

CHAPTER I

Teleology, Aristotelian and Platonic

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GOD AS PARADIGM

Aristotle was Plato's student for two decades before founding his own school. Is it more fruitful to think of his mature work as anti-Platonist, or as that of an independent Platonist? Although this age-old question does not admit of final resolution, I am convinced with regard to my present topic, the explanation of purposive structures in the world,¹ that most can be learnt by emphasizing, rather than minimizing, Aristotle's Platonic background and training.²

Plato, like nearly every other thinker in and well after antiquity, associated teleology with conscious purpose. To make the world a purposive structure just is to posit an intelligent mind as its cause. True, the intelligent mind could have created the world and then left it to run itself mechanically, but no ancient thinker – after at any rate Anaxagoras, whose position on the point is open to dispute – was ready to contemplate a split-level theory of that kind. Either the world was intelligently created and is intelligently run, or it originated from non-intelligent causes and is still, with the possible exception of human action, governed by causes of that same kind. While the atomists defended the latter view, Plato developed the former:

This chapter is based on material from my book *Creationism and its Critics in Antiquity* (Sedley 2007), and I am grateful to the University of California Press for permission to reuse it here. In working on the topic, I have received help from people too numerous to list in this note, although they are listed, as exhaustively as I can manage, in the book's preface. In addition, Errol Katayama and Larry Jost have been kind enough to supply criticisms of the book that have prompted me to make some changes to the current version. Let me finally say what it pleasure it is to be able to dedicate the chapter to my friend Allan Gotthelf, whose work on Aristotelian teleology has been truly seminal.

¹ I must here leave untouched many of the major issues in Aristotle's teleology, on which see esp. Gotthelf 1997c.

² Gerson 2005, provocatively entitled *Aristotle and Other Platonists*, should be consulted for a much more ambitious, and more Neoplatonic, assimilation of the two than I have contemplated, including chapter 4 on issues relating to causation.

his Demiurge, who created the world, has left it under the overall control of the intelligent and divine world-soul.³

In conformity to this background, Aristotle too treats the twin issues of creation and administration in strict parallel to each other. The world, along with its resident species, is not the product of an intelligent act of creation, for the simple reason that it had no beginning at all but has always existed – a thesis he defends by appeal to the essential eternity of the heaven's circular motion. And likewise when it comes to the world's continued functioning, there is no divine oversight, planning or enforcement.⁴ So far he may seem to tend closer to the atomist camp, since no divine interest in our world is invoked at any stage. But like Plato, and unlike the atomists, he nevertheless holds that throughout the natural world there are irreducibly purposive structures. Pretty well everything in nature has a purpose, despite the fact that no intelligence either conceived that purpose or administers it.

This restrained teleology has won Aristotle innumerable admirers. For, it is rightly said, purposive structures are indeed basic to nature, quite regardless of the question of divine control or its absence. Never mind whether you are a creationist or the most hardened of Darwinians: you cannot avoid saying that the heart is for pumping blood, the eyelid for protecting the eye, the teeth for cutting and grinding food. Nor, for the Darwinian, are these locutions just a shorthand for some more accurate mode of biological explanation: adequate non-teleological explanations of the parts of the eye are simply not available.

Now, it is one thing to commend Aristotle for the refreshing modernity of his teleological thinking, and to contrast it with the antiquated creationism of a Plato. It is quite another thing to suppose that the outlook's appearance of modernity is the key to Aristotle's own rationale in developing the theory in this particular way. Ancient atomism likewise resulted in a great many modern-looking theses, yet it started from premises utterly unlike those of modern or even early modern physics. Similarly, or so I shall argue, Aristotle's minimalist approach to purpose in nature is very far from being a sign of his modernity. Such a recognition should not, however, lessen our appreciation of the light that his ideas can be used to shed.

Where did the motivation for Aristotle's revised teleology come from? From an unexpected quarter, it seems. Plato had famously conceded in

³ It is admittedly hard to establish how much more the Platonic world-soul governs than the celestial rotations. But *Ti.* 37a4–c5 (on which cf. Reydam-Schils 1997) makes it clear that it has true 'opinions' (δόξαι) about the sensible world of becoming and hence does not concentrate its thought exclusively on pure being.

