

## 1 The Fall and Rise of Hylomorphism

Holism, broadly speaking, is the view that the properties of the parts of a whole depend on the nature and existence of the whole. Holism is in vogue in the philosophy of science and receives a more receptive ear among metaphysicians today than it did in the early days of analytic philosophy: biological organisms are often touted as paradigmatic examples of irreducible wholes, in which the parts of an organism are ‘caught up in a life’ such that they compose something novel and unified.<sup>1</sup> Yet how can a whole be ‘more than the sum of its parts’,<sup>2</sup> such that the whole is irreducible to the properties of and relations between them? Alternatively, how could the parts of a composite be related to one another in such a way that they compose a unified whole?

These questions have a special relevance for the philosophy of biology in relating the kinds of entities studied by biologists to the kinds of entities investigated by physicists. Are biological organisms just arrangements of physical entities picked out by our best physics, which we happen to count as individuals, or is there something about the *nature* of an organism which demands that it should be counted as an individual in its own right? In this section, I shall outline Aristotle’s doctrine of hylomorphism, which explains the nature and unity of a biological whole in terms of its having a ‘form’ as well as matter. I will consider why this doctrine was abandoned by early modern philosophers in the wake of the Scientific Revolution, and why contemporary metaphysicians and philosophers of science are discussing it once again.

*How Is Change Possible?* For much of the high scholasticism of the Middle Ages, prior to the Scientific Revolution, the philosophy of nature was concerned with placing common conceptions of experience within a more abstract but broadly realist philosophical framework derived from the metaphysics of Aristotle; a philosophy intended to interpret the world of ordinary experience rather than shatter it. Although medieval philosophers disagreed about many of the details of their metaphysical systems, and interpreted Aristotle in a wide variety of different ways, they were united in believing the world to be made up of ‘substances’, which are individuals that are irreducible to more basic constituents, and which are said to act in the world according to their own ‘natures’.<sup>3</sup>

<sup>1</sup> The phrase was introduced by the philosopher Peter van Inwagen (van Inwagen, 1995), adapted from the biologist J. Z. Young’s phrase, ‘caught up into the living system’ (Young, 1971).

<sup>2</sup> The phrase is often attributed to Aristotle. Significantly, however, Aristotle describes the whole as being something besides the parts (see *Metaphysics* VIII.6, 1045a. 8–10.).

<sup>3</sup> This vision of nature also provided a basis for a natural law theory of ethics (Angier, 2021).

Whereas Plato conceived substances to be eternal and immaterial kinds that characterise the ephemeral things of nature, Aristotle maintained that substances exist as mutable parts of the natural world. According to Aristotle, properties may be predicated of a substance, some of which are essential to being a substance of that kind, but a substance is not itself predicable of anything else. His paradigm examples of substances are *living beings*, which maintain their complex identities through change. Pasnau has identified four ‘common sense’ assumptions of the Aristotelian-Medieval worldview (Pasnau, 2011, p. 633), which were challenged by the philosophy of nature that ultimately displaced it:

- (A<sub>1</sub>) We can have knowledge of the substances that exist in the physical world and of the natural kinds to which they belong.
- (A<sub>2</sub>) A folk ontology based on ordinary experience can carve things up in the physical world according to their true natures.
- (A<sub>3</sub>) Many of the objects of ordinary experiences – trees, cats, people, and so on – are in fact real substances.
- (A<sub>4</sub>) Substances naturally come into and go out of existence.

The confidence in ordinary experience which characterises this vision of reality – and the faith it places in the powers of sensory perception to disclose the existence and properties of substances – finds its source in Aristotle’s ‘hylomorphic’ account of the nature of substances. This metaphysical account was born from his struggle to overcome various kinds of scepticism that he encountered in the work of ancient philosophers, such as scepticism concerning the possibility of change or of the possible existence of a plurality of entities. An essential step in Aristotle’s account of how change and multiplicity are possible was to posit a fundamental distinction between *actual* and *potential* being. This distinction offered a way of carving a *via media* between the teachings of the Eleatics, on the one hand, and those of the Heracliteans, on the other.

