opposite; hence, asymmetry is preserved. Similarly, if A is constructed from B and B is constructed from C, then A is, in some sense, constructed from C: the heterogeneous parts of organisms are proximately formed from homogeneous parts, and ultimately from the corporeal elements and primary contraries. This is sufficient to preserve transitivity.

However, the interpretation developed in this paper suggests that Aristotle's compositional hierarchy diverges sharply from, perhaps, a standard way of thinking about compositional levels. Inorganic and animate compounds can both be formed from the primary contraries and corporeal elements, but not in the same way. The former result from interactions of heating and cooling forces in the environment – perhaps the moist and dry exhalations, as described in *Meteorology* III 6 – whereas the latter require a specific, teleologically-directed application of heat from an organism.<sup>106</sup> Once a compound is formed, its trajectory is limited: inorganic compounds cannot be formed into organisms or their parts, and animate compounds are generally not suited to be made into artefacts until they are removed from life.<sup>107</sup>

Thus, the interpretation developed in this paper implies that for Aristotle, there is a sharp divide between materials that have life and those that do not. This divide should not be unexpected, given Aristotle's philosophical commitments. Materials that have life – the animate compounds – are produced specifically for the sake of their functions in living bodies, and this requires that they are produced through the appropriate confluence of formal, efficient, and final causes. Inorganic materials are not produced for the sake of a function in a living body, and can thus be produced in the environment without the intervention of an organism or its form. The stronger conclusion is that formal, efficient, and final causes work on ingredients in such a way that their products differ with respect to their physical properties, and not only their forms and functions. Living materials are structurally as well as functionally distinct from their inanimate and inorganic counterparts; as such, they enjoy a privileged position within Aristotle's compositional hierarchy.<sup>108</sup>

---

**106** One interesting idea is that heat and cold are tools used by the soul. See Gelber (2020) for a defence of this view, and Kress (2023) for the further idea that heat and cold are agents that can act because they are acted upon by the soul.

**107** One notable exception may be hybrids, and in particular domestic cultivars of plants; on this problem, see Wardy (2005).

**108** I would like to thank both reviewers from this journal for feedback that greatly improved the structure and clarity of this paper.

