

5 From Craft to Nature: The Emergence of Natural Teleology

Thomas Kjeller Johansen

A teleological explanation is an explanation in terms of an end or a purpose. So saying that 'X came about for the sake of Y' is a teleological account of X. It is a striking feature of ancient Greek philosophy that many thinkers accepted that the world should be explained in this way. However, before Aristotle, teleological explanations of the cosmos were generally based on the idea that it had been created by a divine intelligence. If an intelligent power made the world, then it makes sense that it did so with a purpose in mind, so grasping this purpose will help us understand the world. This is the pattern of teleological explanation that we find in the Presocratics and in Plato. However, with Aristotle teleology underwent a change: instead of thinking that the ends were explanatory because a mind had sought to bring them about, Aristotle took the ends to operate in natural beings independently of the efforts of any creative intelligence. Indeed, he thought that his predecessors had failed to understand what was distinctive of nature, namely, that its ends work from the inside of natural beings themselves.

In this chapter I consider how Aristotle negotiates this shift from 'unnatural' to 'natural' teleology.¹ It has sometimes been suggested that Aristotle ceased to consider 'unnatural' teleology proper teleology at all,² or that he saw the differences as so important that only a relatively weak or insignificant analogy remained between craft and natural teleology.³ I want to argue against such views. Aristotle inherited from Plato's cosmology a particular model of craft, which is key to understanding his natural teleology.⁴ And it is only by understanding this inheritance that we can assess the extent to which Aristotle's natural teleology represents a genuine innovation.

THREE EARLY TELEOLOGISTS

Before Aristotle, teleological explanations were generally offered in the context of intelligent causes. As David Sedley has shown,⁵ such

teleological explanation is more widespread in the Presocratics than has been commonly thought. Let me give three brief examples. Anaxagoras said that reason (*nous*) organised and governed the cosmos. Plato and Aristotle criticised him for failing to show how reason worked for the sake of the good,⁶ and for relying instead on material processes, centrifugal motions, and the like, to explain the world order. However, a failure to provide proper teleological accounts does not mean not attempting to give a teleological account. Indeed, Aristotle accepts that Anaxagoras was trying to provide a teleological account.⁷ Moreover, behind Aristotle's criticism lies a distinctive and demanding conception of teleological explanation: it should not just be shown that the good occurs as a result of a certain process, or that the process generally brings about this good outcome, nor again should it merely be shown that the good causes the outcome through this process; it should also be shown how the good *as good* directs the process. It is therefore not enough for a teleological account to say that *nous* causes a good result: we need also to understand in what way the result was good such that *nous* chose to bring it about.⁸

There is some evidence that Anaxagoras did indicate how the material processes work for the best. *Nous*, he tells us, works by first separating out the various elements in the original mixture of all elements. Here the planets were formed as rocks hurled out towards the extremities of the world. This world-order also serves as a background for the creation of plants and animals. So, according to Sedley, '*Nous* is a farmer. Its creation of worlds is its way of setting up environments which enable seeds to germinate with plant and animal life the outcome.'⁹ Anaxagoras may have relied on the agricultural model to suggest that *nous* operates teleologically by the processes familiar to most of us from working the land: tilling, weeding, watering, and so on, are clearly all processes informed by the good of plant growth. We would then understand the processes of nature as teleologically directed towards the variety of lifeforms we see around us. This brings us back to the importance of craft as a model of teleological causation. Farming is a craft, one which, more than some other crafts, works by facilitating processes that nature already initiates; nonetheless, its procedures are clearly regulated by the farmer's idea of the good.

After Anaxagoras, Empedocles explained the cosmos in terms of two forces, Love and Strife. They were responsible respectively for the coming together and separation of the four basic elements. At different

times Love or Strife dominated. Several fine works are ascribed to Love. Since Love caused them it is reasonable to think that they are fine because Love wanted them to be so.¹⁰ We see in the case of the eye how Love or Aphrodite fashioned the eye like a lantern illuminating man's surroundings at night allowing him to see (fragments 84, 86). It is plausible to see Love in such contexts as operating like a craftsman seeking to produce the best possible product. Fragment 24 makes the point explicit, comparing the cause of living beings to a painter:

As when painters decorate offerings,
men well trained by wisdom in their craft,
who when they grasp colourful chemicals with their hands,
mixing them in combination, some more, some less,
from them provide forms like to all things,
creating trees, men, women,
beasts, fowls, water-nourished fish,
and long-lived gods foremost in honours.

(Empedocles fr. 24, trans. D. Graham)

The emphasis is on the variety and adaptation of living creatures ('water-nourished', 'long-lived'). The parallel is with the well-trained craftsman who knows what he is doing, and is able to produce a variety of colours of beauty and value, such as offerings to the gods, while the craftsman of nature mixes the elements to produce beings that are 'foremost in honour'. Clearly in both cases the value of the outcome directs the production.