Parmenides of Elea is widely understood to have denied that change is a real feature of reality: there is real being, but no real *becoming*. For a change to take place in nature – that is, for something new to arise in reality – it could not have been real before it occurred, and this can only mean, according to Parmenides, that it must have arisen out of nothing. Yet the event of something arising from nothing is inexplicable and an offence against reason (at least, for ancient philosophers). In the second part of his poem, *On Nature*, Parmenides can be construed as taking the following line of argument: if real change is possible, being must arise from non-being. However, being (something) cannot possibly arise out of non-being (nothing). Therefore, real change is impossible.

Parmenides denied the possibility of multiple beings on similar grounds: there can be unity but no multiplicity. For there to be real multiplicity, it would have to be the case that one part of reality *lacks* what another part has, and thus non-being would have to be the cause or source of their multiplicity.<sup>4</sup> Yet even if nothing (non-being) is an intelligible metaphysical concept, it does not refer to anything that exists, and cannot therefore be used to mark where one being begins and another ends. To put the argument more succinctly: if real multiplicity is possible, one being must be distinguished in reality from another being by non-being (nothing). However, one being cannot possibly be distinguished in reality from another being by non-being (nothing). Therefore, real multiplicity is impossible. For Parmenides, reality is fundamentally One and any changes that we perceive are only appearances.

The Heracliteans, on the other hand, are portrayed by Aristotle as taking the opposite view to Parmenides (in *Metaphysics* IV.5, at 1010a10 and following): the world is always changing, and it is our impressions of unity and persistence, rather than our impressions of change and multiplicity, which pertain to appearance rather than reality. In the limiting case, reality is a flux of multiplicity in which nothing in nature persists in the relentless succession of events.

Both of these sceptical extremes do violence to ordinary experience and give rise to performative self-contradictions: the reality of change and multiplicity is presupposed, for example, in the attempt of one person to persuade another to adopt Parmenides' views by articulating the steps of his argument. Likewise, the reality of unity and persistence is presupposed by a philosopher who professes unwavering fidelity to the sort of sceptical views that Aristotle attributed to the Heracliteans. Seeking to avoid such absurdity, Aristotle theorised that some beings are composites of both actual and potential being, introducing the concept of *potentiality* (or being-in-potency) as a middle ground between non-being and *actuality* (or being-in-activity).

Utilising the concept of potentiality, Aristotle was able to solve Parmenides' puzzles by denying the first premise in both the aforementioned arguments: change does not involve being arising from non-being, in contradiction of the immemorial principle, *ex nihilo nihil fit*;<sup>5</sup> rather, the transition is from being-in-potency to being-in-activity. This occurs when something exercises a *power* according to its nature. For example, a philosopher who, by exercising their intellectual powers, becomes convinced by Parmenides' arguments

<sup>4</sup> Or, to impose a more modern parlance about Parmenides' discussion: for two beings to be distinct in reality – that is, not merely in our conceptual schemes – there must be some property which one has but the other lacks, and this can only mean, according to Parmenides, that the difference between them must be grounded in the lack of something, which is literally, *nothing*.

<sup>5</sup> That is, *nothing comes from nothing*; a philosophical dictum put forward by Parmenides.

changes from being potentially Parmenidean to being an active disciple. Likewise, non-being is not the only principle by means of which two beings might be differentiated: two things can be differentiated by reference to their potentialities. Someone who is an *actual* disciple of Parmenides, for instance, differs from someone who is *potentially* Parmenidean but does not exercise their mind about such questions.

By distinguishing actual from potential being, Aristotle was also able to troubleshoot the counterintuitive view of change he attributed to the Heraclitians. After all, it is difficult to make sense of change without the concept of an actual state towards which change is moving (or from which it is departing). There also seems to be a need for some persisting actuality which can serve as the subject or underlying substrate of that change. Our scientific inquiries inevitably invoke the concept of actuality, as well as potentiality, when they pose the questions ‘*what* is changing in this physical system?’ and ‘in what *ways* can it change?’

