CHAPTER 3

Aristotle's Building Blocks in the Physics

Two major complaints that Aristotle raises against Plato regard final causation and the notion of imitation. Both criticisms reflect the more general Aristotelian view that Plato fails to provide a proper theory of causes, but instead presents an underdeveloped notion of causality. These two complaints are not, however, made at the same time and are, to some degree, unrelated. The first states that Plato fails to recognise final causes qua good; the second critiques the Platonic notion of imitation as the relation between forms and particulars. I shall address these two complaints together here for two main reasons. First, unlike the topics addressed in the previous chapter, Aristotle does not here use artefacts as counter-examples or as crucial elements of a counter-argument levelled against the Platonic theory. Rather, Aristotle explicitly voices his dissatisfaction with certain Platonic notions and then comes up with conceptual tools that prevent the same mistakes from occurring. In this sense, these two complaints should also be kept separate from the project carried out in the remainder of the book, where Aristotle does not build on elements of Platonic theory that he finds unsatisfactory, but rather on what he thought were the right metaphysical intuitions. Second, in an indirect reaction, Aristotle fashions a conceptual tool that addresses *both* unsatisfactory elements in the Platonic theory. Indeed, the art analogy responds to the problems of both final causation and imitation. It establishes final causes both in art and in nature and reinterprets the Platonic relation of imitation between models and likenesses, without ascribing to them a different ontological status. This conceptual tool is found in the arsenal assembled in the *Physics*. The *Physics* constitutes a fruitful starting point for our study of Aristotle's metaphysics of artefacts, since we can glean from it an account of artefacts that is not only compatible with, but also directly related to the account offered in the *Metaphysics*. This account chiefly consists of: (i) the art analogy and (ii) the fundamental distinction between artefacts and natural beings.

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Typical artefacts and natural beings come-to-be by art and by nature, respectively. However, whereas artefacts and natural beings differ in terms of their possession of an internal or an external principle governing their behaviour, things that come-to-be by art and by nature differ in virtue of their principle of coming-to-be, but not necessarily in terms of their principle of behaviour. Aristotle envisages both the possibility that natural beings are artificially caused or caused by an external principle and the possibility that some artefacts might be naturally caused (although in the latter case, only in a derivative sense).

Another Aristotelian conceptual tool I discuss in this chapter and is provided by the *Physics* is indeed the distinction between 'artificially caused' and 'artefact'. This distinction is made in response to the notion of imitation advanced in the *Timaeus*, according to which the whole cosmos is the product of divine craftsmanship. Aristotle proposes a sharp distinction not only between natural and artificial beings, but also between artificially caused beings and artefacts. In the second part of this chapter, I shall discuss the salient difference between artefacts and natural beings. This survey will accomplish two tasks: it will present *typical* artefacts (i.e. generally accepted members of artificial kinds that are brought about by art) and it will open space for the conceptual possibility that art might be able to bring about things that are not artefacts proper. By identifying the building blocks presented in the *Physics* and presupposed in the *Metaphysics*, this chapter also lays the foundations for the remainder of the book.

3.1 The Theory of the Four Causes and the Art Analogy

The *Physics* is the work in which Aristotle makes the most use of artefacts. The main goal of the *Physics* is to establish how natural sciences are supposed to operate. In this sense, it lays the foundations for the Aristotelian works of natural philosophy: *On the Heavens*, *On Generation and Corruption* and *Meteorology*. The *Physics* offers a theoretical paradigm for the more specialised natural sciences. The theory of causality offered here (i.e. the theory of the four causes) is developed primarily in order to study nature. However, this is not its sole function, since it is also used to explain human action. Moreover, it can also be applied in metaphysics to the science of the being qua being, a science that also consists of a causal explanation. Now, Aristotle makes use of artefacts on a massive scale to draw conclusions regarding this theoretical paradigm for natural behaviour. Although his primary interest is in natural beings and their behaviour,

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what Aristotle claims about artefacts within the framework of the art analogy still holds true. This is why the *Physics* alone does not resolve our metaphysical concerns about artefacts, but still plays a crucial role in advancing our understanding of them.

In this work, Aristotle famously illustrates the theory of the four causes,[1] which is based on the use of artefacts and is not limited to their teleological structure. In *Phys.* 2.3,[2] Aristotle explains that every being can be accounted for with reference to four types of explanation (*aitia*) – or four ways of answering a why question – which are more commonly called 'four causes'.[3] On this model, the material explanation of a statue identifies its matter (i.e. bronze), the formal explanation points to its shape, the efficient explanation indicates its producer (e.g. a builder or a sculptor) and the final explanation concerns the end or function of the object in question. These types of explanation apply to natural and artificial beings alike. For instance, material causes include both the matter of artefacts and the elements of bodies; formal causes are the mode of composition and the whole or form; efficient causes can be things such as a doctor or a seed; and final causes are the end and the good (195a14–25). The theory of the four causes is complicated by the introduction of finer-grained distinctions that apply to each cause. Causes can be either particular causes or causes as kinds, depending on their level of generality. For instance, the material cause of a statue can be either this particular chunk of bronze or bronze more generally. In the case of an efficient cause, 'a sculptor is the cause of a statue, and this sculptor of this statue' (195b26–7). The issue of the degree of generality also applies to the distinction between per se and coincidental causes (i.e. between a cause which is explanatory and one which is not). For instance, the per se efficient cause of *this* statue is Polyclitus, whereas a coincidental efficient cause of *this* statue might be 'musical', if Polyclitus also happens to be musical. Again, all such causes can be causes either as potentialities or as actualities. For instance, the efficient cause as potentiality of a house is the builder, whereas the efficient cause as actuality is the builder building. The 'most precise' efficient cause of a house, however, is not so much the builder as the art according to which they build (i.e. their housebuilding skills; 195b21–5). The most precise efficient cause should make no reference to factors such as desires, intentions and beliefs.[4] This restriction will prove crucial when it comes to teleological

[1] On the theory of the four causes, see, among others, Falcon 2019; Henning 2009; Stein 2011.
[2] The same account is found in *Met.* Δ 2. [3] Annas 1982; Falcon 2019; Stein 2011.
[4] See Falcon 2019. As he explains, this does not mean that such psychological factors never enter the explanation of an artistic production. If I am a student of natural philosophy, I should be aiming at

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explanation: psychological aspects such as intentions, beliefs and desires should play no role in explaining the teleological structure of natural processes – at least once Aristotle has proven the teleological structure of nature.[5]

In *Met.* A 7, Aristotle accuses Plato of failing to recognise final causes. The art analogy serves the purpose of showing that there is a final cause in nature, a good for the sake of which things occur the way they occur. The art analogy cannot be reduced to the statement that art imitates nature. Platonists should readily agree with this point: the couch made by the carpenter is an imitation of the real couch made by God in the *Republic*, and, more generally, likenesses are said to imitate models in the *Parmenides* and the *Timaeus*. The art analogy is rather the synthesis of the idea that art imitates nature and that art has a final cause – which is more knowable to us – leading us to conclude that there is a final cause in nature. Now, teleological structure is a trait that is also typical of Plato's conception of art. Aristotle's art analogy is meant to lead us to the conclusion that we ought to recognise final causes in nature too.

Plato offers a description of the relation between Ideas and particulars in terms of imitation. Particulars are likenesses that imitate an unchanging, intelligible reality. For Aristotle, however, this notion of imitation is both unclear and incorrectly applied. It is unclear because it seems to be a metaphorical label for participation, which is equally unclear. It is incorrectly applied because it cannot capture the relation between forms and particulars. In fact, as Aristotle's art analogy shows, imitation is a relation among particulars. Moreover, imitation does not indicate a metaphysical difference between the model and the image; it does not hierarchise reality. On the contrary, it is based precisely on a shared trait that puts models and likenesses on the same level (i.e. the possession of a final cause).

Aristotle's employment of the art analogy goes back as far as the *Protrepticus*. This exhortation to philosophy contains the first Aristotelian engagement with the distinction between nature and art. The *Protrepticus* also allows us to show the existence of a deeper debt to Plato than is

a level of generality that is sufficient to exclude elements concerning the individual artisan. However, if I am studying a particular artefact as the achievement of that particular artisan, I might need to also take psychological factors into account.

[5] As Falcon (2019) well says: 'Aristotle does not psychologize nature because his study of the natural world is based on a teleological model that is consciously free from psychological factors.' See also Broadie 1987, 35–50.

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commonly supposed. Here,[6] Aristotle states that art imitates nature and that, in fact, natural beings have intrinsic ends as well.[7] This amounts to a far from trivial affirmation, namely that artefacts have intrinsic ends. Moreover, not only does art imitate nature, but it also completes it: some natural beings come-to-be and survive by nature, whereas human beings, for instance, need art sometimes in order both to come-to-be (obstetrics) and to continue living (agriculture). If art imitates nature and completes it, nature is prior to art: for this reason, Aristotle says that natural ends are better than artificial ends. Although natural ends are axiologically better than artificial ends, artefacts are still ascribed ends in the fullest sense. The presence of intrinsic ends in artefacts is clearly stated as follows: 'if, then, art imitates nature, from it (nature) it follows that also every artificial generation is for the sake of something' (14.1–2).