## References

- Ackrill, J. L. 1972. "Aristotle's Definitions of *Psuche*." *Proceedings of the Aristotelian Society* 73: 119–33.
- Anagnostopoulos, A. 2021. "Mixture, Generation, and the First *Aporia* of Aristotle's GC 1.10." *Phronesis* 66 (2): 139–77.
- Bodnár, I. 1997. "Movers and Elemental Motions in Aristotle." *Oxford Studies in Ancient Philosophy* 15: 81–117.
- Balme, D. M. 1962. "Development of Biology in Aristotle and Theophrastus: Theory of Spontaneous Generation." *Phronesis* 7 (1): 91–104.
- Bliss, R., and K. Trogdon. 2021. "Metaphysical Grounding." In *The Stanford Encyclopedia of Philosophy* (Winter 2021 Edition), edited by N. Edward. Zalta. <https://plato.stanford.edu/archives/win2021/entries/grounding/>.
- Boylan, M. 1982. "The Digestive and 'Circulatory' Systems in Aristotle's Biology." *Journal of the History of Biology* 15 (1): 89–118.
- Bubb, C. 2020. "Blood Flow in Aristotle." *The Classical Quarterly* 70 (1): 137–53.
- Cohen, S. 1989. "Aristotle on Heat, Cold, and Teleological Explanation." *Ancient Philosophy* 9 (2): 255–70.
- Cohen, S. 1994. "Aristotle on Elemental Motion." *Phronesis* 39 (2): 150–9.
- Connell, S. M. 2016. *Aristotle on Female Animals: A Study of the Generation of Animals*. Cambridge: Cambridge University Press.
- Cooper, J. M. 2004. "Two Notes on Aristotle on Mixture." In *Knowledge, Nature, and the Good: Essays on Ancient Philosophy*, 148–73. Princeton: Princeton University Press.
- Crowley, T. J. 2008. "Aristotle's So-Called Elements." *Phronesis* 53 (2): 223–42.
- Crowley, T. J. 2013. "De Generatione et Corruptione 2.3: Does Aristotle Identify the Contraries as Elements?" *The Classical Quarterly* 63 (1): 161–82.
- Düring, I. 1944. *Aristotle's Chemical Treatise: Meteorologica Book IV*. Göteborg: Elanders.
- Ebrey, D. 2015. "Blood, Matter, and Necessity." In *Theory and Practice in Aristotle's Natural Science*, edited by D. Ebrey, 61–76. Cambridge: Cambridge University Press.
- Falcon, A. 2005. *Aristotle and the Science of Nature: Unity without Uniformity*. Cambridge: Cambridge University Press.
- Fine, K. 1995. "The Problem of Mixture." *Pacific Philosophical Quarterly* 76 (3–4): 266–369.
- Frede, D. 2004. "On Generation and Corruption I.10: On Mixture and Mixables." In *Aristotle: On Generation and Corruption Book I*, edited by F. de Haas, and J. Mansfeld, 289–314. Oxford: Oxford University Press.
- Freudenthal, G. 1995. *Aristotle's Theory of Material Substance: Heat and Pneuma, Form and Soul*. Oxford: Oxford University Press.
- Frey, C. 2007. "Organic Unity and the Matter of Man." *Oxford Studies in Ancient Philosophy* 32: 167–204.
- Frey, C. 2015. "From Blood to Flesh: Homonymy, Unity, and Ways of Being in Aristotle." *Ancient Philosophy* 35 (2): 375–94.
- Furley, D. J. 1983. "The Mechanics of *Meteorology* IV: A Prolegomenon to Biology." In *Zweifelhafte im Corpus Aristotelicum: Studien zu einigen Dubia, Akten des 9 Symposium Aristotelicum*, edited by P. Moraux, and J. Wisner. Berlin: De Gruyter, 73–93.
- Furth, M. 1988. *Substance, Form, and Psyche: An Aristotelian Metaphysics*. Cambridge: Cambridge University Press.
- Gelber, J. 2020. "Soul's Tools." In *Heat, Pneuma, and Soul in Ancient Science and Philosophy*, edited by H. Bartoš, and C. G. King, 243–59. Cambridge: Cambridge University Press.
- Gill, M. L. 1989. *Aristotle on Substance: The Paradox of Unity*. Princeton: Princeton University Press.