Aristotle’s distinction between actuality and potentiality thus opened a conceptual space for a philosophical account of ordinary experience which steers between the Heraclitian and Parmenidean rocks of scepticism: one which affirms the reality of change and multiplicity by endowing things in nature with powers. Nonetheless, even if change and multiplicity are admitted as part of reality, there is an important distinction between the kinds of changes that things undergo that was also subject to scepticism among ancient philosophers. On the one hand, there is the kind of change which involves the alteration of something, as when a scholar gains knowledge (an accidental change). On the other hand, there is the kind of change which involves the corruption of one thing and the generation of another, as when a Nordic warrior dies in fierce battle and a delicate flower springs up from the burial mound (a substantial change).

According to the philosopher Democritus and his teacher Leucippus, things only appear to go into and out of existence. We should account for the reality of all change in terms of the alteration of small, indivisible bodies (metaphysical atoms) of which everything else is composed. Contrary to Parmenides, Democritus argued that change does not require something to come into being out of nothing, but rather the existence of some persisting material principles that are continually rearranging themselves within an infinite void to form the changing world of appearances. Biological entities, such as cats and dogs, are not part of nature’s ontology; in reality, there are just the metaphysical atoms, some of which may happen to be arranged cat-wise or dog-wise.

Aristotle’s concepts of matter (*hyle*) and form (*morphe*) opened conceptual space for a realist account of substantial and accidental change as distinct kinds

of change that occur in nature (see Aristotle, *Physics* I.7–9). His conception of matter differs significantly from that of Democritus. For Aristotle, matter is that which gets actualised or determined, whereas form is that which actualises or determines matter; the two metaphysical principles are essential to the being of all sensible substances and they cannot be physically separated. Both matter (which is the principle of potential being) and form (which is the principle of actual being) are required to explain the changes we observe in nature, along with the concept of privation, which is the lack of the form that is required by whatever the *telos* (end) of the change happens to be.

For instance, when an animal consumes a plant, the animal (a substance) is a subject of accidental change: by exercising its powers of digestion, the animal gains muscular mass it was previously lacking, yet remains the same animal. The matter of the animal – sometimes called ‘secondary matter’ – is thus said to have the potential to be actualised by different *accidental forms*. But this is not the only kind of change taking place. By being transformed into the flesh of the animal, the matter of the plant is stripped of the substantial form and those powers that are essential to being that kind of plant, and acquires the substantial form and those powers that are essential to being that kind of animal. The matter underlying these substances, which was understood by many medieval philosophers to be a wholly metaphysical ‘prime matter’, is thus said to have the potential to be actualised by different *substantial forms*.<sup>6</sup> It is because substances are composites of matter and form that they can be *subjects* of change, having both a determinate nature and a potential to be actualised.

Much is supposed to rest, then, upon the concept of substantial form for making sense of our ordinary experience of change. Indeed, the concept of substantial form has been widely considered by philosophers to play all of the following explanatory roles in the Aristotelian-Medieval account of substances:<sup>7</sup>

- (R<sub>1</sub>) Substantial form determines the kind of substance a thing is by determining its (essential) properties and causal powers.
- (R<sub>2</sub>) Substantial form determines those sensible qualities our folk ontologies rely upon for carving nature into different substances.

<sup>6</sup> It is controversial among ancient philosophers whether Aristotle requires the concept of prime matter in his account of hylomorphism. Scholars agree that for Aristotle, the matter underlying animals is something like flesh, bone, or blood. They also agree, however, that *if* prime matter arises in Aristotle, it properly arises in the context of the generation of the four elements.

<sup>7</sup> Picked out and indexed according to the common-sense theses (A<sub>1</sub>–A<sub>4</sub>) identified by Pasnau (2011). I do not say that they are necessary and sufficient conditions for being a substantial form.

- ( $R_3$ ) Substantial form is the principle of unity which explains the existence of composite entities that count as individual substances.
- ( $R_4$ ) Substantial form grounds the natural distinction between substantial change (generation and corruption) and accidental change.