The art analogy is then systematically used in the *Physics* for pedagogical and, more importantly, heuristic purposes. Certain facts are true of artefacts and, since art imitates nature, these facts are also true of natural beings. As Witt (2015a) shows, the art analogy is the philosophical tool by means of which Aristotle manages to argue for the existence of intrinsic ends in natural beings on the basis of their existence in artefacts. In *Phys.* 2.2, 194a21–6, the question of whether physics should engage with the study of form and/or matter is answered via the art analogy: since art imitates nature and both the doctor and the builder ought to know the form as well as the matter, the same holds true for the natural sciences. The natural philosopher must enquire into both matter and form.

Fundamental for the elaboration of an ontology of artefacts is, indeed, Aristotle's use of the art analogy to establish the presence of intrinsic ends in natural beings. In *Phys.* 2.8, productions and the actions required for them are said to be for the sake of an end. Since art imitates nature, natural productions are also for the sake of an end. Aristotle explicitly derives the existence of intrinsic ends in natural beings from the existence of intrinsic ends in artefacts: 'generally art in some cases completes what nature cannot bring to a finish, and in others imitates nature. If, therefore, artificial products are for the sake of an end, so clearly also are natural products' (199a15–18). When Aristotle explains that if a house were made by nature it would come-to-be in the same way as it does by art and that if a natural being were made by art, it would come-to-be in the same way as it does by

[6] Iamblichus, *Protrepticus*, ch. IX, 49.26–51.6.

[7] Johnsons-Hutchinson translate: 'Further, if skill imitates nature, a consequence from this for the skills as well is that everything that comes-to-be comes-to-be for the sake of something' (50.12–13).

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nature,[8] he is claiming that both natural and artificial beings are produced through a series of steps leading towards an end that they embody in a relevant sense. These ends are not attained in case of mistakes: because mistakes are possible in the domain of art, they are also possible in the natural realm (199a33–199b1): 'if then among artificial products there are cases in which what is correctly produced has an end, and if where mistakes occur there was an end in what was attempted, only it was not hit, so must it be also in natural things'. The very possibility of mistakes (i.e. of failing to attain a certain end) proves once again that there are indeed ends to be attained, in artefacts and, therefore, in natural beings. Artefacts are, particularly in the art analogy, more than just a pedagogical tool; they are a heuristic tool.[9] This amounts to saying that in the *Physics*, in the context of the art analogy, what Aristotle says about artefacts holds true in itself and not merely in the context of the analogy. Were artefacts only pedagogical tools, what holds true of natural beings would not necessarily hold true of artefacts. But, in the heuristic context of the art analogy, what holds true of natural beings holds true precisely *because* it holds true of artefacts as well.

The art analogy grounds Aristotle's use of artefacts as examples, as well as his treatment of artefacts in general. Indeed, in the first two books of the *Physics*, Aristotle both *uses* artefacts to illustrate his theory of the four cause and *treats* artefacts as similar to natural beings, insofar as they undergo unqualified coming-to-be, while at the same time being different from them, insofar as the principle governing their behaviour lies outside of them. In both cases, whether artefacts are *used* or *treated* directly, the presence of intrinsic ends as established by the art analogy is fundamental. Artefacts could not be used to illustrate the theory of the four causes if they did not possess a final and a formal cause; artefacts could not undergo unqualified coming-to-be if they did not have a form (i.e. a function) to be acquired; artefacts would not need to be distinguished from natural beings if a form and an end was not already present within them. I will return to these points in the next section.

The art analogy is not only a tool used by the early Aristotle, since he makes use of it also in *PA* 1.1, 639b15–21.[10] Here, Aristotle announces that

[8] *Phys.* 2.8, 199a12–15.

[9] For a slightly different take, see Falcon 2019. Falcon argues that in *Phys.* 2.8 final causality is not proven, but only introduced as the best explanation for an aspect of nature which would otherwise remain unexplained (i.e. regularity). *Parts of Animals* seems to actually attempt to prove final causality.

[10] In *Meteor.* 4.3, 381a9–12 Aristotle compares the artificial process of boiling to the natural one and highlights that in both cases the cause is the same. Although the idea behind this is that we artificially

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the study of nature – in this case zoology – needs to take into account several causes, most importantly the final cause and the efficient cause. The problem of whether the efficient cause is prior to the final cause or vice versa is easily solved using the art analogy. The final cause is clearly prior to the efficient cause, as is evident in the case of a physician or a housebuilder: their 'movements' start from the account of what their product is supposed to be. That is, they both start from the end to be realised. The art analogy here serves the heuristic function of helping us to understand that the final cause is prior to the efficient cause.[11] Because art imitates nature, and because artisans (i.e. the efficient causes) start from the *logos* (i.e. the final cause), it follows that in nature too, the final cause is prior to the efficient cause.[12]

3.2 The Salient Difference between Artefacts and Natural Beings

In the *Sophist* (265C, 266B), the Eleatic Stranger suggests that all mortal animals including human beings, plants, elements and inanimate bodies are ultimately products of the Demiurge's craftsmanship. This doctrine is at the core of the *Timaeus*, where the Demiurge creates the entire cosmos.[13] In a way, natural beings are artificial, since they are produced by an artisan. Natural beings and artefacts would therefore both be likenesses of unchanging models. There is evidence that Aristotle is dissatisfied with the ontology implicit in the Platonic notion of imitation. There is also evidence that he takes the *Timaeus* seriously. But how could he do that? How could Aristotle take the *Timaeus* seriously, while still maintaining the distinction between natural beings and artefacts? The way in which he preserves the story of the Demiurge without saying that artefacts are natural, or that natural beings are artificial, is to offer a distinction between 'artificially caused' and 'naturally caused', on the one hand, and 'artefacts' and 'natural beings' on the other. It is possible to be artificially caused without being an artefact or a member of an artefact-kind – as living beings are if there is a Demiurge. Similarly, it is possible to be naturally caused

boil by imitating the natural processes, it does not seem that Aristotle is employing the art analogy here to obtain any relevant heuristic result.

[11] For the explanatory priority of the final over the efficient cause, see Code 1997, 127–43.

[12] For a denial of the importance of the art analogy in establishing natural teleology, see Cooper 1982.

[13] The picture is certainly more complicated. For a discussion of the fact that the Demiurge creates only the heavenly bodies and leaves the creation of mortal beings to these celestial gods, see Johansen 2021.

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without being a natural being. Although typical artefacts come-to-be by art, this does not mean that whatever is artificially caused is an artefact.[14]

In the *Statesman*, the Eleatic Stranger advises Socrates the Younger to make accurate divisions of reality that are able to capture real classes of beings. Socrates observes, however, that this advice is somewhat vague. Not only is it difficult to perform the division in such a way as to be sure to spot a real genus corresponding to an Idea, but it is also unclear what a real class is supposed to be. One way of understanding this is to identify real classes with natural kinds. On this interpretation, artefact-kinds will not qualify as real kinds. On another interpretation, real classes might include both natural and artificial kinds. Either way, if one were to build on this – as I think Aristotle does – it is necessary to distinguish between natural beings and artefacts.

In what follows, I shall first discuss the salient difference between artefacts and natural beings presented in *Phys.* 2.1, along with some of its implications. I will then address cases that seem to resist clear categorisation and contrast artefacts with other human- or animal-dependent objects, rather than with natural beings. I shall then argue that artefacts, in the sense of members of artificial kinds, will *typically* come-to-be by art, before better qualifying art as a principle by contrasting it with other external principles and their products. Finally, I shall argue that *some* artefacts will *only* come-to-be by art and, moreover, that *some* natural beings can *also* come-to-be by art. This latter case is essential to understanding how the entire cosmos can be a product of divine craftsmanship, without abandoning the distinction between natural beings and artefacts or making all beings into artefacts (i.e. likenesses of ontologically superior models).

Imitation does not make for a proper theory of causality. Moreover, applied to the Demiurge's making of the cosmos, it erases the distinction between natural beings and artefacts. Aristotle is able to maintain the distinction between natural beings and artefacts by identifying the distinctive feature of natural beings, namely the possession of an inner principle of behaviour, and by distinguishing between artefacts proper and things that are artificially caused. For the sake of clarity, I will call 'artefacts' those things that are members of artificial kinds and 'art products' or 'products of art' those things that come-to-be by art. While artefacts so understood are *typically* art products (i.e. come-to-be by art),

[14] A similar worry seems to be at the core of Plotinus' comparison of the making of the cosmos by the Demiurge with the performative art of dancing. See Emilsson 2021.

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they are not *necessarily* so. In other words, an artefact cannot be entirely determined as a product of art. Far from being an anomaly, the disconnect between artefacts and products of art is, in fact, necessary. The process of production is fundamentally dependent on the product, so that there must be a way of specifying the product prior to the question of whether this process brought it about.[15] Art might be what typically brings about a good house and might be preferable to chance or experience, when it comes to the reliability with which it produces good houses, but in order to make this point the house must have some independent specification. The *Physics* identifies the salient difference between a member of a natural kind and a member of an artificial kind. This difference concerns not so much the principle from which each thing comes-to-be, as the principle something possesses or lacks once it has come-to-be.

3.2.1 *The Definition of Nature in* Phys. *2.1*

In *Phys*. 2.1, Aristotle's central aim is to define nature in such a way as to delimit the range of items with which physics as a discipline is concerned. However, scholars are puzzled by the fact that the definition of nature itself is obtained through the contrast between natural and artificial things. Leaving aside the problem of the circularity of the whole strategy, the definition of nature is reached through the opposition between nature and art as principles of change and rest of their corresponding objects. Aristotle begins by drawing the well-known distinction between things that are by nature (*phusei onta*) and things that are not (are not *phusei sunestôta*):

> Of the things that exist some are due to nature; some are due to other causes. By nature are animals and their parts, plants, and simple bodies like earth, fire, air, and water (for we say that these and things like them are due to nature). All these things plainly differ from things which are not constituted by nature: each has in itself a principle of change and rest, whether in respect of place, or growth and decay, or alteration. (192b8–15)

All things that are not constituted by nature, such as artefacts, lack an internal principle of change and rest. So far, it seems that Aristotle has in mind only qualified coming-to-be, and no mention of unqualified coming-to-be is made. Artificial things are those things whose changes have an external source, while the internal principle is nature. This suggests that, as

[15] This point was brought to my attention by an anonymous referee, who also points out that, in this regard, art differs from virtuous action.