Finally, the less obvious instance of Parmenides' cosmology.¹¹ In the first part of his poem, the so-called way of truth, a goddess describes being as changeless and unitary. Nonetheless, in the second part, the 'way of opinion', she accounts for the cosmos as subject to plurality and change. Clearly the way of opinion is cognitively inferior to that of the truth, though it may still have some credibility. In his cosmology Parmenides in fragment 12, lines 3–4 refers to a goddess (*daimôn*) in the middle of the cosmic rings, 'who governs (*kubernai*) all things: for everywhere she rules over hateful birth and mixture'. The language suggests an organising god. Again in fragment 13 the goddess is said to have 'devised' *Erôs*.¹² It would be the cosmic goddess's intellectual efforts, then, which are the cause of the cosmic order. Parmenides' word for this order is *diakosmos* (fragment 8.60), which implies a *proper*

arrangement. So here too, it seems, we find a teleological cosmology premised on a deity who deliberates about how to make the best world.

PLATO

The sampling of three Presocratics has shown that teleological accounts were on offer prior to Plato and Aristotle and that they were cast in terms of an ordering intelligence, even craftsmanship. However, while the Presocratics used notions related to craft to explain the cosmos, they did not articulate what kind of cause a craftsman is or why it is appropriate to invoke crafts when explaining the cosmos. In the absence of any explicit theory of what it is to be a cause, this is hardly surprising. It falls instead to Plato to offer the first such theory, most clearly in his *Timaeus*.

The cosmology of the *Timaeus* is based on the premise that the cosmos was caused by a divine craftsman (*dêmiourgos*).¹³ The craftsman is referred to as what is responsible for the cosmos. A distinction, however, is observed between what is responsible (*aitios*) and his cause or reason (*aitia*) for creating the cosmos.¹⁴ The cause is god's wish to make everything as like himself as possible, which Timaeus rephrases as his wish for all things to be as good as possible, a paraphrase that follows naturally from his claim that god is all good. This cause combines two elements: a wish, which one might understand as a rational desire or desire of reason, with an object clause that specifies what the desire is for. It is the good-as-desired-by-an-intelligence, then, that works as the cause (*aitia*) of the cosmos. Later Timaeus will refer to this cause as the intelligent cause (46d8).

It is no surprise that god as a craftsman should want to make the world as good as possible. As Socrates argued in *Republic* 1 (341c–342e), the craftsman, as such, works for the best of his subject. The craftsman, then, is the kind of cause which makes things for the good.¹⁵ Like other craftsmen, the demiurge works with materials, which he shapes to make as fine as possible. Also characteristically, the craftsman does not work to make just a part of his product fine, but strives to make all of it an ordered whole.¹⁶

In these respects, Plato's cosmic craftsman does not seem to differ significantly from Anaxagoras' *nous*, or Parmenides' cosmic goddess: they too were the cause of a *diakosmos*, a well-ordered whole. However, there are two other features of Plato's craftsman,

which have no precedent in Presocratic philosophy, and which fundamentally shape his, and, as we shall see, Aristotle's, conception of cosmology. The first of these is that a proper craftsman looks to a model, which is an eternal character or form.¹⁷ Thus Timaeus argues (29a) that the cosmic craftsman clearly must have looked to an eternal rather than a perceptible paradigm. Given the imperfections of the perceptible, only an eternal paradigm will make the product as good as possible. It is highly likely that Plato's notion of forms was inspired by Parmenides' description of being as eternal, changeless, and one, as we saw, but there was no clear suggestion in Parmenides that such being served as a model for whoever made the cosmos. Plato, then, is basing his notion of a craft on a distinctive and novel theory of reality, whereby there are eternal forms which craftsmen look to as the model.

The demiurge's wish to make the world as good as possible is its cause, and his strategy for making it so is likening it to the forms. However, the world is a product not just of divine intentions, but also of 'Necessity', which reason persuaded to work for good ends (47e–48a). 'Necessity' represents the processes and attributes that arise necessarily from the constitution of the simple bodies and their compounds. Timaeus refers to this necessity as the 'wandering cause' (48a7) since these processes and attributes are untrammelled by the goals or direction of reason. Still, the processes may be *used* by reason for such ends, and if so they acquire the status of 'contributory cause' (*sunaition*). The account of vision illustrates the point. Vision involves fire issuing from the eyes, meeting with daylight, forming thereby a 'visual ray', along which qualities of the sense-objects are transmitted through the body to the soul. These material processes are employed by vision, but they are not the reason why we have eyes:

All these are among the contributory causes which god uses as servants in shaping things in the best way possible. But they are thought of by most people not as contributory causes but as causes of everything, achieving their effects by heat and cold, solidification and liquefaction, and the like. Yet they are completely incapable of having reason or intelligence; for the only existing thing which properly possesses intelligence we must call soul, and soul is invisible, whereas fire, water, earth and air have all come into being as all visible bodies. So the lover of intelligence and knowledge is bound to investigate, first, causes of a rational nature, and, second,

those causes that occur when things that are moved by some things of necessity move other things. Our procedure must be the same. We must deal with causes of both sorts, distinguishing those that with intelligence are craftsmen of what is beautiful and good from those which when deprived of wisdom on each occasion bring about a random disordered result.