The first role of substantial form ( $R_1$ ) supports the first of the four common-sense assumptions of the Aristotelian-Medieval worldview ( $A_1$ ): we have the prospect of becoming acquainted with the nature of a substance by discerning its powers, since different kinds of substances have different kinds of powers. The second role of substantial form ( $R_2$ ) supports the second common-sense assumption which came into dispute ( $A_2$ ): at least some substances can be discerned in ordinary experience in virtue of their sensible qualities. Likewise, the third role of substantial form ( $R_3$ ) supports the third assumption ( $A_3$ ): the domain of Aristotle's substances, unlike Democritus' atoms, is not confined to any particular physical scale – either the microscopic or the cosmic scales – but encompasses many of the middle-sized objects of ordinary experience, including biological entities such as plants and animals. Finally, its fourth role ( $R_4$ ) supports the fourth assumption ( $A_4$ ): when one thing comes into being and another is corrupted, this is not merely the alteration of something more fundamental, such as Democritus' atoms, but due to the action of substantial forms in transforming matter to generate a new fundamental reality.

*Why Did Hylomorphism Fall into Disrepute?* Whether Aristotle's doctrine of hylomorphism, as it was originally formulated or subsequently interpreted, succeeded in supporting theses ( $A_1$ ) to ( $A_4$ ) is a matter for contentious debate. The cursory description that I have given only touches the bare bones of a doctrine that raises many metaphysical questions, and which was interpreted in a variety of ways within the medieval tradition.<sup>8</sup>

On the one hand, it was widely agreed that Aristotelian substances are supposed to have a *per se unity* which other kinds of entities lack. An aggregate entity, such as a pile of bricks or a heap of sand, is composed of physical parts which can exist independently of the wholes of which they are parts, and which retain their natures and identities even whilst they are composing the aggregate. An aggregate entity thus derives its being from the sum of its actual parts. In contrast, a living substance, such as a whale or a horse, is an irreducible whole whose organs are supposed to depend for their natures and identities upon the substance as a whole. Many Aristotelians have understood his notion of substance to imply that all of the *physical parts* of a substance (if it may be said

<sup>8</sup> A few paragraphs of this subsection draw verbatim on my discussion in Simpson (2018).

to have ‘parts’) are also supposed to depend for their natures and identities upon the substance as a whole. Although a living substance such as a horse is corrupted into a collection of non-living chemicals when it dies, which do not depend upon the original substance for their existence, these entities are not *numerically identical* to any parts of the substance that existed prior to its corruption. The substances into which a substance may be corrupted are typically said by Aristotelians to exist only *in potential* – or, as ‘potential parts’ rather than ‘actual parts’ – just so long as the substance itself continues to exist.<sup>9</sup>

Yet how should we understand the nature of matter and form in Aristotle’s hylomorphic analysis of substance? Are they some kind of metaphysical parts which fit together to compose a physical substance, or are they merely conceptually useful ways of analysing entities which may be mereologically simple? If a substance is endowed with parts, how is its substantial form supposed to unify them to compose something which is metaphysically one?

Whilst many modern readers of Aristotle regard his theory of hylomorphism as a useful way of thinking about substances, but do not believe the concepts of matter and form are supposed to carve nature at the joints, philosophers within the scholastic tradition generally conceived matter and form as metaphysical constituents, believing that they are real and contribute to the whole. According to Aquinas, the unity of a substance that is metaphysically composed of matter and form pertains to its having a *single* substantial form which, whilst having no powers to influence directly the behaviour of other substances, explains the nature and unity of the physical substance which it in-forms by determining the properties of its matter and fixing its powers. Although matter and form cannot be separated *physically* from one another, they are metaphysical realities which can be separated *conceptually* through an intellectual process of abstraction.

The subsequent trajectory of hylomorphic metaphysics in the Middle Ages, however, has been characterised as one of an increasing fragmentation of the unity of substance and physicalisation of the concept of matter (Pasnau, 2011). For instance, Aquinas’s characterisation of matter as a substrate of *pure potentiality*, which lacks any properties apart from form, was widely criticised by other scholastics for failing to bottom out in anything concrete or determinate which could serve as an intelligible substrate of substantial change, and was never widely accepted. Duns Scotus insisted against Aquinas that matter should have actual parts.<sup>10</sup> William of Ockham, writing in the early fourteenth century, went so far as to say that substances must be composed of actual substances.<sup>11</sup>

<sup>9</sup> See Aristotle, *de Generatione et Corruptione* I.10, and Aristotle, *Metaphysics* VII.