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long as the principle in question is internal to the thing being changed, this principle must be nature. In fact, the definition of nature confirms that the most prominent feature required of a principle for it to be nature is for it to be internal in the fullest sense:

> This suggests that nature is a sort of principle and cause of change and remaining unchanged in that to which it belongs primarily of itself and not by virtue of concurrence (*prôtôs kath' hauto kai mê kata sumbebêkos*). (192b20–3)

Aristotle explains what 'internal in the fullest sense' consists in by referring to two examples of artefacts: the couch made of stones and the doctor who heals themselves. These cases all have in common that they merely appear to have an internal principle. Upon closer examination, these two cases, too, will be shown to involve an external principle. In the definition of nature provided here, the *prôtôs kath' hauto kai mê kata sumbebêkos* has the function of specifying that in order to be natural, the principle must be internal in the fullest sense (i.e. primarily and not coincidentally), so that artefacts in which the principle merely seems to be internal do not end up in the class of natural things. The first example of an artefact is a couch made of stones, which is meant to represent qualified comings-to-be:

> A couch, on the other hand, or a coat, or anything else of that sort, qua receiving such designation, and insofar as it is by the agency of art, has no inborn impulse to change, but insofar as it happened to be made of stone or earth or a mixture of the two it has. (192b14–20)

An inattentive observer might think that a couch made of stones has an internal principle of change. After all, a couch can change and deteriorate without any external intervention. However, the couch does not change qua couch, but rather qua made of stones. The internality of the principle must be complete, meaning that it must belong primarily to the thing itself (i.e. it must concern the couch qua couch). Hence, in the case of the couch made of stones, the internality of the principle does not make it a natural thing. Another misleading case is that of a doctor who heals themselves, producing the quality of *healthy* in their own body:

> By 'not in virtue of concurrence' I mean that a man who is a doctor might come-to-be a cause of health in himself. Still, insofar as he is healed he does not possess the medical art, but being a doctor and being healed merely concur in the same person. And this is why they come apart from one another. (192b23–7)

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Here, Aristotle is spelling out what he means by stating that the principle must be internal to the thing and not present in it by virtue of concurrence. The inattentive observer might say that when a doctor heals themselves the principle of the body that is healed is in no way external to it. Aristotle's remark that the principle must not be internal merely by virtue of concurrence is meant to rule out this case. The man who is healed does not, as such, internally possess the principle (in this case, the art of medicine).[16] The person who is healed and the doctor just happen to coincide in the same person. Nature, as a principle, is not internal merely by being present in something as in a container: if being spatially inside an object were sufficient for being a natural principle, then the Trojan horse would also be a natural being.[17] The salient difference between artefacts and natural beings is that the former lack an inner principle governing their behaviour qua what they are, while natural beings are equipped with such a principle.

Let us linger for a moment on the question of qualified comings-to-be and the way in which a living being is responsible for its own changes, for, in *Physics* 8, Aristotle seems to restrict the status of animals as self-movers. First, animals are self-movers only with respect to locomotion, but not with respect to the other kinds of qualified coming-to-be (259b6–7). Second, animal locomotion is self-motion not in the full or proper sense (*ou kuriôs* at 259b6–7). This two-fold restriction seems to threaten the kind of autonomy that living beings enjoy in contrast to artefacts. After all, if living beings are not self-changers, but only self-movers, and even this in a restricted and qualified sense, the opposition between natural and artificial beings weakens.

Locomotion is the only change that an animal undergoes which represents self-motion. The other changes are not instances of self-motion because 'here the motion is caused by the environment and by many things that enter into the animal' (259b11–12). Environmental changes include growth, diminution, respiration, digestion and distribution (259b9, 12–13). The principle of these changes is not internal to the animal, but external, coming from the environment (259b13–16). Evidence that such changes have an external principle can be seen in the fact that the animal undergoes such changes even when it is not moving itself, for example, when it is asleep. Most changes are therefore not due to an inner principle. The only

[16] Stavrianeas (2015) labels this as the 'essentiality condition': there is no essential relation between the man who is healed and the doctor.

[17] The example is from Johansen (2016). I might add that it is no wonder that among the meanings of 'having' in Δ 23, none corresponds to a natural being that has a nature.

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kind of change that constitutes self-motion is locomotion, which is not self-motion strictly speaking.

According to the standard interpretation, locomotion is not self-motion strictly speaking because it depends on an external cause (i.e. the *orekton* or desired object). This does not, however, mean that the principle of animal locomotion is external or comes from the environment. Scholars have proposed several solutions, in order to safeguard the soul as the unmoved mover responsible for qualified comings-to-be, which also amounts to safeguarding the salient difference between living beings and artefacts. They have either pointed out that the desired object is a mover insofar as it is seen or perceived by the animal, thus stressing the role of the faculty of the soul,[18] or clarified that the animal does not move itself in the strict sense, because one moving part moves another part which is unmoved (i.e. the soul), but it is moved accidentally.[19]

In *Phys.* 8, especially 2 and 6,[20] Aristotle does seem to restrict the self-motion of animals, but he does so in order to avoid the threat of eternal motion. If animals were indeed self-movers in the fullest sense (i.e. as fully autonomous beings whose locomotion is absolutely independent from changes existing before), Aristotle would not be able to hold that motion exists eternally and that there is a first mover that is necessarily unmoved. However, this is not the sense in which animals are self-movers. The strict sense in which something is a self-mover involves it being a causally fully autonomous being, a condition that is exclusive to the unmoved mover.[21] The sense in which animals are self-movers, by contrast, is that they can bring about motion from within themselves – just not without any pre-existing change.[22] And indeed, this is confirmed by *De motu animalium*, which does not seem to be concerned with the problem of the unmoved mover or with the *orekton* as a possible threat to animal self-motion. The desired object is presented as an unmoved mover (*MA* 6, 700b24ff. and 8)[23] together with the soul (*MA* 6–10: in particular 9, 702b34–5 and 703a11–13). In this case too, there are several ways to understand the mention of two

[18] Several interpretations argue that the *ou kuriôs* restriction does not contradict the animal's status of self-mover. According to Furley (1987, 177, 1994, 13), the *orekton* is 'seen' as such by a faculty of the soul. For another nuanced position according to which animals are self-movers insofar as they can initiate locomotion in response to certain external factors, see Berryman (2002, 91).

[19] According to Morison (2004), the self-mover is divided into two parts, only one of which is unmoving, but it is moved accidentally: 'an animal *in a sense* (*ou kuriôs*) moves itself, because one part moves another'.

[20] 2, 253a7–12 and 6, 259b1–22.

[21] 'A self-reliant being throughout' according to Rapp (2020, 61).

[22] Ferro 2021; Rapp 2020.

[23] For the *orekton* as unmoved mover, see also *DA* 3.10, 433b15-16.

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different unmoved movers (i.e. the soul and the *orekton*).[24] What is relevant for our purposes is that the *orekton* does not thereby replace the soul as unmoved mover, and thus the salient difference between living beings and artefacts can be maintained. The two unmoved movers can be taken as complementary and as answers to different questions. Hence, while the *orekton* is supposed to explain how the capacity to desire is activated (by an unmoved mover), the soul as unmoved mover is supposed to explain how movement originates within the body.[25] The salient difference between living beings and artefacts is maintained in all its strength: artefacts lack an unmoved mover within themselves that would be the origin of their movement. The difference between natural beings and artefacts is also maintained, as some natural beings might fail to be self-movers, but are still self-changers qua what they are. There are, however, some tricky cases.

3.2.2 Daedalus' Statues, Machines, the Olive Tree and the Swallow's Nest

The salient difference between artefacts and natural beings refers primarily to the ability of living beings to self-move and of natural beings in general to self-change. Potentially tricky cases include machines and Daedalus' statues, which were so ingeniously made as to seem alive. Genuine and fully artistic production of a living being is for Aristotle not a realistic possibility:[26] the statues of Daedalus simply cannot exist.[27] The closest things to Daedalus' statues are machines, of whose existence Aristotle was fully aware. Machines behave, in a way, like living beings in that they can move continuously by themselves. However, they are not self-propelled (i.e. they lack an inner principle of motion and rest). Even though they might have an inner principle of change insofar as they can move by themselves, the cause of their ability to move themselves comes from without (e.g. from whoever constructed the mechanism). They are thus clearly artificial items.[28]

[24] See Rapp's (2020, 64) overview, especially his arguments against the view that there is only one mover that ultimately is 'the soul in a certain state that moves'.

[25] For this interpretation, see Hankinson 2020; Rapp 2020.

[26] Certainly, this concerns the living and not the natural. On the level of chemistry, *technê* can produce the exact same effects as nature, as *Meteor.* 4 shows. I discuss this case in Section 3.4.2.

[27] Aristotle mentions Daedalus' statues in *DA* 406b19–20 and in *Pol.* 1253b35–6. In the latter passage, he also mentions Hephaistos' tripods, famous from Book XVIII of the Iliad for being self-propelled servants built by Hephaistos.