What makes this passage crucial in the history of teleological thought is the notion of a contributory cause. One way of bringing this innovation into focus is to compare Socrates' treatment of causes and their necessary conditions in the *Phaedo* (98b–99c). Here Socrates insisted on the distinction between a proper cause (*aitia*), which would show why a certain feature was good, and that without which the cause would not be a cause. Socrates' example was the account of his sitting in prison. The cause was his thought that it was better for him to stay and face his punishment than to run away; the necessary conditions of his doing so were the workings of his legs, bones, sinews, etc. One might construe the notion of a necessary condition in two ways. One is as a mere necessary condition. In this sense there are innumerable necessary conditions of Socrates' sitting in prison which are not specifically conditions of this outcome rather than many others, e.g. the law of gravity or the presence of oxygen. But there are also conditions that are more directly linked to the *explanandum*. One might perhaps think that legs, bones, and sinews were picked out by Socrates because of their relevance to sitting. But Socrates points out that these same limbs would have been on their way to Megara had it not been for his wish to stay. This comment includes the limbs amongst those mechanisms, like heating or cooling, being added or taken away, that fail as causes because they could equally well bring about opposite results.¹⁸ There seems therefore to be no particular explanatory link for Socrates between the necessary conditions and the proper cause: they seem rather to be mere necessary conditions.

Socrates said in the *Phaedo* that he had to abandon his search for real causes. When Plato returns to the creation of the cosmos in the *Timaeus*, the situation has changed. The key factor in this change is the introduction of the craftsmanship model. In the *Phaedo* there was no indication that the *nous* Socrates hoped for was going to work specifically as a *craftsman*; the notion of 'steering' (*diakubernan*) or ordering the cosmos was vague enough to allow for any directive action. Nor,

relatedly, was there any indication how certain necessary conditions could be understood as instrumental in specifically bringing about certain good outcomes. We may indeed take Plato's and Aristotle's complaint that Anaxagoras failed to use his *nous*, referring instead just to blind material processes, as a reflection on the explanatory disconnect between a cause working for a good and the processes supposed to produce this good. This is exactly the sort of connection that is established by showing how certain processes are *instrumental* in producing the good. Necessary processes now become integrated into an overall causal story dictated by the good they serve. Craft provides such an integrated causal account. The craftsperson starts from a conception of the product they want to fashion and then reasons about the specific processes, materials, and tools that will help them bring it about. With the craft model comes, then, a form of explanation whereby causes are ordered as either directive ends or instrumental causes specifically contributing to such ends.¹⁹ This model mends the shortcoming that Socrates saw in Anaxagoras.

Viewing material processes as contributing causes in this sense opens up another notion of necessity, what we might call 'conditional' or, with Aristotle, 'hypothetical necessity'. The thought is that certain features are necessary *if* there is going to be a certain end. One might initially hesitate to attribute to Plato this notion of hypothetical necessity. There is after all a difference between invoking necessary processes that serve an end, and considering those processes as necessary *because* they serve the end. Only the second counts as hypothetical necessity. There are several places, however, where Timaeus uses the notion of 'necessary for an end'. So at 41c the demiurge bids the assistant gods to create 'every kind of living creature which it must have *if it is* to be sufficiently complete'. Again he says of the human souls that they are embodied 'by necessity' (42a), which again must refer to the necessity of god's plan for the cosmos. The processes of vision involved irrational necessity, but they are also necessary for the end of vision: 'For I reckon that sight has become the cause of the greatest benefit to us in that not a word of all that is being said now about the universe would ever have been said *if we had not seen* stars and sun and heaven' (47a). In a similar vein, Timaeus presents pleasure and pain as a necessary consequence of the soul's embodiment (69c–d), but then also says that feeding the appetitive soul is 'necessary, *if mortals were to exist* at all' (70e5). There are, then, bodily processes that may be necessary in their own right, but are also necessary if certain divine ends are to be.²⁰

It is not just the *Timaeus* that draws this nexus between contributory causes and conditional necessity. In the *Statesman* the Eleatic Visitor explains the notion of a contributory cause in terms of hypothetical necessity:

Visitor: 'Well then, let's look at two sorts of expertise that are in relation to all the things that people do.' Young Socrates: 'Which are they?' V: 'One which is a contributory cause of production, one which is itself a cause.' YS: 'How so?' V: 'Those which do not make the thing itself, but which provide tools for those that do – tools which, if they were not present, what has been assigned to each expertise would never be accomplished.'