⁴ True, Aristotle does occasionally talk as if god can be credited with some providential action, e.g. *GC* 2.10.336b27–34, but I join the consensus that regards such locutions as merely figurative (see esp. Solmsen 1963, pp. 485–95, but cf. Bodéüs 2000 for a less dismissive reading).

book 7 of the *Republic* that, for a philosopher, government ranks second best to the life of pure contemplation. And correspondingly in the *Timaeus*, where he maintains that the entire world has been so structured as to enable the rational human soul to imitate the divine mind through the study of astronomy and philosophy, this imitation of god is located in pure mathematical and philosophical contemplation, rather than in the exercise of moral or political virtues.⁵ Yet the divine creator and divine world-soul of Plato's *Timaeus* are themselves viewed as partly engaged in world-management. If so, they are not, even on Plato's own view, exclusively engaged in the best activity available to them.

Aristotle is in this regard more Platonist than Plato himself. He too (*EN* 10.7–8) holds that the kind of happiness that can come from leading a virtuous civic life, although of great value, is second-best to the godlike happiness of pure detached contemplation. But he improves on Plato to the extent that he seeks to make his own theology consistent with that same ranking of different brands of happiness. God's activity can only be the best, he argues in *Metaphysics* Λ, and, if so, it must be pure contemplation.⁶

The effect of this minor-looking adjustment to Platonism is breathtakingly far-reaching. If god must be a pure contemplator, he cannot be an administrator.⁷ There can therefore be no Demiurge, and no divine world-soul. In which case, the world is uncreated and functions without divine oversight. The outcome is, in short, Aristotle's cosmology.

In positing a detached and self-absorbed god, one who is above any inclination to intervene in our world, Aristotle sounds surprisingly similar to Epicurus. Yet unlike Epicurus he fully shares with Plato the conviction that god is the supreme explanatory principle. And he reconciles these two apparently conflicting motifs – god as detached and god as causally supreme – by drawing on another Platonic idea: that god is the supreme object of emulation. The goal of life, as Plato's followers expressed his idea, is 'to become as like god as possible'.⁸ Plato meant this goal mainly as a human aspiration, although in two contexts (*Smp.* 207c9–208b6; *Lg.* 4.721b6–c8) he extended it to the entire animal kingdom by presenting the drive to propagate as mortal organisms' best shot at achieving

⁵ I defend this interpretation of the *Timaeus* in Sedley 2000a.

⁶ It is entirely possible that this complete insulation of god from practical activity took time to evolve and is not yet fully worked out in the *On the Heavens*, although even there note, for example, 2.12.292a22–8 on god as free from *praxis*.

⁷ For an especially forthright development of this theology on Aristotle's behalf, cf. the passages of Alexander of Aphrodisias cited and discussed by Sharples 2003.

⁸ Annas 1999 chapter 3; Sedley 2000a.

immortality – surrogate immortality, that is, achieved by living on through their descendants – and the perpetuity of their species. Aristotle takes up this latter cue and develops the idea still further. The supreme divinity is an unmoved mover, a detached self-contemplator, whose activity is pure actuality, and *everything* else in the world functions by striving, in its own way, to emulate that actuality.⁹

The highest human aspiration, philosophical contemplation, is the most direct imitation of god's own activity (*EN* 10.7.1177b26–1178a8; 10.8.1178b7–32). Procreation, in humans, lower animals and plants is, as it had been for Plato, a bid for immortality by proxy, another way of imitating god's eternal actuality, namely by perpetuating both oneself and one's species (*de An.* 2.4.415a26–b7; *Pol.* 1.2.1252a28–30; *GA* 2.1.731b24–732a1; *Metaph.* Θ.8.1050b28–30).¹⁰ Even below the level of plant life, the world's natural cycles, such as the weather cycle whereby the four elementary bodies undergo endlessly repeated intertransformations, are imitations of god's eternal actuality (*Mete.* 1.9.346b35–347a10; *GC* 2.10.336b34–337a7).

It is, in short, scarcely an exaggeration to say that for Aristotle the entire functioning of the natural world, as also that of the heavens, is ultimately to be understood as a shared striving towards godlike actuality.¹¹ Admittedly Aristotle does not very often stand back to view the matter panoramically in this way, for his interest is far more often taken up with specific biological structures and processes and their contribution to the organism's success; but he does view it along these lines in *Metaphysics* Λ.10, the culminating chapter of his theological treatise, to which I shall return in the final section of this chapter.