[28] On *automata*, see, for example, *Met.* A 1, 983a14. Puppets with a concealed inner mechanism are also mentioned in *Mech.* 848a3–37, *MA* 7, 701b2, *GA* 2.1, 734b10, 13, 5, 741b9. Plato refers to them in *Rep.* VII, 514B.

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There are cases that might be described as artificially caused natural beings. Is this way of looking at things inaccurate? Do these cases represent natural things or rather 'living quasi-artefacts'?[29] I am referring to natural beings that come-to-be with the help of humans: are these artefacts or natural beings according to Aristotle? At issue here are beings that function naturally, but that came-to-be through non-natural processes, such as domesticated plants. Are these a *tertium quid* (i.e. entities that are neither obviously artificial nor obviously natural) or can they be ascribed to one or the other class? Our tentative and preliminary answer will refer to the Aristotelian view that art not only imitates nature, but also completes it. Some natural beings can come-to-be through the help of art, and once they come-to-be, they live the life of a living being. An olive tree is such even if it is brought into being via human intervention. When Aristotle states that art completes or supplements nature, he does not mean that art does something that nature cannot do, but rather that art helps nature in what, under certain circumstances due to human purposes, nature cannot accomplish by itself. The sprouting of a seed, although helped by human intervention, is still a natural event. Domesticated plants are natural beings, insofar as they have an inner principle governing their behaviour. Although Aristotle did not know about seedless grapes or synthetically produced chemical compounds, he did know about the domestic olive. The domestic olive need not constitute a different item than the wild olive: art intervenes in helping nature to pursue results that it cannot pursue given certain circumstances, such as an indoor environment. Although artificially caused, it is a natural being.

There are also cases involving what might be described as naturally caused artificial beings. Animals can be said to produce objects: spiders make webs to catch their prey, while birds make nests to lay eggs and to raise offspring. These products come-to-be in virtue of natural causes, but can be compared to any human artefact in that they lack an inner principle governing their behaviour. For instance, a swallow's nest is naturally caused but seems to lack the inner principle that the swallow possesses. To this extent, it does not qualify as a member of a natural kind.[30]

3.3 Artefacts Will *Typically* Come-to-Be by Art

Aristotle presents us with an example of a non-maximalistic account of artefacts: his definition of art is highly refined and his criteria for something to be a typical artefact are narrower than those of several contemporary

[29] The label is from Wardy (2005). [30] For a discussion of animal artefacts, see Section 3.3.2.

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thinkers. Examples of maximalistic view are Hilpinen's definitions of artefact, who first defined an artefact as an object having an author (1993), and later as 'an object that has been intentionally made or produced for a certain purpose' (2011). Aristotle's notion of artefact proper is narrower than both of Hilpinen's definitions. On Aristotle's account, authority and intentionality are not sufficient conditions for something to be an artefact.

Scholars and readers of Aristotle might maintain that there exists an intuitive notion of an artefact, something like a human-dependent object, along the lines of tables and chairs. However, while there is an intuitive sense in which we talk about artefacts, the notion of artefact is not self-evident. After all, the several answers to the question of the essence of artefacts (which are, in turn, influenced by the definition of artefact that one embraces), the rare awareness of the trans-categorical nature of art and the existence of ambiguous or amphibious cases show that the meaning of 'artefact' is far from apparent.

3.3.1 *Art as Principle*

In order to understand the first and basic features of typical artefacts,[31] the most obvious place to look is *NE* 6.4, where Aristotle provides a definition of *technê*[32] and introduces the distinction between natural beings and artefacts. Aristotle defines art as 'a certain disposition, concerned with making, that reasons truly' (1140a20–1).[33] For instance, the housebuilding art is defined as a *hexis* (1140a7), i.e. a relatively stable or permanent condition which is acquired or lost over a long period of time.[34] Although the products of art are contingent, they stem from a stable ability that presupposes knowledge (*meta logou alêthous*). This disposition is concerned with making, because it deals with the bringing into existence of some contingent object. The disposition concerned with making differs from the disposition concerned with acting:[35] moral actions are not,

[31] I shall provide a brief account mostly based on *NE* 6.4 and *Met.* A 1. For detailed accounts of Aristotle's notion of art, see Bartels 1965; Cambiano 1971; Isnardi Parente 1962, 1966; Vattimo 1961.

[32] The range of meanings covered by the word *technê* cannot be reproduced by any single modern equivalent, such as 'craft' or 'skill' (Meißner 1999). Given that any translation would fall short of reproducing the meanings of *technê*, I have adopted 'art' as the sole translation for the sake of consistency with the term 'artefacts', and I employed 'artefact' in order to place Aristotle in communication with the contemporary debate.

[33] Moss (2014) talks about 'right reason' and identifies it with an explanatory and prescriptive account.

[34] In the *Cat.*, *hexis* is opposed to *diathesis*, which only applies to states or conditions that are easy to remove and change, such as being hot or cold.

[35] Aristotle discusses this distinction both in the *NE* and in the *Met.*, especially in Book Θ, where the capacities for acting are said to have one *energeia*, while the capacities for making have two *energeiai*: the action itself that is an intermediate *energeia* and the object produced.

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therefore, artefacts. Although Aristotle puts technical and practical ability on a par and distinguishes them primarily in terms of being concerned with making or with acting, there are important differences. To begin with, unlike practical ability, *technê* cannot move something on its own. Moreover, if in practical ability the mover (i.e. decision or the conclusion of practical thinking) and the end are the same, in *technê* the mover and the end are two distinct things (Müller 2018). If the mover is decision, however, one might interpret technical ability within the framework of practical ability, although technical ability proceeds through hypothetical necessity and does not depend on the agent's character. For instance, if the mover is the decision to make, the exercise of the technical ability would begin at this point, and technical ability as such would include desire and the practical thinking ending up in the decision (cf. *Met.* Z 7–9). This disposition reasons truly because it has intellectual content. What does this intellectual content consist in? Art implies an account that provides information about what the object to be produced is, how it can be brought into existence and why a certain procedure leads to a certain desired result.[36] The intention to bring something into existence alone does not suffice, and consequently Aristotle's notion of a typical artefact is therefore different from Hilpinen's (2011) definition. The footprint that I intentionally make in the sand is obviously not a product of art, since the scope of art is not limited by the producer's desire to produce something. Despite its insufficiency, when taken in isolation, the intention of the artisan is a necessary condition:[37] unintended products, such as the residue resulting from human production, are not artefacts proper. By-products, residues and unintended outcomes, such as sawdust, are not artefacts proper. Let us imagine that an artisan chisels a statue out of a block of material. The residues produced by the artisan's activity are, in a way, products of an art, but they cannot be regarded as artefacts proper. As we will see in *Met.* Θ 7, 1049a5–12, one precondition for an artefact's coming-to-be is that the artisan wills it. Now, the

[36] One controversial question concerns the knowledge that the possession of art includes. According to Menn (2002), the artisan has in mind a sort of recipe for producing a certain result. See also Fernandez and Mittelmann (2017). Müller (2018) argues that the knowledge possessed by the artisan is knowledge of the 'how' and it is given in universal terms – and this is why productive thinking is similar to practical thinking: it concerns how to turn the decision into something. For Müller (2018, 28), the importance of knowledge can be minimal. In my view, the artisan needs not only to know what and to know how but also to know why. This is the crucial difference between the experienced person and the artisan. The experienced person might well know what health is and also how to produce it, but they would lack the knowledge of why the 'how to produce' actually produces health. For this view, see also Johansen 2017.

[37] Note that I am referring to typical artefacts. See Section 3.4.1 for inadvertent objects, which are not typical artefacts.

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role of psychological factors in *technê* has not been clearly assessed. Technical ability is often described as non-psychological.[38] However, it seems important to keep in mind that Aristotle brings in the notion of desire (*orexis*) as principle of human production.

The knowledge involved in the possession of a skill is at the core of art's reliability and regularity. The rational part of *technê* is then mostly addressed in *Met.* A 1 and modelled after the scientific paradigm of the *An. Post.* Aristotle draws a crucial distinction between art and experience (*empeiria*).[39] While art is a faculty that is exclusive to human beings, experience is also shared by animals. The relationship between art and experience is therefore one of continuity, rather than opposition. Experience derives from a collection of memories regarding the same object, whereas art seems to derive from collection of experiences regarding the same object. One cannot possess an art without experience, but one might be experienced and still unskilled. Given that the relationship between art and experience is one of continuity, is there a qualitative difference between the two?[40] Experience too involves some general concept. However, grasping a universal can be done in two different ways: the first is by grasping *a* universal that is merely an extrapolation from particular cases; the second is to grasp the universal that 'differentiates the cases as being instances of a specific kind of disease or condition, such as being phlegmatic or bilious' (Johansen 2017, 110) and this is the universal that is causally pertinent. The universal grasped by the experienced person is of the first type, whereas the second type of universal is the one the artisan grasps.[41] Art entails knowledge of the why. We will soon go back to this theoretical aspect of *technê* when distinguishing it from other external principles in Section 3.3.2. At this point, I would like to stress that art as a principle is a guarantor of reliability and regularity but Aristotle also holds another conception of *technê* that is non-scientific and allows that the same kind of thing can be produced by other external principles.

Some *technai*, in fact, are closer to experience and more practically oriented.[42] They are non-scientific in that they lack a proper *genos*, or subject-matter amenable of scientific inquiry. Dialectic and rhetoric, by concerning 'everything that is', fully embody such non-scientific modes of

[38] Broadie 1990.