(Pl. *Plt.* 281d–e, trans. C. Rowe)

Again the contributing cause is not a mere necessary condition. It is that of a tool required for a specific job. As Socrates says at *Cratylus* 389b–c, there is a tool that is naturally suited to each kind of function, e.g. a shuttle that is suited to each kind of weaving, and each tool must be made to suit each function. So we should understand contributing causes as necessary for the realisation of a *specific* end. A craftsperson after all chooses the instruments and materials required for a specific job; the weaver will worry about the appropriateness of his shuttle, the blacksmith about the hardness of her drill; it is not their brief to put in place the law of gravity, the light of day, the hardness of wood, or the softness of wax, or any of the umpteen general conditions that are equally necessary for their activity and many others. So if the processes invoked as contributory causes are those that serve specifically as instruments for the craftsperson, we should expect them to include not all necessary conditions, but just those that are specific to the job in hand. Of course, if you are a *cosmic* craftsman these tasks are many, but the point remains.

While previous philosophers too had seen the world as the well-ordered product of a designing intelligence and craftsman, Plato refigured the notion of craftsmanship involved in two crucial ways: (1) the production aimed to imitate an eternal form and the product was good to the extent that it was like this form, and (2) the materials and processes used in the production were understood as contributing causes specifically geared to bringing about this good and as hypothetically necessary for it. While these two features were for Plato aspects of craftsmanship, we shall see that they will be reworked as key aspects also of Aristotle's *natural* teleology.

ARISTOTLE

The Priority of Form

It is no accident that Aristotle's natural philosophy frequently refers to craft. He is writing in an Academic context, in which *the* model of teleological causation is that of craft, understood Platonically, as we have seen. He also in important ways followed it as his model for natural teleology.

In *Physics* 2, Aristotle argues that nature is said in the sense of both matter and form. He uses the analogy with craft to characterise the relationship between matter and form in natural beings. Natural beings are like artefacts in that the form is prior to the matter. For just as we say that a chunk of wood is not a bed unless it has the form of a bed, so we do not say that some matter has the nature of bone or flesh until it has the form of bone or flesh.²¹ On this point he relies on a basically Platonic conception of form. The form is the object of definition, expressing the essence of this kind of thing, and the material thing qualifies as being this kind of thing only insofar as it possesses the form.

Like Plato, Aristotle understands the craftsman as thinking about this changeless, universal form. It is this form that is defined by the craft. The definition (*logos*) gives the craftsman the basic information required to bring about the product.²² So the doctor understands what health is, its essence or form. Having this form in her mind, she is then able to realise the form in the matter. The artefact comes to be like the form the craftsman had in mind. Aristotle takes the form to be the same in all particular artefacts of a kind, as artefacts of this kind. True, all houses need not be the same – they will differ in shape, orientation, materials, colour, and so on – but they will all share certain basic features, a structure, that defines what it is to be house. The craftsman as such is viewed as the conveyer of this invariable and universal form.

In *Metaphysics* 7.7 Aristotle is concerned to show that all kinds of coming-into-being presuppose a form that is already present. There are some tricky cases of so-called spontaneous generation, say maggots suddenly appearing in food, or abnormal progeny, e.g. mules born of horses. But generally we observe that a living being is generated by a mature member of the same kind: 'man generates man' is Aristotle's motto. In artistic production, in contrast, the craftsman is not of the same kind: a man makes a house, not another man. However, the form of the house, as we saw, is already realised in the craftsman's soul in virtue of his

craft. It is this form that is conveyed by the craftsman to the building materials. *Qua builder*, then, but not *qua* human, man does generate something of his own kind.

The point relates to the central difference between craft and nature: in nature the moving or efficient cause is internal to the product, in craft it is external.²³ In nature we see the same kind of thing developing into actuality by its own agency: a child grows into an adult by itself. The environment merely facilitates the natural tendency of the child to grow up. The form is already present in the matter sufficiently to propel the child to adulthood, if nothing interferes. The matter of artefacts does not generally have such tendencies: their form needs to be imposed from the outside by a craftsperson. Still, even on this point of a fundamental contrast, Aristotle does not abandon the craft analogy. For there is a special case of craft which illustrates the way nature works from within, namely, a doctor healing himself. Here too the moving cause of health is internal to the patient. To be sure, in this special case the doctor only happens to be the same as the patient – doctors mostly cure other people than themselves – while in nature agent and patient, what undergoes the change, are essentially the same. Still, the way the moving cause is present in the patient is sufficiently similar for the craft case to be illuminating.

The prior presence of form in the craftsman helps Aristotle explain natural generation in further ways. So it allows him to show what comes into being and what does not. Neither the form nor the matter is generated, he argues, only the particular composite. Consider the production of a bronze sphere. The matter, the bronze, the craftsman finds in nature, but the form too pre-exists the particular bronze sphere. For this is the universal form of sphere, and no craftsman makes what it is to be a sphere. What the craftsman does, having availed himself of the bronze and having understood what a sphere is, is to implement this form in this matter, to make this particular bronze sphere. Similarly, in nature something that already has the form of man, the universal form of human being, informs some matter. The father transmits the human form to the matter, which Aristotle explains in the *Generation of Animals* is the contribution of the female. Out of these two, this particular human being is generated.