Even biological structures that might have been accounted for in far more down-to-earth ways are, on occasion, brought by Aristotle under the same explanatory principle of striving for godlikeness. According to Plato in the *Timaeus* (45a3–b2), describing the original creation of the human body, our creators made the face the natural front (here, as in Aristotle's biology, defined by the orientation of the senses), because front is 'more honourable' (*timiōteron*) than back, being both of higher ranking and more appropriate to leadership. This evaluative ranking of directions, which the modernizing interpretation would happily have seen Aristotle consign to history, is a doctrine which on the contrary he develops and frequently

⁹ Cf. *EE* 7.15.1249b13–15, 'For it is not by giving commands that god is ruler, but as the good towards which practical wisdom gives commands.'

¹⁰ Cf. Burnyeat 2004, 24 for the possibility that in addition the latter cycles are for the sake of the former.

¹¹ See esp. Kahn 1985.

exploits. According to Aristotle, not only is front more honourable than back, but so are right than left and up than down.

To take the up–down polarity, man’s unique uprightness makes him superior, to the extent that his natural up, his head, coincides with the cosmos’s upward direction (*PA* 2.10.656a7–13):

Of this kind is the human race. For it, either alone or most of all among animals known to us, shares in the divine . . . It is alone in having its natural parts in the natural arrangement, and its up is related in the natural way to the universe’s up. For alone of the animals, man is upright.¹²

At the other end of the biological spectrum, plants have their natural ‘up’ coinciding with the cosmic down, in that their roots – which are functionally their mouths – are down in the soil. For example (*de An.* 2.4.416a2–5):

For up and down are not the same for each and every being, but as the head is in animals so the roots are in plants, if one ought to call organs different or the same by their functions.

Virtually all of this is Platonic in origin. Compare *Timaeus* 90a2–b1:

Concerning the most authoritative kind of soul found in us, we must have the following thought. God has given it to each of us as a daimon – this thing which we say dwells at the topmost part of our body and raises us up from the earth towards what is akin to us in the heaven, because we rightly call ourselves a heavenly plant, not an earthly one. For the divinity keeps our body upright by suspending our head and root from the place out of which our soul was first born.

We can here see how Aristotle’s treatment of plants as inverted human beings has its origin in Plato’s elevation of human beings to the status of inverted plants. In so far as Aristotle gives ‘up’ and ‘down’ their own specialized biological senses – as Plato had already done in speaking of a ‘natural front’ – Aristotle is no doubt saying something scientifically credible.¹³ Try drinking a cup of tea while standing on your head. We might intelligibly ask if you can get the tea to go ‘down’ your throat. Even though its geographical or cosmic direction of flow is up, we understand the expression because in context we assign ‘down’ a meaning determined by biological function alone. Aristotle similarly assigns directions like up

¹² There are many other relevant passages in Aristotle, but I here limit myself to citing for comparison *HA* 1.15.494a20–b1 (which supplies a good deal more detail), and *Juv.* 477a21–3. Gregoric 2005 is a valuable comparison of Plato’s and Aristotle’s explanations of human erect posture, but in my view it does not pay sufficient attention to the intrinsic value that both attach to our postural kinship with cosmic topography, for which (regarding Plato) cf. Osborne 1988, 107–9.

¹³ Thus Lennox 1985, 149–55, replying to Lloyd 1966, 52–61. It will be evident that my main sympathies are with Lloyd, but Lennox is a valuable guide to the controversy.

and down their own functional biological senses (*Progression of Animals* [IA] 4–5).

Nevertheless, the use to which Aristotle puts this mode of expression is hardly so innocuous. When he presents up, front and right as ‘better and more honourable’ (*PA* 3.3.665a6–26), he does so in the context of explaining why, in human anatomy, nature sometimes favours these orientations even when practical utility alone would not. Thus the heart, as governing organ, occupies the ‘honourable’ front,¹⁴ even though that in turn requires the windpipe, which services it, to be ‘badly placed’ in front of the oesophagus; the resultant danger of food going down the wrong hole then requires the remedial provision of the epiglottis.