[39] Aristotle is here probably engaging and rejecting the distinction between these two in Plato's *Gorgias*.

[40] On the relation between experience and production, generalist views (Bolton 1991; Frede 1996; see also Butler 2003), particularist views (e.g. LaBarge, 2006; McKirahan 1978; Salmieri 2010) and more nuanced views (Gregorić and Grgić 2006; Hasper and Yurdin 2014; Modrak 1987) have all been articulated.

[41] For different views on this topic, see Cambiano 2012; Politis 2004.

[42] See Bolton 2021.

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technê. The same cannot be said for all stochastic arts, for the subject-matter of medicine, for instance, is the proper *genos* of health. Stochastic arts are those arts whose success does not solely depend on the author because external conditions can interfere.[43] In his commentary on the *Topics*,[44] Alexander of Aphrodisias sharply distinguishes between cases such as medicine, where expertise is compatible with failure, and productive *technai*, such as weaving or housebuilding, where nothing is left to chance. Examples of stochastic arts therefore include medicine, rhetoric and the performing arts.[45] While the product of a rhetorical speech seems to be the persuasion induced in the audience, the adversary being trapped in contradiction seems to be the product of dialectic and health the product of medicine. At any rate, the two classes of artefacts identified – (i) the products of stochastic arts, such as persuasion, agreement and health, and (ii) crafted artefacts – happen to coincide, respectively, with (i) properties and (ii) substances in the categorical sense. Products of stochastic arts will be set aside. As explained in the Introduction, the reason for this decision is that these things are qualified as attributes and not as substance-like cases. Health can be conceived of as a quality of a body and persuasion as a state of mind. Moreover, as we will see in Section 3.4.1, properties can easily come-to-be also spontaneously, thus they are not *typical* artefacts.

3.3.2 *Other Dependent Objects*[46]

Typical artefacts are substance-like cases of material objects that are brought into existence by the specific capacity of art (e.g. houses and tables). This notion defines a spectrum of objects that is certainly narrower than the vast array of human-dependent things. Material objects produced by art are part of the class of what Baker calls ID objects, namely objects 'that could not exist in a world lacking with beliefs, desires and

[43] Certainly, all artificial productions require the absence of external hindrances (see *Met.* Θ 7). However, this does not make all arts stochastic arts. The general condition that nothing should hinder the production applies to all cases, whereas being a stochastic art more specifically means that *even* under ideal conditions, where there are no external hindrances, the maker's will and skill do not guarantee success.

[44] Alex., *in Top.* 32,27–33,23.

[45] See *EE* 1247a5–7: 'in matters involving art, luck too largely enters, for example in strategy and navigation.'

[46] By 'dependent objects' I mean objects whose principle of motion and rest is external. I am not referring to the concept of 'dependent objects' as objects that cannot be separated from their surroundings without being destroyed, such as tunnels. For the difference between dependent and independent objects in this different sense, see Simons 1987, 294–323.

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intentions'.[47] Aristotle does not seem to be bothered about whether there are marginal cases that are hard to classify. After all, he can handle blurry boundaries, as long as there are cases on either side that are clear, such as wild animals and tables. However, it is important to understand why these cases are clear and what makes the marginal cases difficult. Once again, pushing Aristotle towards a solution – and thus identifying what his answer would have been if he had been directly confronted with marginal cases – may make a valuable contribution both to the contemporary debate on artefacts and to our understanding of Aristotle's own account.

All things lacking an inner principle of behaviour are dependent objects (i.e. they depend for their functionality and existence on principles that are external to them). The Aristotelian corpus is filled with dependent objects that are not typical artefacts. In general, one might say that whatever lacks an inner principle because it is brought about through art is an artefact. However, if this claim is to be clear and not circular, it is important to distinguish art from other external principles that are responsible for what Aristotle calls 'makings' or 'productions' as opposed to 'generations'. Because Aristotle does not seem to theorise about the range of artefacts as such, he is not worried about giving a sharply defined set of criteria for distinguishing artefacts from other human productions. However, that there exist non-artificial production and human-dependent objects that are not typical artefacts is clear from *Met.* E 1 and Z 7. In the latter (1032a27–8), Aristotle first distinguishes between natural generations and productions, before dividing the class of productions into three subclasses: productions are either by art (*apo technês*), by some capacity (*apo dunameôs*) or by thought (*apo dianoias*). Not all productions are artificial, nor are all products brought about through reason artefacts. In *Met.* E 1, 1025b22–4, productions are grouped together in that the principle of their making lies in the producer and the producer is identified either with art (*technê*), reason (*nous*) or some capacity (*dunamis tis*). It appears important to distinguish things that are brought about by art from those that come-to-be by reason, thought or a certain capacity. In *Met.* Z 7, as well as *Met.* E 1, coming-to-be by art, a certain capacity or reason/thought are presented as distinct alternatives – although not necessarily mutually exclusive ones – (*ê apo technês ê apo dunameôs ê apo dianoias* and *ê nous ê technê ê dunamis tis*). But what are these latter things? The class of things *apo dunameôs* is potentially quite broad. If, as we read in *Met.* Δ 12 and Θ, a *dunamis* is simply a principle found in something other than the object produced,

[47] Baker 2007, 11.

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then all artefacts will be products *apo dunameôs* (though not necessarily *vice versa*). However, in the context of productions, it seems that Aristotle does envisage a difference between the two cases. Frede and Patzig (1988, 111) identify the capacity in question with experience. However, we will see that the experienced person grasps a universal of some sort, such that it seems they still appeal, at least to some extent, to their rational soul and, hence, their makings should be classified together with productions brought about by reason or thought. Products of a particular capacity must be products of a capacity (i.e. of an external principle) that is not rational. We have started to see that animal artefacts might fit into this class. The spider's web has an external principle governing its making and behaving but this principle is neither art nor anything involving inquiry and deliberation.[48] The same consideration applies to the so-called non-rational capacities, such as heating by fire. In *Met.* Θ 5, Aristotle includes the fire's ability to heat within the class of capacities that lie in something other than the product, together with arts.[49]

What is left to understand is the difference between art and thought/reason, a difference that narrows down the definition of the notion of a typical artefact. Of course, the application of art involves thought and reason – and this is why they are not mutually exclusive. Throughout *Met.* Z 7–9, Aristotle argues that things that come-to-be by art have their starting point in the form in the soul of the artisan. Which part of the soul is involved? In chapter 9, Aristotle mentions reason (*hupo nou*).[50] In Θ 7, 1049a5, examples that clearly concern artefacts, such as that of a house, are introduced as things *apo dianoias*. The discussion of art in *NE 6* lists art among the faculties of the rational soul. However, thought and reason are listed as alternatives to art as principles of makings both in *Met.* Z and E. Once again, there seem to exist productions that are brought about by the rational soul and that do not count as works of art or typical artefacts. Perhaps the objects produced by experience are indeed in this class, for they

[48] *Met.* Z 8 continues the discussion of Z 7 and sets *dunamis* on the same level as art and nature: the essence is said 'to be made to be in something else by art or by nature or by some capacity' (*Met.* Z 8, 1033b7–8). Aristotle frequently lists art and nature as principles of change together with spontaneity. In *Met.* Z 7, after saying that makings are either by art, by thought, or by some capacity, he briefly mentions and sets aside the case of spontaneity. One might therefore conclude that things that come-to-be spontaneously are what we are seeking. However, spontaneously generated beings like bees or ants cannot under any description be something other than natural beings, for they possess an inner principle governing their behaviour. Spontaneity is a privative principle that occurs in relation to both typical artefacts and typical natural beings. Spontaneously generated animals are indeed further proof that being a natural being and coming-to-be by nature are two distinct things.

[49] *Met.* Θ 5, 1047b31–5. [50] 1034a21–5.

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involve an intelligent grasp of a universal. Similarly, it is possible that other makings fit into this class as well. We need to understand what these makings are so as to be able to more narrowly specify what an artefact is.

In *Met.* Θ 2, Aristotle talks about *pasai hai technai kai hai poiêtikai epistêmai*.[51] One way of taking the *kai* is surely as epexegetic: in this way, arts and productive forms of knowledge would be functionally equivalent.[52] We have already seen that arts indeed are productive branches of knowledge: they are concerned with making and they presuppose general knowledge over and above experience alone. Arts are productive branches of knowledge also in the sense that their aim is an *ergon* that is different from that of knowledge.[53] The point concerning the goal of the productive branches of knowledge is addressed also in the *Eudemian Ethics*. In *EE* 1.5, while arguing that the aim of productive knowledge is different from that of science and knowledge, Aristotle refers, on the one hand, to medical science and, on the other, to political science.[54] Health is the product of medicine, while law and order are products of political science.[55] For law and order to come into existence there must be a maker who reasons truly and who aims at producing something particular, whose principle is external. In *Met.* Δ 1, 1013a10–14, arts and governments are mentioned as examples of one particular meaning of 'principle' (i.e. something moving and changing according to choice; *kata prohairesin*). However, Aristotle does not seem to regard law and order as proper artefacts. He does not completely flesh out the difference between productive branches of knowledge and arts, but it seems plausible to consider the products of a productive science, such as political science, as makings, but not as artefacts. However, a further difficulty arises in this regard. Even though Aristotle mentions law and order as products of political science, political science is listed among the practical sciences rather than the productive ones. In fact, the proper product of political science is the realisation of good behaviour by the widest range of people (citizens). Law and order are, therefore, human-dependent objects brought about through practical and productive knowledge. Productive branches of knowledge are therefore meant to include human-dependent objects that are not brought about by art, but by a set of knowledge and skills that might rather belong to a practical science. In *Met.* Θ 5, arts are distinguished from other capacities in that they are acquired by learning. Playing the flute is

[51] *Met.* Θ 2, 1046b2–3.
[52] This is the most frequent reading. See, for instance, Johansen 2017; Ross 1924.
[53] Also in *Cael.* 306a16. [54] *EE* 1.5, 1216b16–19.
[55] For insights regarding political science as architectonic productive knowledge, see Barney 2021.