- Gill, M. L. 1997. "Material Necessity and *Meteorology* IV.12." In *Aristotelische Biologie*, edited by W. Kullmann, and S. Föllinger, 145–61. Stuttgart: Franz Steiner Verlag.
- Gill, M. L. 2009. "The Theory of the Elements in *De Caelo* 3 and 4." In *New Perspectives on Aristotle's De Caelo*, edited by A. Bowen, and C. Wildberg, 139–61. Leiden: Brill.
- Gill, M. L. 2014. "The Limits of Teleology in Aristotle's *Meteorology* IV.12." *HOPOS* 4 (2): 335–50.
- Gotthelf, A. 1989. "Teleology and Spontaneous Generation in Aristotle: A Discussion." *Apeiron* 22 (4): 181–93.
- Gotthelf, A. 2012. *Teleology, First Principles, and Scientific Method in Aristotle's Biology*. Oxford: Oxford University Press.
- Henry, D. 2019. *Aristotle on Matter, Form, and Moving Causes*. Cambridge: Cambridge University Press.
- Joachim, H. H. 1922. *Aristotle on Coming-To-Be and Passing-Away*. Oxford: Oxford University Press.
- Katayama, E. 2011. *Aristotle on Artifacts*. New York: SUNY Press.
- Kress, E. 2020. "Aristotle on Spontaneous Generation, Spontaneity, and Natural Processes." *Oxford Studies in Ancient Philosophy* 58: 157–204.
- Kress, E. 2023. "How the Soul Uses its Tools: Flexible Agency in Aristotle's Account of Animal Generation." *Phronesis* 68 (3): 293–325.
- Kress, E. 2024. "Concocting Teleology in Aristotle's *Meteorology* 4 and *Generation of Animals*." *Archiv für Geschichte der Philosophie* 1–45, <https://doi.org/10.1515/agph-2023-0117>.
- Krizan, M. 2013. "Elemental Structure and the Transformation of the Elements in *on Generation and Corruption* 2.4." *Oxford Studies in Ancient Philosophy* 45: 195–224.
- Krizan, M. 2018. "Mixture and the Formation of Homoeomers in *on Generation and Corruption* 2.7." *Oxford Studies in Ancient Philosophy* 54: 187–226.
- Lennox, J. 2001. *Aristotle on the Parts of Animals I-IV*. Oxford: Oxford University Press.
- Lennox, J. 2014. "Aristotle on the Emergence of Material Complexity: *Meteorology* IV and Aristotle's Biology." *HOPOS* 4 (2): 272–305.
- Lewis, E. 1996. *Alexander of Aphrodisias on Aristotle's Meteorology 4*. Ithaca, New York: Cornell University Press.
- Mirus, C. V. 2001. "Homonymy and the Matter of a Living Body." *Ancient Philosophy* 21 (2): 357–73.
- Mirus, C. V. 2006. "The Homogeneous Bodies in *Meteorology* IV.12." *Ancient Philosophy* 26 (1): 45–64.
- O'Connor, S. 2015. "The Subjects of Natural Generations in Aristotle's *Physics* I.7." *Apeiron* 48 (1): 45–75.
- Ogle, W. 1912. "Aristotle Parts of Animals." In *The Works of Aristotle*, V, edited by W. D. Ross. Oxford: Oxford University Press.
- Peck, A. L. 1961. *Aristotle Parts of Animals, Loeb Classical Library*, Vol. 323. Cambridge, MA: Harvard University Press.
- Popa, T. 2010. "Aristotle on Pure and Simple Stuff." *Rhizai* 7 (1): 29–61.
- Popa, T. 2020. "Aristotle on the Powers of Thermic Equilibrium." In *Heat, Pneuma, and Soul in Ancient Science and Philosophy*, edited by H. Bartoš, and C. G. King, 202–16. Cambridge: Cambridge University Press.
- Popa, T. 2022. "Aristotle on Microstructures and Capacities." *Dialogoi: Ancient Philosophy Today* 4 (1): 46–72.
- Quarantotto, D. 2022. "Aristotle on the Order of Embryonic Development and the Homonymy Principle." In *Aristotle's Generation of Animals A Comprehensive Approach*, edited by S. Föllinger, 233–68. Berlin: De Gruyter.
- Schaffer, J. 2003. "Is There a Fundamental Level?" *Nous* 37 (3): 498–517.
- Sokolowski, R. 1970. "Matter, Elements, and Substance in Aristotle." *Journal of the History of Philosophy* 8 (3): 263–88.
- Solmsen, F. 1950. "Tissues and the Soul: Philosophical Contributions to Physiology." *The Philosophical Review* 59 (4): 435–68.

- Sprague, R. K. 1991. "Plants as Aristotelian Substances." *Illinois Classical Studies* 16 (1/2): 221–9.
- Stavrianeas, S. 2008. "Spontaneous Generation in Aristotle's Biology." *Rhizai* 5 (2): 303–38.
- Thorp, J. 2012. "Homeopoesis: Aristotle on Nutrition and Growth." *The Society for Ancient Greek Philosophy Newsletter* 462: 26–31.
- Wardy, R. 2005. "The Mysterious Aristotelian Olive." *Science in Context* 18 (1): 69–91.
- Whiting, J. 1992. "Living Bodies." In *Essays on Aristotle's De Anima*, edited by M. Nussbaum, and A. O. Rorty, 75–91. Oxford: Oxford University Press.