The conception of form that allows Aristotle to establish this parity between craft and nature is again the Platonic one of a changeless, invariable form expressed in a definition. True, Aristotle also takes a

swipe in *Metaph.* 7.7 at Plato for his claim that the forms are separate from the particulars they help bring about. However, this is a point worth making for Aristotle, exactly because the analogy between craft and nature has shown that the form pre-exists any particular composite created from the form. If the form pre-exists any of the particulars it helps bring about, could it not, then, also exist separately from *all* of these particulars? The answer for Aristotle, against Plato, is a 'no'. What Plato misses is the proper conception of the efficient cause: the efficient cause is a particular entity, explaining why a particular change happens on a particular occasion. If the form is to act as an efficient cause, it needs to exist as a feature of a particular. Again, 'man generates man' in the sense that a particular instance of the form generates another instance of the same form. If the form existed separately from all particulars, it could never act in this way.

Final Causation in Craft and Nature

We have seen Aristotle use the craft analogy to establish the priority of form over matter in two ways: it takes priority over the matter in the definition of what the thing is and it takes priority temporally in the generation of the thing. We shall now see how he exploits the craft analogy also to present a notion of form as function, a notion which in turn allows him to shed further light on the priority in definition of form over matter.

Of Aristotle's four causes we have already encountered three: the formal, the material, and the moving cause. However, teleology is above all about the fourth, the final cause, the end, 'that for the sake of which'. Natural beings are determined by their formal cause, as we saw. But if we ask what their form is, the most proper answer is generally their end. This end, in turn, Aristotle takes to be their proper function, that is, their ability to act or be acted on in certain ways. So what a certain living being is, for example, is primarily understood by its distinctive abilities to act and suffer in various ways. The functional understanding of the form is typical of natural beings, and contrasts, for example, with the way mathematical objects are defined. But it is not unique to them: artefacts too are defined by their function, a house by its providing shelter, a saw by cutting, or an axe by chopping. Again Aristotle uses this fact about artefacts to explain the role of function in natural beings. So in *De anima* 2.1 he argues that the soul

is the form and actuality of the living body, and illustrates this view by analogy with an artefact. He says that the soul is the essence of a living body, just as the being of an axe is its ability to cut. This functional understanding of the soul allows Aristotle to understand the body as what has the ability to engage in these functions. So an eye, say, without the ability to see would be an eye in name only ('homonymously' is Aristotle's word, 412b21), just as an axe without the ability to cut is no real axe.

It is far from obvious what complex natural beings are for. Artefacts, in contrast, are typically designed with a simple function in mind. The craft analogies invite us to think in the same way about natural beings. So asking what a snail is, for example, the craft analogy shifts our attention away from a vast range of facts about it – what it is made of, what sort of shape or colour it has, its uses in cooking or medicine, etc. – to what the snail does, e.g. moving and perceiving in very specific ways. The craft analogy helps us focus on identifying the proper function of a natural being as our starting point for understanding other facts about it – how it is composed, how it is generated, grows up, feeds, and so on.

More particularly, the craft analogy helps us identify the proper function by directing us to a hierarchy of functions. For the crafts are organised hierarchically, some crafts helping realise the ends of others. So, in the example of the *Statesman*, the art of carting is subservient to the art of weaving, or in the *Euthydemus* (290b–c), the art of fishing serves the art of cooking, in both cases because the latter art knows how to use the products of the former. In *Nicomachean Ethics* 1.1–2 Aristotle argues on the analogy of the crafts, that human beings too pursue some ends as means to further ends which lead to a single end as the highest good. Approaching natural functions in this way directs us to a few structuring or architectonic functions as the most important, with other functions sub-serving them in various ways and at various removes. So the functions of living beings are hierarchically ordered: in animals, for example, nutrition serves perception, while in humans both are subservient to reason. The biological works show that there will typically not be a single function characterising one kind of living being. Animals typically display a range of irreducible differentiae, e.g. a dog is both viviparous, blooded, and four-footed. But many functions may still be seen as serving a few such characteristic functions.

Hypothetical Necessity

We have seen that Aristotle uses the craft analogy to express how the final cause works so as to structure the development, parts, and activities of natural beings. In *Ph.* 2.8 he argues for the primacy of final causation against certain opponents who took natural beings as necessarily arising from the hot and the cold and such material elements. Aristotle's reference to these opponents closely mirrors Plato's in the *Timaeus* 46c–e: those thinkers who take everything to arise by necessity, e.g. through the heating and cooling of bodies. Through the example of rainfall, which works exactly in terms of heating and cooling (198b16–21), Aristotle argues that proponents of necessity cannot explain the regularity with which good outcomes happen in nature. To explain that we need to assume that natural processes happen *for the sake* of the good.²⁴