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a capacity that lies in something other than the product (i.e. it is external to the flute music played or to the emotions evoked in listeners) but it is not necessarily an art, because it can be accomplished by merely acquiring the ability through constant practice.[56] To be a product of practice is not necessarily not to be a product of productive knowledge. Playing the flute correctly requires practice, as well as an account of what the product is. A flute player does employ their rational soul. In conclusion, a way to narrow down the class of artefacts from the class of human-dependent objects is to look at the kind of external principle involved: artefacts typically come-to-be by art; other human-dependent objects come-to-be by an unskilled – in the strict sense – choice, deliberation or desire. Productions of thought or reason include products of experience, products of practical sciences or, more generally, intended products of human activity – which might include the footprint in the sand or the Lego fort; productions resulting from a certain capacity also include non-rational products.

Instructions: IKEA's Billy

The maker of an artefact should possess knowledge of both the form and the causes, as well as being equipped with the skill necessary to produce it. However, there are cases in which an artefact is brought into existence and the maker neither possesses the proper knowledge nor would be able to teach the art in question. For instance, anyone is able to build an IKEA bookshelf, such as Billy. Part of its success is undoubtedly due to the fact that anyone is capable of following the instructions and assembling this nice piece of furniture. The Billy built by my cousin, however, is an artefact only insofar as it is considered as the result of the *joint* effort of my cousin and whoever on the Ikea staff designed it so that it could be put together at a later stage. The example reflects the difference between the master-worker (*architektôn*) and the manual worker (*cheirotechnês*).[57] Only the former knows the causes and would be able to teach the art in question. In *Met.* A 1, Aristotle even compares manual workers to inanimate beings because they do not really know what they are doing – or, at least, they do not need to know (981b2–5). The fire heats without possessing any knowledge, just as the manual worker builds without possessing the relevant art. A similar situation is found in the *Politics*,

[56] In the opening lines of *Met.* Θ 5 we read 'since all capacities are either innate, like the perceptual capacities, or come by habit, like that of flute-playing, or by learning, like that of the crafts' (1047b31–3).

[57] *Met.* A 1, 981b31–982a1. The distinction goes back to Plato's *Statesman* 258C–60C.

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regarding the art of medicine.[58] Aristotle divides physicians into three classes: (i) the ordinary practitioner (*ho dêmiourgos*); (ii) the master physician (*ho architektonikos*); and (iii) the man educated in the art (*ho pepaideumenos peri technên*). The health brought about by the master physician is presumably the form of health that most properly fulfils the requirements for being an artefact in the strict sense. However, both the health that is restored by the medical practitioner and the one that is restored by the man educated in the medical art are artefacts, as long as the practitioner and the learner follow the *logos* of the medical art. It comes as no surprise that in *Met.* A 1[59] Aristotle regards the manual worker as wiser than the experienced person: although the manual worker lacks proper knowledge, they rely on the master's knowledge in such a way that their production is ultimately informed by art. The experienced person, by contrast, acts only according to experience, such that their product is not informed by art.[60]

To sum up, IKEA's Billy is a typical artefact in that it is brought into existence according to art: the master's productive intention – loaded with an explanatory and causally relevant grasp of the universal in play – is expressed in the instructions, which are precisely meant to transfer the knowledge of the object and of the procedure (i.e. art), to the manual builder.

Dianoia or *Nous* as Principles: Products of Experience

On the basis of the difference between art and experience, one might determine that, strictly speaking, if health is produced only from experience, it is not an artefact. If the same kind of object produced by art is brought about by experience, this does not qualify it as a product of art, but it still is the kind of thing it is (i.e. it might still be a member of a certain artificial kind). If an experienced person brings about health, it still qualifies as health, despite the fact that it did not come-to-be by art, because the person who produced it had no medical skill. The health that is restored through home remedies is still health insofar as it is a uniform state of the body. The same applies to substance-like cases: the

[58] *Pol.* 3.11, 1282a3–5. [59] 981b30–982a1.

[60] To claim that the experienced person is inferior to the manual worker, because their work is not informed by the *logos,* seems to contradict the idea that the experienced person employs their rational soul and perhaps also knows what they are doing and how to do it. However, the relevant notion of *logos* also includes knowledge of *why* a certain procedure guarantees a certain result: this notion of *logos* occurs in the manual worker's production by way of the master worker, whereas it does not occur in the case of the experienced person's production.

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experienced person might know what a house is, know how to bring it into existence and even succeed in actually producing it. In this case, the house that comes-to-be is, strictly speaking, not a product of art, but is still an individual of the kind *house* and is still an artefact since its functionality is governed by an external principle. It just is not a *typical* artefact of the kind *house*. Some products might not require a specific body of expertise to come-to-be but only an intention; some others belong to artificial kinds but they might have come-to-be by the agency of a maker lacking or not activating the relevant skill but only expressing an intention or an unskilled reasoning. There is nothing wrong if the ontological status of artefacts turns out to be shared with other human-dependent objects. This is ever more the case if we consider that according to Aristotle the experienced person might turn out more successful than the artisan (*Met.* A 1, 981a12–15). It is true that in order for a particular artefact to come-to-be, the maker must possess knowledge of the universal, but the maker looks for knowledge of the object to the extent to which it is useful for their work, whereas the scientist seeks knowledge for its own sake. The goal of scientific knowledge is knowledge itself, whereas the goal of technical knowledge is production. In *NE* 1.7, 1098a29–32, Aristotle applies this difference to the carpenter and the geometer. The former seeks the right angle for the sake of the objects he wants to produce, while the latter seeks the right angle in order to acquire knowledge of its essence. The productive syllogism[61] starts from universal knowledge, but, since it ends up with something contingent and particular, it consists of steps that are not apodictically connected to each other. This is why the experienced person might turn out more successful than the artisan.

Now, a house can be brought about by art, by experience or by received instructions. However that may be, the house is a product of an external principle and lacks an inner principle of its behaviour qua house. Although artefacts are *typically* products of art, some objects, such as the house, might not come-to-be by art strictly speaking. Yet, they come-to-be by virtue of an external principle. This has consequences for the remainder of our enquiry. If the externality of the principle does indeed play a role in situating an object in Aristotle's metaphysics, it might turn out that the ontology of artefacts is shared with the ontology of other objects that have an external principle. This is, however, far from being problematic. Once we are clear as to what counts as an artefact, it is unproblematic if they enjoy the same

[61] For the relationship between the *logos* of the artisan and the practical syllogism, see Moss 2014.

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metaphysical features of other beings. A problem would rather arise if we elaborated a metaphysical explanation for a vague and unclear class of beings that just happens to include what we intuitively think of as an artefact.

A Certain Dunamis as Principle: Animal Artefacts

Aristotle clearly excludes these so-called 'animal artefacts' from the class of typical artefacts. An example of this exclusion can be found in *Phys.* 2.8. Spiders and ants are among those non-human animals about which people wonder whether they have intelligence or not. Aristotle regards animals other than human beings as lacking art and deliberation: 'they make things neither by art nor after inquiry or deliberation' (*Phys.* 2.8, 199a20–1). Interestingly, the spider's weaving a web and the swallow's building a nest are compared to a plant's growing leaves. What someone might see as an animal artefact is presented as a natural process in which the presence of a final cause is simply evident to a greater extent. Therefore, animal artefacts are not artificially caused, because art is not possessed by non-human animals.[62] Aristotle's comparison of the swallow's nest and the spider's web with the biological process of the growing leaves seems to suggest that the principle of the production is internal after all. However, the comparison intends to convey the idea that, in animal behaviour, there is no intentional planning, just like in natural processes in general. If this is the case, animal artefacts might not be artificially caused, but they can still be similar to artefacts in having an external principle governing their making and behaviour. Animal artefacts are animal-dependent objects. I defined this class as including artefacts proper and other objects lacking an inner principle. Animal artefacts are naturally caused in a secondary sense[63] (i.e. they are caused by a maker who is naturally equipped with a certain capacity). In other words, animals that are able to produce things are certainly impressive, but they are not sagacious. Aristotle talks about sagacious animals, by which he means animals able to hear, learn, be domesticated and reproduce a certain social hierarchy. Memory is a faculty that human beings share with animals. Experience is a faculty that can be found in animals other than humans too. Certain other animals are sagacious and able to learn thanks to their hearing capacity (*Met.* A 1, 980b21). These animals

[62] This point was already made while discussing *Met.* A 1.

[63] Byrne (2018, 162 n. 14) explains that 'such things seem to be natural by virtue of being products of a natural, internal principle of change, one located in the animals that make them'. However, they are natural in what he calls a 'derivative or paronymous sense'.

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are able to give and receive instructions: animals with the ability to hear are able not only to hear sounds, but also to distinguish different signs. However, animals that build are not referred to as being sagacious. This amounts to saying that the natural principle in virtue of which they build is neither art, nor thought nor any rational principle, but rather an innate capacity – like fire's ability to heat. Despite being caused by a natural capacity, animal artefacts are not natural beings.[64] A similar explanation might apply to the case of human communities.[65] Humans gather together to form a community according to a capacity they are naturally equipped with, and fulfilling that capacity is part of their nature. However, this does not make communities natural beings.