<sup>10</sup> See Scotus (Rep. II.12.2 n. 7 (XI:322b) in Wolter and Bychkov (2004).

<sup>11</sup> For a discussion of Ockham’s view, see Pasnau (2011), ‘Matter and extension’.

Likewise, the ‘unitarian’ doctrine of substantial form that Aquinas advocated (Wippel, 2000, pp. 327–51), in which a substance is attributed a single substantial form that determines all of its essential causal powers, was widely rejected by other scholastics.<sup>12</sup> According to Scotus, the form of *corporeity* (by which an animal is embodied) and the form of the *soul* (by which an animal is living) are present simultaneously within a human substance. Others embraced more extreme degrees of pluralism. As Zabarella remarked: ‘if two forms at once are not contrary to reason, then neither will it be contrary for there to be four or a hundred at once in the same substance’.<sup>13</sup> Yet if multiple substantial forms can exist within the same substance, and if the matter of this substance is composed of actual parts which have their properties and identities independently of its substantial form, wherein lies the unity of the substance?

The mechanical philosophy of the seventeenth century that rapidly replaced the hylomorphic metaphysics of the scholastics, far from arising out of a philosophical vacuum, represents a development in these tendencies within medieval philosophy, which culminated in the physicalisation of matter as a substrate of actual parts and the rejection of any role for substantial form, such as its role of determining the properties of matter ( $R_1$ ). The corpuscularianists proposed a much simpler ontology consisting of corpuscles arranged within physical space which have intrinsic and determinate properties, echoing the atomism of Leucippus and Democritus that Aristotle had so vehemently opposed.

In doing so, corpuscularianists were seeking to place their metaphysics in service to a new physics, which promised greater power over nature than Aristotle’s physics, and to wrest the philosophy of nature from the metaphysical wranglings of the scholastics, which they perceived to be endless and exasperating.<sup>14</sup> In the old vision of nature which had dominated the Middle Ages, substances were reckoned to have metaphysical constituents which could be discerned through a process of intellectual abstraction. In the new vision of nature fomented by the Scientific Revolution, however, nature’s building blocks are disclosed only to scientists who have been technically trained to measure and manipulate them.

<sup>12</sup> William de la Mare attacked Aquinas’ affirmation of unicity in *Correctorium Fratris Thomae*.

<sup>13</sup> *De rebus naturalibus*, De gen. ch. 2, cols. 397–7, as translated in Pasnau (2011).

<sup>14</sup> There were also theological motivations for abandoning the medieval synthesis in favour of a mechanical, corpuscularian conception of nature, which I have not the space to discuss here: the rise of a voluntarist conception of God (Gillespie, 2008); a desire for a more modest metaphysics in the light of God’s arbitrary power (Olson, 2004); a concern to address superstition by securing a clean separation between the natural and the supernatural (Olson, 2004); and a revived concern with apparent contradictions between the teachings of Aristotle and Christian doctrines concerning creation and the soul (Funkestein, 1986). The rise of Protestantism in Europe contributed to the decline of the medieval synthesis in multiple ways (Gregory, 2015).

The corpuscularian philosophy of nature swiftly supplanted scholasticism in many parts of Europe, as scientists like Robert Boyle contrived plausible mechanical explanations for natural phenomena, specifically targeting cases in physics where scholastics had attributed phenomena to the activities of forms.<sup>15</sup> Henry Oldenburg, who served as the first secretary for the Royal Society, memorably complimented Boyle for having ‘driven out that drivel of substantial forms’ which ‘has stopped the progress of true philosophy, and made the best of scholars not more knowing as to the nature of particular bodies than the meanest ploughmen’.<sup>16</sup> Whilst corpuscularianists maintained a commitment to the notion of a material substrate underlying all change – in Boyle’s view, a ‘substance extended, divisible, and impenetrable’<sup>17</sup> – the doctrine of substantial forms was swiftly abandoned during the course of the seventeenth century (albeit with some notable dissenters, such as Leibniz).