Having established that nature works as final cause,²⁵ Aristotle in *Ph.* 2.9 wants to show how properly to understand necessity in those cases where final causation operates. Examples from craft show that the opponents' notion of necessity is inadequate in dealing with phenomena that are teleologically explained. Take the case of a wall. If the opponents were to explain a wall the way they explain natural beings, they would have to do so by reference to the natures of each of the constitutive materials: stone sits at the bottom of the wall because of its weight, the somewhat lighter earth settles further up, and the lightest wooden planks rise to the top. However, as Aristotle points out, the wall has come about for the sake of shelter, and while it is true that it could not come about without stone, earth, and wood, or materials with such properties, the reason why the materials are there is to serve the function of a wall, protecting property and people. The opponents talk as if the materials necessitate a wall, but the materials are there in the first place only because of the final cause. The materials are there only because there is going to be a wall, so it is the wall that necessitates the presence of the materials rather than the other way around. It is this conditional dependence of the matter on the final cause that Aristotle refers to as hypothetical necessity. His term 'necessity *from* hypothesis' brings out the direction of dependence: 'if E(end), then necessarily M(matter)'. Contrast the materialist's 'if M then necessarily E'.

Aristotle generalises from the example of the wall to other cases of final causation and offers the further illustration of the saw (200a7–13). In the argument of 2.9 there is no attempt to justify the applicability of hypothetical necessity to nature in particular. Examples from craft, a

wall, a saw, a house, carry the entire weight of the argument. This does not in itself weaken the argument, since Aristotle's aim is to show that where there is final causation, we need to understand the sort of necessity that attaches to the materials primarily as hypothetical rather than the necessitation by matter relied on by the opponents. To be clear: this is not to say that Aristotle denies necessitation by matter – fire does heat of its own accord, stones do fall down – only that where good ends are generally achieved, in craft as in nature, the necessity that explains how these ends come about is primarily hypothetical. Since we already know from the previous chapter that final causation does operate in both nature and craft, we can assume that if hypothetical necessity applies to craft insofar as craft displays final causation, then it will also apply to final causation in nature. However, if one did not accept the generalisation that final causation equally operates in craft and in nature, because one thought, for example, that craft only offered some weak analogue or metaphor for nature, then it is much harder to see how the argument of *Ph.* 2.9 could work.

In *Metaphys.* 5.5 Aristotle explicates the notion of hypothetical necessity in terms of a contributory cause, *sunaition*. His examples of a contributory cause are food (as in *Timaeus* 70e5), something without which one cannot exist, as well as other things which are necessary for the realisation of one's good. This notion of the necessary as necessary for an end contrasts (as in the *Physics*) with what is necessary in the sense of what is compulsory, since it has to do with what is necessary given a certain end, living or the good, as it may be.²⁶ The notion of a contributory cause is then a way of explicating the conception of hypothetical necessity.

We have already observed the Platonic template for the term *sunaition*. In the *Timaeus* the term applied specifically to necessary processes insofar as they were persuaded to contribute to the intelligent *aitia*. We also noted how Plato viewed such processes as necessary *if* a certain good end was to be. This link between contributory cause and conditional necessity was a particular feature of the craft model by which he explained the cosmos. Aristotle appears to have applied the model to nature, without fundamental changes, to explain how form hypothetically necessitates matter.

One might well wonder why, if Plato already offered teleological explanations in terms of functional ends and hypothetical necessity, Aristotle criticises Plato for having failed to use the final cause.²⁷ This is a complex issue, but it is worth pointing out that Plato often presents

ends as good or beautiful, not because of their function, but because of their mathematical structure. So, for example, in the *Timaeus* he explains the beauty of the primary bodies in terms of their geometrical properties (54a).²⁸ If we recall that Aristotle contrasts mathematical objects with natural ones exactly on the point that their form is not functional – mathematical objects do not initiate or undergo change – we may understand why Aristotle does not think that Plato is generally clear about the proper use of final causes in nature, even if he sometimes, as we have seen, does give proper weight to the functional aspect of ends.²⁹ The problem may be exacerbated by Plato's understanding of the highest form, the Form of the Good, as the One: if the highest good of all things for Plato is a mathematical entity, as Aristotle seems to think, then it will not be a function of the sort that through hypothetical necessity can explain purposeful *change* in the natural world.

Two Differences between Craft and Natural Teleology: How Important Are They?

I have focused on points where Aristotle's teleology was influenced by Plato's conception of craft. I shall now look at three differences which have persuaded some scholars that Aristotle could only have intended a weak analogy between the teleologies of craft and nature.

First of all, one might think that artificial teleology importantly differs from natural teleology in that it involves *consciousness* of the end. So David Charles has argued that it is a major unclarity in Aristotle's account of nature in *Ph.* 2.8–9 that it does not distinguish clearly between what Charles calls the 'agency' and the 'nature' model of final causation.³⁰ The difference is that the agents are sensitive to changing circumstances and so are able to adapt their behaviour to achieve the goal in other ways. It may be that a conscious agent can track changes relevant to the goodness of an end, whereas a non-conscious agent will be locked into a pattern of behaviour that is blind to environmental variation. This point might apply equally to any intermediary ends.