3.4 *Some* Artefacts Will *Only* Come-to-Be by Art and *Some* Natural Beings Will *Also* Come-to-Be by Art

Aristotle proposes a sharp distinction between artificially caused beings and artefacts as well as between naturally caused beings and natural beings. In other words, to be a member of an artificial kind is not the same as coming-to-be by art and to be a member of a natural kind is not the same as coming-to-be by nature. Such a distinction allows the *Timaeus*' Demiurge to be a craftsman without this meaning that the cosmos is a member of an artificial kind. Further evidence that Aristotle holds such a distinction is that he clearly envisions the possibility that some artefacts come-to-be without art as principle of their production (inadvertently made objects) and that some natural beings come-to-be without nature as principle of their generation (artificially made mixtures).

3.4.1 Inadvertently Made Objects

Aristotle states, 'Some things are due to nature; for others there are other causes' (*Phys.* 2.1, 192b8). Among the other causes, he includes not only art, but also luck (*tuchê*) and chance (*tautomaton*). Notoriously, chance is broader than luck because luck concerns people's actions alone, whereas chance also concerns animals and inanimate beings. Things occurring by chance are teleological outcomes that exceptionally occur without having nature or art as principles. More precisely, chance is privation: not only

[64] Cohen (1996, 30–1) comes to the same conclusion: 'natural artifacts do not, on Aristotle's view, possess an IP [innate impulse] any more than human artifacts do.'
[65] For this intuition, see also Byrne 2018, 162 n. 14.

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privation of nature but also of art. The fact that chance might cause the production of an inanimate being opens conceptual space for inadvertently made objects or what we might provisionally call 'artefacts by chance'. Here, I will argue that, according to Aristotle, an inadvertently made seat is not a product of art, but still a seat (i.e. still an item belonging to the kind 'seat').[66]

The very possibility that something comes-to-be by chance, or spontaneously, is explicitly asserted by Aristotle with reference to both the animal and the artificial realms. In *Met.* Z 9, he sets out the following *aporia*: why can some things come-to-be by art as well as by chance, while others can come-to-be only by art? There are indeed certain artificial things, such as a house, that cannot come-to-be without an artisan, whereas others, like health, can come-to-be even without the doctor's art. The solution to the *aporia* (1034a10–14) refers to the matter which initiates the generation of something (*hê hule ê archousa tês geneseôs*). The matter initiating a production is either: (1) capable of being set in motion by its own agency (*oia kineisthai uph'autês*) either (1a) in the particular way required (*hê men ôdi oia*) or (1b) not in the particular way required (*hê de adunatos*); or (2) incapable of being set in motion by its own agency (*hê d'ou*). It seems that some things that are brought about by art can be brought about by chance because the matter – which in the artistic production is that which initiates the coming-to-be and in which there is already some part of the final product – can, in some cases, move by its own agency. While (2) is not mentioned again, Aristotle basically deals only with (1a) and (1b), which are also the cases relevant to our discussion. We soon (1034a14–18) learn that the case of the matter of the house, namely the stones, represents an instance of (1b), for it is said that this matter is incapable of being set in motion in the particular way required unless the agency of something else intervenes. That stones can move by their own agency is not puzzling, for Aristotle clearly has in mind their natural downwards tendency. Stones can move so as to fall downwards, but not so as to form a house (i.e. in the particular way required). At this point, we could easily think that (1a) is supposed to represent the case of health. The reasoning would be the following: heat (as the matter of health) can move by itself so as to produce health (1a), whereas stones (as the matter of the house) cannot move by their own agency so as to produce a house. This is why some things can come-to-be by art as well as by chance, while others cannot.

[66] For a detailed discussion of Aristotle's take on inadvertently made objects, see Papandreou 2021.

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Aristotle then addresses the case of chance in more detail (1034a18–21). What happens when something that normally comes-to-be by art comes-to-be by chance? There are two possibilities: either (i) the motion is initiated by the agency of things that do not have art, but that can be moved by other things not having art, or (ii) the motion starts out from a part. Now, these options are unclear, to say the least, since Aristotle unfortunately does not immediately provide examples. How are we then to understand (i) and (ii)? Aristotle seems to provide an example for (ii) soon afterwards (1034a26–30), with the aim of showing how things coming-to-be by chance come-to-be out of something containing some part of the product (1034a25). Indeed, health comes-to-be out of a part of itself, namely the heat. As explained in 1034a26–30, friction can produce heat in the body, and heat in the body might be part of what health is. An example of (i) is not provided in the text, but we could imagine the case of a dam: a dam can come-to-be either by art, if a skilled builder builds it, or by chance, if a large number of stones just fall into the water ('motion will be started up by the agency of these things that do not have the art') and creates a sort of dam, as the result of an earthquake ('but are themselves capable of being moved by other things not having the art').

The more complexity an artefact displays, the more it appears to come from intelligent design. But what if we take an object that requires the matter to move according to its natural impulse? What if there is a case of an object whose matter can move in the particular way required? While Aristotle excludes the possibility that highly complex artefacts, such as a house, can come about without intention, he does not preclude the possibility that artefacts of lesser complexity might come-to-be inadvertently. What makes a house a house is a complex arrangement of matter, such that it seems highly unlikely that, in the absence of an external principle, such as a skilful maker, matter would simply arrange itself in such a way as to form a house. By contrast, what makes a seat a seat is a less complex arrangement of matter, such that it seems plausible that matter could arrange itself so to form a seat, without the intervention of a skilful maker. There is just less demand on the matter.

Aristotle provides a pertinent example, which has been widely discussed by commentators. In *Phys.* 2.6, 197b16–18, Aristotle exemplifies chance occurring to inanimate beings by taking the case of a tripod that accidentally falls on its feet and thus happens to function as a seat. The tripod therefore seems to offer an example of an artefact-like thing that comes-to-be by chance, even though it typically comes-to-be by art. Importantly, a tripod is not a property like health. To this extent, it might qualify as an

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inadvertently made object. Now, the commentary tradition has worked out the example better. Later commentators turned the tripod into a stone, explaining that it was a stone that fell and, in the process, changed its shape and happened to become smooth enough to function as a seat. The change of shape seems to be the key element for the newly created seat as the change of position alone can be due to the nature of the stone itself, which tends downwards. If it is in the nature of an object to change position in the particular way required, but the shape of the object does not undergo any change, it seems that one cannot take it as an outcome of chance after all – for the outcome is merely the result of natural necessity. Objects that typically come-to-be teleologically might also come-to-be by chance, if the matter can move in the particular way required. Now, in the case of a seat, one might say that the matter (i.e. stone) can move of its own accord in the particular way required (i.e. downwards). However, if all it took to make a seat was for a stone to fall down, this would merely be a case of a stone acting naturally. However, if the stone becomes suitable to be used as a seat because, on the way down, it changed in shape, then (i) there is not merely natural necessity involved; (ii) the stone can move in the particular way required because the motion (i.e. the change of shape) is initiated by the agency of things that do not have art (perhaps the stone striking various surfaces) but can be moved by other things not having the art (whatever caused the falling of the stone).

Things that typically come about by art might still come about by chance (provided that the matter undergoes some relevant change like a change in shape), but this does not make them different things. A seat typically comes about by art, but it might come-to-be by chance – yet the seat that comes about by chance is still a seat. What we ought to say, then, is that things belonging to artificial kinds might occur without intention. However, not all artificial kinds have members that might occur without intention. A house, for instance, can only come-to-be by art.

3.4.2 *The Case of Artificial Mixtures*

Some artefacts will come-to-be *only* by art. A house, for example, embodies such a complex arrangement of the matter that it will not come-to-be if not by art or by an external principle of this kind. As we have seen, a house might even come-to-be by experience, but it will not come-to-be by chance.

Now, mixtures or chemical compounds are a peripheral case, but a tricky one to assess. Some mixtures might come-to-be by chance, others

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are far too complex for this to happen.[67] Some are only found by nature, others are at least reproducible by art, others again could not exist without a highly skillful maker. Here, I argue that mixtures, even the ones that can only come-to-be by art, are not members of artificial kinds, and thus they will not play a central role in this book. What is more, the case of mixtures is further evidence of how divergent the concepts of artefacts and products of art are: even things that can come-to-be *only* by art might fail to be artefacts. To reformulate the claim somewhat more provocatively, there exist some natural beings that can only come-to-be by art.