The reason why, regardless of practical utility, Aristotle attaches an honourable status to the body’s sharing the cosmic inclinations up, front and right is his belief, also derived from Plato,¹⁵ that these orientations represent the divine source or direction of motion governing the rotation of the heavens themselves (*Cael.* 2.2). The fact that in the anatomy of the best animals, namely humans, inclinations to front, up and right are repeatedly favoured is therefore one expression of our superior likeness to the divine heavens, and through them to god.

If the whole natural world is, in one way or another, pulling itself up by its own bootstraps in the interests of maximum godlikeness, how is that possible? Desire is a faculty that, according to Aristotle, is found only in animals, yet he is explicit that plants too strive for immortality through reproduction, and that in some attenuated way even the four elementary bodies strive for everlasting actuality. Almost certainly the notion of striving will have to be interpreted reductively, as describing an inherent natural tendency. Such psychologizing descriptions of non-psychological processes, misleading and indispensable in equal measure, have been commonplace in the history of science, from ‘Nature abhors a vacuum’ to Natural Selection and the Selfish Gene. Certainly the *Timaeus* is full of them, including intelligence’s ‘persuasion’ of the four elementary stuffs.

But even after effecting such a reduction, we are left with the following result. The reason why in Aristotle’s view no directive mind can be at work in natural processes is not any preference on his part for ‘scientific’ over theological modes of explanation. It lies rather in the conviction that the

¹⁴ Unlike Lennox 1985, 149–52 (cf. Lennox 2001a, 254), I understand *PA* 3.3.665a19–26 as saying that the reason why the heart must necessarily be at the front is that it is more honourable, and not that it is practically advantageous.

¹⁵ In the *Timaeus* heavenly rotation is both to the right, 36c6, and forwards, 40b1. Cf. also 90a2–b1, quoted above.

Platonic account gets the theology *wrong*. God's causality in the natural world is omnipresent, as Plato held, but must be such that all the operative drives and impulses belong to the natural entities, leaving god himself eternally detached and self-focused.

In the remainder of this chapter I shall consider two other areas in which Aristotle's teleology seems to me to reflect his Platonic beginnings. One is the fundamental role of the craft model in his accounts of nature; the other is his assumption – which surfaces more frequently than is generally appreciated – that purpose is present in nature not just at the level of individual organisms, but also in the entire world's interactive structure and functioning.

THE CRAFT ANALOGY

Plato had appealed not merely to divine benevolence in explaining the natural world, but also to divine craft, which was itself in turn to be understood in terms of familiar human craft. It could hardly be denied that Plato had been stunningly successful in explaining the natural world as the product of craftsmanship, and Aristotle must have been loath to throw away those gains. Yet divine craftsmanship was ruled out by his theology, as we have seen. No natural process could be acceptably explained, along the lines set by Plato, as decreed by the deliberations of a world-soul or of any other immanent deity, let alone a transcendent one. Such then was Aristotle's dilemma. He resolved it, as *Physics* 2 eloquently attests, by developing his conviction that although nature is not divine craft, it is sufficiently *analogous* to craft in its working for much of the light shed by Plato to remain. So wedded is he to the craft analogy that its characteristic language is ubiquitous in his biological writings, where he frequently, for example, speaks figuratively of nature as an agent 'crafting' (*dēmiourgein*, cognate with 'Demiurge') her products.¹⁶

Aristotle's whole understanding of natural processes relies on his famous distinction between four kinds of cause. And one prominent way in which the craft model comes to his aid is in enabling him to elucidate that very distinction. His preferred methodology is, as he reminds us at the opening of the *Physics* (1.1.184a16–21), to start with what is more familiar, or makes more sense, *to us* (that which is *gnōrimōteron hēmin*), and to move from there to what makes more sense *in its own right* (that which is *gnōrimōteron*

¹⁶ Cooper 1982, although to my mind a most penetrating portrayal of Aristotle's teleology, is I think wrong to deny the craft analogy's centrality to Aristotle's physical thought. For a convincing reply on this point, see Broadie 1990, 392–6.

haplōs or *phusei*). The causal processes of nature make more sense in their own right and exhibit teleology in a higher degree, but the causal processes of craft make more sense to us, because all of us have practised a craft or witnessed one at close quarters.