Aristotle is indeed explicit at *Ph.* 195a26 that it does not matter if the good is the good itself or the apparent good when we say that that for the sake of which is the good and the end of the other things. So it seems he does not think that the sensitivity aspect of conscious agency is important to articulating what a final cause basically is. And this may have been a mistake, if we are concerned about assimilating conscious agency in general to natural teleology. However, in the specific case of

conscious agency that is craft, Aristotle's assimilation can be justified, at least given his Platonic view of craft. As Sarah Broadie has argued, behind Aristotle's analogy between craft and nature is a tendency to de-psychologise craft.³¹ We have seen that craft aims to realise a universal, changeless form. No variation in terms of the basic conception of what constitutes a good house is therefore to be expected. Craft differs markedly from other kinds of practical wisdom in this respect since there is no similar general conception of what constitutes, say, a generous action, the way there is a general account of health or a house. But this point extends also to a difference in the way craftspeople and other practical agents think about the way to realise their aim. Aristotle says that craft does not deliberate.³² I take his point to be that while craftspeople may in various circumstances deliberate about how to apply their craft, the methods of production are laid down by the craft and are not themselves deliberated about. So a baker will not normally deliberate about how to make bread, though she may deliberate about how much longer to let the dough rise if it is a particularly cold day, and so on. As one might say, part of the point of knowing the craft is that you do not normally have to think out such basics: the better you are at your metier, the less you have to think about it. Whereas the practically wise (the *phronimos*) is somebody who stands out by their grasp of the particulars of the ethical situation and their ability to reason correctly about how to bring about the good given these particular circumstances, the crafts-person is distinguished simply by their ability to reproduce the universal form.³³ Deliberation is not characteristic of the exercise of craft as such.

In *Physics* 2.8 (199a9–19) Aristotle stresses the ordered sequence of steps in natural generation by analogy with the crafts. If a house, he says, had come about by nature, it would have come about in the same way as it does by craft. Since natural beings generally come about in the same way, Aristotle must be presupposing that craft is no more subject to individual variation, and he must be presupposing this as a generally recognisable feature of craft. In nature as in craft, the same form is produced by the same regular steps. And it is because craft like nature always proceeds in such ordered stages towards the same kind of end that Aristotle can conceive of craft as *completing* the natural process as a further step in the same series.

Second, Aristotle says that ends are realised last in the processes of which they are the final cause. But in conscious agency the end causes the action as an object of desire which precedes the action. But if

so, it seems that ends in conscious action cannot provide proper teleological explanation. Now again this kind of objection, whatever validity it may have in relation to other kinds of agency, fails in the case of craft. Aristotle's analogy between craft and nature is not one about individual craftspeople and natural beings, but between craft and nature, and the end of craft most certainly is the finished product, not the finished product as represented to some craftsperson or other.

Third, Aristotle draws a distinction between two kinds of final cause: the objective and the beneficiary. The classic example is medicine, whose objective is health and beneficiary the patient.³⁴ Now generally in craft it may seem that the good in the sense of the beneficiary is external to the thing in which the objective is realised. Flautists benefit from flutes, residents from houses, riders from bridles. The beneficiary of natural processes in contrast seems primarily to be the natural being itself.³⁵ Oak trees benefit from the growth of leaves and roots and so on. We may therefore think that the craft analogy goes against the proper conception of good ends as internal to natural beings. However, as the example of medicine shows, sometimes in craft the beneficiary, the patient, is also that in whom the objective, health, is realised. We might say that the sameness of beneficiary and objective is a contingent feature in craft but a necessary one in nature.³⁶

Also on this point Plato prepared the way. Recall Timaeus' explanation of the eyes. The cause (*aitia*) of the eyes reflected god's plan for the cosmos, helping us to become more rational by observing the heavens. Yet the purpose of the eyes is also internal to us: we use our eyes in observing the heavens and correcting *our own* reason. So the objective of the eyes is realised in us as their beneficiaries. Generally, though our bodies have an external provenance in god, and serve to fulfil his cosmic plan, they are not the mere instruments of some external user, but integral features of us as human beings, which we use to achieve our own ends. Even if our eyes had not been given us by god, we could still have used them to become better human beings, and so have realised their purpose. To accept this counterfactual is already to begin to see the world through Aristotle's eyes.

NOTES

- 1 I borrow here the terms from Lennox 1985. The term 'unnatural' is used from Aristotle's viewpoint. There should be no implication that his predecessors saw their explanations as other than natural. See, for example, Plato's *Leg.* 10 (889b–d)