Aristotle mentions cases of mixtures both in the *Physics* and in the *Metaphysics,* but it is only in his elementary physics and chemistry offered in *GC* that *mixis* plays an important role. A mixture[68] is the result of the unification (*mixis*) of ingredients through their reciprocal interaction (*GC* 1.10, 328b20–4): '*mixis* is the union of the things mixed after they have been altered' (328b22).[69] The character of a mixture is intermediate between the characters of its ingredients. Aristotle does not distinguish between *mixis* and *krasis* (i.e. fusion) in *GC* 1.10. However, we know from *Top*. 122b26-31 that *mixis* in its narrower sense is a composite of dry ingredients, whereas *krasis* is the fusion of liquids. One example occurring in both *Phys*. and *Met*. is that of honey-water. While in *Met.* H 2 the principle of honey-water is *krasis* and *krasis* is subsumed under the case of forms of the kind *sunthesis tês hulês*, in *GC* 1.10 *krasis* is paired with *mixis* in opposition to *sunthesis*. This inconsistency is easily justifiable in terms of the different angle and aim of the two passages. We will analyse the first passage in Chapters 4 and 7, but we can already clarify the second. In *GC,* Aristotle is concerned with distinguishing *mixis*, any kind of *mixis* irrespective of the resulting phenotype, from other kinds of change. There is a crucial aspect in which *mixis* differs from *sunthesis*: a mixture is a homoiomerous result, in that every part of it is the same as the whole (*GC* 1.10, 328a5-12), thus it presupposes that all its parts share the definition of the whole. An example of a natural mixture is blood: every part of blood is indeed blood (*GC* 1.10, 328a9–11). This is not the case with *sunthesis*. A product of *sunthesis* is, for instance, a house: a house is not a homoiomerous result and its parts are not

[67] I take this claim to be genuinely Aristotelian, but it can certainly be controversial to some. An atomist, for example, might deny it for objects of any order of complexity.

[68] A terminological clarification is due. I am calling 'mixture' the result of *mixis* as the process which brings it about. There are many interpretative problems with the concept of *mixis*, such as whether it is a generation, and alteration, or something different in between. For important contributions on mixture, see Cooper 2009; de Haas (2016); Fine 1995, 1998; Krizan 2018; Burnyeat 2004; Scaltsas 2009.

[69] On this definition, see, for example, Frede 2004; Wood and Weisberg 2004.

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the same as the whole. *Mixis* is therefore a change that reaches all the way down to the natures of the ingredients.

Now, there are certainly many interpretative problems concerning mixture and the features that Aristotle ascribes to them. However, one rather uncontroversial point is that Aristotelian mixtures are homoiomerous.[70] An explicit statement of this is to be found in *GC*. 1.10, 328a10–12: 'if mixture has taken place, the compound *must* be homoiomerous – any part of such a compound being the same as the whole, just as any part of water is water.' Homoiomerous beings are the elements, uniform chemicals and organic tissues, like flesh and bones. A thorough treatment of the topic of homoiomera is contained in *Meteor.* 4.8–12, where Aristotle focuses more on higher-order mixtures. These mixtures include (4.10, 388a13–18): 'metallic substances (e.g. bronze, gold, silver, tin, iron, stone, and similar material and their by-products) and animal and vegetable tissues (e.g. flesh, bone, sinew, skin, intestine, hair, fibre, veins) from which in turn the anhomoiomerous bodies, face, hand, foot, and the like are composed'. There are mixtures that come about out of the elements or simple bodies, and higher-order mixtures that come about from the mixing of already composite bodies. To take an example from the *Phys.* and *Met.*, we could say that honey is a mixture of elements, and honey-water a higher-order mixture – or again refer to tin and bronze and the unnamed mixture of the two. But both kinds of mixtures are homoiomera. For now, we should not be concerned with the explanation of each organic and inorganic body and their behaviour. What is rather crucial for the present discussion is understanding whether both organic and inorganic homoiomera alike are to be considered natural beings. If every mixture is homoiomerous,[71] can we also claim that every homoiomerous body is a natural being?

We might have the general intuition that homoiomerous bodies are natural beings according to Aristotle. They are chiefly addressed in works such as *Meteor.* and *GC*, which are works of natural philosophy dealing with *ta phusei onta*. We also know that the class of natural beings is wider than the class of living beings, and we have no apparent reason to believe that only elements constitute that portion of lifeless natural beings. While

[70] The scholarship discusses how many features Aristotle is pointing to and whether the potentiality of mixtures' parts is a feature or the solution of the *aporia*. Moreover, Krizan (2018) argues that *GC* 1.10 is about higher-order mixtures (i.e. mixtures out of already compounded bodies), whereas Aristotle would be dealing with the mixtures out of the simple bodies only in *GC* 2.7. She claims that not all features apply to both types of mixtures.

[71] Note that not all homoiomerous bodies are mixtures, for the elements are homoiomerous without being mixtures.

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Meteor. (389b25) speaks about the nature of compound bodies, in the background there is the statement in the *Phys*. that having a nature amounts to being by nature. Moreover, the opening lines of *De Caelo* (267b1–268a6) state that the science of nature (*he peri phuseôs epistêmê*) concerns itself with bodies and magnitudes, a subject matter that also involves compound bodies.

A general intuition that homoiomerous bodies might be natural shall be accompanied by the test of *Phys.* 2.1. In other words, we should inquire as to whether homoiomerous bodies possess the salient feature of natural beings (i.e. an inner principle of their behaviour concerning them qua themselves; *Phys.* 2.1, 192b8–15). Although in the case of homoiomera, as compared with the case of animals, nature is responsible for a rather limited range of changes, it might still function as the inner principle of their behaviour – however restricted it may be. According to the definition of nature offered in *Phys*. 2.1 elements are natural beings, and so are parts of animals. While organic homoiomera seem to be covered by the explicit mention of both the four elements and parts of animals, inorganic homoiomera are less obviously included.[72] Whenever homoiomerous bodies are mentioned, Aristotle places them between the elements and the living beings, leaving the reader unsure as to whether the point made only applies to organic mixed bodies: 'The homoiomerous bodies are composed of the elements, and serve in turn as material for all the works of nature' (4.12, 389b26–8).

The problem seems to turn on whether we can safely say that inorganic homoiomera, which might occur as stand-alone homoiomera, possess an inner principle governing their behaviour.[73] We have reason to answer positively. In the list of natural beings of *Phys.* 2.1, Aristotle states that the class of natural beings also includes the elements 'and things like them'. By 'things like them', he might be referring to homoiomerous bodies to the extent to which they are *like* the elements in being indeed homogenous.[74] More persuasively, however, the clarification that artefacts such as a couch have an inner principle governing their behaviour qua things 'made of stone, earth, or a mixture of the two' more directly identifies inorganic

[72] Aristotle's lists of natural beings do not explicitly mention them. For instance, *Met.* Δ 4, 1015a5 mentions as things by nature animals and their parts, for they are composed of matter and form.

[73] This is not obvious at all. See Krizan 2018; Mirus 2006. This is also related to the problem of whether one can treat all homoiomerous bodies as a uniform class.

[74] 'The simple bodies and everything of that sort' in Δ 8. See also Z 2, 1028b8–15, 'natural bodies such as the elements and other things of this sort'. Things of the same kind as the elements, but that are not living beings and their parts, must be compounds of elements.

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homoiomera as natural beings.[75] While nature as a principle of behaviour of the elements originates their natural motion downwards or upwards, nature as the principle of behaviour of more complex homoiomera dictates their motion according to their phenotype. Their behaviour consists of (i) their capacity to act on the various senses, as well as (ii) their aptitude to be affected. This is most clearly stated in *Meteor.* 4.8, 384b30–385a10, where Aristotle explains that compound bodies (*ta homoiomerê sômata*) are characterised by active capacities in relation to sense perception, such as white, fragrant, noisy, sweet, hot, cold and 'more characteristic' (*oikeioterois* at 385a4–5) passive capacities, such as the aptitude to melt, solidify or bend.[76] This is the range of behaviours exhibited by a compound body and constitutes its nature. In fact, it concerns the compound body not qua composed of elements or other less complex compound bodies, but qua itself.

This range of capacities does not fade away if the mixture in question is made by art. For instance, whether ice is found by nature or intentionally manufactured by a human agent, it does not make a difference: ice still counts as a natural being in that it possesses an inner principle of its behaviour (i.e. nature). If every mixture is a homoiomerous body and every homoiomerous body is a natural being, even high-order mixtures qualify as natural beings in virtue of their possessing nature as an inner principle. We need not confine the result to the elements and their mixtures. For instance, among the liquids that are thickened either by heat or by cold, as they consist of more than one element, Aristotle mentions oil and honey and sweet wine alike. Therefore, some natural beings might *also* come-to-be by art. What is more, some natural beings might be able to come-to-be *only* by art. Take theriac,[77] for instance, a complicated drug made from dozens of hard-to-find ingredients. Its great complexity makes it extremely unlikely that theriac will come-to-be by chance. However, if theriac is a mixture, and a mixture is a homoiomerous being, theriac still qualifies as a natural being. For this reason, our reconstruction of Aristotle's ontology of artefacts will not deal with mixtures, for even the exclusively artificial mixtures possess the salient feature of natural beings. To this extent, homoiomerous bodies represent

[75] A stone is a first-order mixture, whereas a mixture of stone and earth is a higher-order mixture.

[76] Here Aristotle also says: 'These are the qualities that differentiate bone, flesh, sinew, wood, bark, stone and all other homogeneous natural bodies.' The homoiomerous bodies are all treated as one distinct class, where there is no distinction between lifeless and alive.

[77] A whole treatise on theriac is ascribed to Galen (see Leigh 2015). See Adamson (2023) for Avicenna's take in *Healing Metaphysics* 1.10.7.

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the Aristotelian counterpart to what today are called 'artificially produced members of natural kinds'. Things such as seedless grapes and synthetic chemical compounds are nowadays debated as tricky cases, insofar as they often fail to be straightforwardly categorised either as natural or as artificial beings. Aristotle's account of homoiomera seems to make room for artificially produced members of natural kinds, since ice is still a member of a natural kind even when produced artificially. This means that artefacts – meaning members of artificial kinds – are never homoiomerous or mixtures. Once the ontology of artefacts has been fully presented, we will also be able to appreciate how this ontology departs from the metaphysical explanation of mixtures.

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