The extirpation of form was accompanied by a lapse into a Democritean account of generation and corruption. According to Boyle, the material world laid bare by the physical sciences is a ‘contrivance of brute matter managed by certain laws of local motion’ (Boyle, 2000, vol.10, p. 447). Without immanent forms to explain things’ powers, natural philosophers invoked extrinsically imposed laws to explain the motions of microscopic corpuscles and how things come into and go out of existence in the macroscopic world of appearances (Silva, 2019, p. 64–5). Substantial change was consigned once again to the world of appearances, since the material corpuscles of which everything is made persist through time and only change with respect to accidents like position.

In summary, the rejection of hylomorphism can be attributed at least in part to a shift in the sympathies of philosophers back towards atomism in the wake of the development of modern science. The rise of corpuscularianism witnessed the reduction of the causal powers and sensible qualities of substances to the mechanical properties of matter (providing defeaters for assumptions  $(A_1)$  and  $(A_2)$ ), as well as the elimination of metaphysical constituents and the rejection of Aristotle’s concept of potentiality (providing defeaters for assumptions  $(A_3)$  and  $(A_4)$ ). Likewise, the methodological monism associated with the new physics, which was supposed to uncover the microphysical laws governing the corpuscles, displaced confidence in the sensory powers of ordinary experience to discern macroscopic substances (providing defeaters for assumptions  $(A_2)$

<sup>15</sup> See R. Boyle, The Origin of Forms and Qualities. In (eds.) m. Hunter and E. Davis, *The Works of Robert Boyle*, (London: Pickering & Chatto, 1999–2000).

<sup>16</sup> H. Oldenburg, *Correspondence*, ed. and trans., A. R. Hall and M. B. Hall (Madison: University of Wisconsin Press, 1965), III:67.

<sup>17</sup> See Works of Boyle, V:305.

and ( $A_3$ ). Taken together, these changes conspired to call into question the nature of matter and the metaphysical roles of substantial form ( $R_1$ – $R_4$ ), driving a wedge between what Wilfrid Sellars famously called the ‘scientific image’ of reality – which is a view of reality that is based upon scientific inquiry – and the ‘manifest image’ of ordinary experience – which is a view of reality that is founded upon reflection on ordinary experience (Sellars, 1997).

*Why Is Hylomorphism Making a Comeback?* Perhaps surprisingly, given its rather ignominious downfall, hylomorphism has been making a comeback in contemporary philosophy, with many prominent and up-and-coming philosophers identifying as hylomorphists of one form or another, including Kit Fine, Kathrin Koslicki, Mark Johnston, Alexander Pruss, Robert Koons, Anna Marmodoro, David Oderberg, Michael Rea, William Jaworski, and many others besides.<sup>18</sup> Yet, why should modern philosophers be interested in retrieving hylomorphism from the intellectual dustbin of history?

Corpuscularianism, which is the philosophical ancestor of the physicalism that held sway over the analytic philosophy of the last century, had a delicate balancing act to perform between two impulses that push in opposite directions. On the one hand, there is the desire to prune ontology down to nothing but the referents of our ‘best physics’ for simplicity’s sake. On the other hand, there is a need to admit within one’s ontology sufficient grounds for the sensory and cognitive powers upon which the scientific investigation of nature depends. The ontology of nature should be sparse, but not too sparse; otherwise, we risk being unable to cash out any of the truth claims of our best physics. The manifest image may be thrown into doubt, but not too much doubt; otherwise, we risk sawing off the epistemic branch upon which the physical sciences are sitting. There are good reasons to question, however, whether corpuscularianists or modern-day physicalists have succeeded in striking this delicate balance. Hence, there are good reasons to question the defeaters they generated against the four ‘common-sense’ assumptions of the Aristotelian-Medieval worldview ( $A_1$ – $A_4$ ).

In the first place, there has been a rise in ‘neo-Aristotelian’ metaphysics among contemporary analytic philosophers, which has included a return to essentialism, a restoration of substances, and the revival of Aristotle’s doctrine of potentiality. Although the highly influential philosopher W. V. Quine had insisted that Aristotle’s distinction between essence and accident is ‘surely

<sup>18</sup> This renewed interest in hylomorphism reflects a broader interest in retrieving elements of Aristotle’s metaphysics. See for example Simpson, Koons, and Teh (2017); and Simpson, Koons, and Orr (2021).