- for the view that it is intelligent soul that moves the cosmos that primarily counts as nature.
- 2 See Johnson 2005, 127: 'Plato's prioritization of art over nature, and his specification of the cause for the sake of which with reference to the whole universe, and not with reference to its individuals or natural kinds, means that he did not employ the notion of the for the sake of which as a cause – i.e. in a causal explanation.'
 - 3 See Cooper 1982, 198, n. 2: 'one must reject the suggestion that is sometimes made that this analogy [sc. between art and nature] is central and fundamental to Aristotelian natural teleology'.
 - 4 I am in full agreement with Sedley 2010 *that* Plato's theory of cosmic craftsmanship fundamentally shaped Aristotle's teleology, though my argument here differs in terms of how.
 - 5 Sedley 2009.
 - 6 Pl. *Phd.* 97d–98d; Arist., *Metaph.* 985a18–21.
 - 7 Arist. *Metaph.* 984b19–20.
 - 8 Not all teleological explanations need share this feature: teleological accounts have sometimes been understood historically or etiologically; see Wright 1973, 154–68. On such a theory, we need not assume that the good of the organism directed the development of the feature, though it is true to say today that the organism has the feature because it is good for it (helps it survive).
 - 9 Sedley 2007, 23.
 - 10 Of course, one should not assume that Love works for the good: *erôs* can notoriously be destructive. However, Empedocles' epithet 'blameless' (*philotêtos amempheos*, frag. 35, l. 13) suggests a kinder power.
 - 11 It does not escape Sedley 2007, 8.
 - 12 Parmenides uses the word *mêtisato*. According to Detienne and Vernant 1974, *mêtis* involves 'la délibération en vue d'un bien'.
 - 13 See Johansen 2016.
 - 14 'Now, let us state the reason (*aitia*) why becoming and this universe were framed by him who framed it. He was good, and what is good never has any particle of envy in it whatsoever; and being without envy he wished all things to be as like himself as possible. This indeed is the most proper principle of becoming and the cosmos and as it comes from wise men one would be absolutely right to accept it.' Translations of the *Timaeus* from Lee 2008. On the distinction between *aitios* and *aitia*, see Frede 1987.
 - 15 Why having shown that the cause (*aitios*) is a craftsman, does Timaeus then have to ask a further question about what his reason (*aitia*) was? Because not all craftsmen act as proper craftsmen: a doctor may kill or cure, depending on the goodness of his character. Timaeus answers therefore: god was all good and only wanted the good, so he chose to work for the proper end of craft.
 - 16 See 'if we compare whole for whole' (*Ti.* 30b); cf. *Leg.* 10.900c–905d.
 - 17 See Pl. *Resp.* 10. Even if Timaeus at first suggests that he may have a choice; see Johansen 2015 for an attempt to explain why.
 - 18 See Sedley 1998b, 122–3.
 - 19 To see how calling mechanisms *sunaitia* is no small concession to their contribution to a causal explanation, see *Plt.* 281c–d, where the Eleatic Visitor argues that,

- while weaving is the cause (*aitia*) of woolly clothing, those arts which produce the instruments of weaving all have a claim to being the *sunaitia*.
- 20 See also 68e–69a where Timaeus says that the divine cause cannot be understood or grasped without the necessary cause.
- 21 Arist. *Ph.* 193b7–12.
- 22 Arist. *Metaph.* 9.2.
- 23 Cf. *Gen. an.* 2.1.735a2–5.
- 24 See Judson 2005 for a persuasive reconstruction of the argument.
- 25 How the argument works, particularly whether it involves a cosmic or even anthropocentric teleology, is a matter of debate; for opposed views, see, e.g. Judson 2005; Sedley 2010.
- 26 Cf. *Part. an.* 1.1.642a9–13.
- 27 ‘In the same way those who say the One or Being is the good, say that is the cause of substance, but not that the substance either is or comes to be for the sake of this. Therefore it turns out that in a sense they both say and do not say the good is a cause; for they do not call it a cause *qua* good but only accidentally’ (*Metaph.* 1.7.988b6–15, after revised Oxford translation).
- 28 See, however, *Timaeus* 87c for a good example of Timaeus linking geometrical properties with functional ones: the body requires a certain proportionality to functional well.
- 29 For an argument along these lines, see Johansen 2010.
- 30 Charles 1991. See, however, Charles 2012 for a revised interpretation.
- 31 Broadie 1987. She takes this to be a problem for Aristotle’s use of craft, as if Aristotle’s insistence on the art–nature analogy ends up distorting his view of craft. I take this view of craft rather to be a Platonic heritage which Aristotle agrees with and exploits to deliver his view of natural teleology.
- 32 *Ph.* 2.8.199b26–27. In favour of this reading, see Broadie 1987; against see Sedley 2010.
- 33 See Arist. *Nic. Eth.* 7.5.
- 34 See, e.g. Arist. *Ph.* 194a27–b8; *Pl. Resp.* 10.601d–e, *Euthyd.* 291c–d.
- 35 A passage in Arist. *Pol.* 1256b10–22 suggests that other living beings exist for the sake of man. How much weight to give to such evidence from outside the more authoritative context of the *Physics* is debated; see Sedley 1991 vs. Judson 2005. Generally, the question of anthropomorphic teleology is beyond the scope of this chapter.
- 36 This would parallel the contingent identity of the efficient cause with the patient in the crafts in cases like the doctor healing himself, noted above, and the essential identity of the two in natural beings.