Aristotle therefore uses a miscellany of craft-related examples to demarcate the four causes (*Ph.* 2.3), before moving on to their application to nature. In a craft, it is normal for the practitioner to impose some form on pre-existing matter, for example a sculptor on bronze. Here the *material* cause is the bronze, the *moving* cause (often called the 'efficient' cause) is the sculptor, and the *formal* cause is the form he imposes on it, all unmistakably distinct from each other. In addition to these, the sculptor works with a goal in view, perhaps the completion or perfection of the statue, and this too is a distinct motivating factor in the story, the *final* (meaning 'end-related') cause.¹⁷ Thus four distinct causes – material, moving, formal and final – are clearly exhibited by craft, and it is only once we have mastered them and their interrelation in this familiar guise that we are ready to look for them in nature.

In nature, the four causes are much trickier to disentangle from each other. Take the development of a pig, and to begin with, its material cause. The pig's matter – its flesh, bones, and the like – is certainly a causal factor helping to constitute its nature but is not nearly as readily distinguishable from the pig's form as the bronze was from the shape of the statue it constituted; for one thing, there never was a time in the pig's history or prehistory when all of these specific materials existed without already having the form of pig, in the way that before the statue was made the bronze was there to be inspected. For an analogous reason the pig's formal cause, that is, its essential form as a pig, is not at first sight fully distinct from its matter. Third, take the moving cause of the changes the pig undergoes. This lies initially (according to Aristotle's theory of animal generation) in its father and hence is external to it, as the sculptor was to the bronze, but during its lifetime its active moving cause becomes an internal one, since this role of mover is taken over by the pig's own soul, identifiable once more with its essential form. Nor is the final cause of its growth, that is, the end or goal governing the process, any more straightforwardly distinguishable

¹⁷ Admittedly this full set of four causes of a statue, although it becomes common in the subsequent tradition (see Todd 1976), occurs nowhere in Aristotle. The examples used in *Ph.* 2.3 to illustrate the four kinds of cause and their further taxonomy are a miscellany that includes, in addition to the sculptor and his bronze, the arts of building, navigation, musicianship, spelling, syllogizing and medicine, as well as some altogether non-technical fields.

from its form, because that goal really just *is* its fully developed form as a pig, towards which it is striving.¹⁸

Nature, then, is difficult. But if we start from the causal distinctions that craft clarifies, we can aspire to understand it. And there is a further reason why we should hope to progress from craft to nature. A craft, according to Aristotle, is an extension of what nature already does. A craft takes over where nature leaves off, imitating and completing nature's work. For this very reason, he argues (*Ph.* 2.8.199a15–20), we can work out that nature already embodies goals or purposes, because that is the only possible source of the goals which crafts adopt. For instance, since medicine is a craft that aims to help the body regain its health, that goal of regaining health can be seen to have already been governing the internal natural healing processes, which the doctor intervenes merely to facilitate and complete.

At the top end of the *scala naturae*, nature forms a near-continuum with craft, it being at times hard to tell where the one stops and the other starts. How, then, does craft still *differ* from nature? This is a vital question. For, once Aristotle has identified the residual differences between craft and nature, his project is to devise perspectives and thought experiments which will shrink or even erase those differences. Such is his procedure for obtaining illumination from the craft–nature analogy, while stopping short of Plato's position, that of fully identifying nature with divine craft.

The first and most obvious difference between craft and nature, in Aristotle's eyes, is that in craft the moving cause is regularly external to the matter. Carpenters are external to their wood, cooks are external to their ingredients, doctors are external to their patients. It is precisely for this reason that the crafts teach us, more clearly than nature can, that the moving cause acting upon the matter really is a distinct factor in the process. Yet even in craft the moving cause is not *essentially* external, Aristotle points out, and here the gap between craft and nature can be narrowed: if a doctor treats himself, the change in his own body from illness to health results from an internal moving cause. That is *very* much like a natural process. Admittedly in this special case of the self-curing doctor the moving cause is not *essentially* internal, as it would be in nature. It just happens that the doctor is also the patient, and it could easily have been otherwise (*Ph.* 2.1.192b23–7). Still, as Aristotle illuminatingly says, when a doctor cures himself this is just about as near to nature as craft can come (2.8.199b30–2).

¹⁸ E.g. *Ph.* 2.7.198a24–7; *PA* 1.1.641a25–7.

Perhaps Aristotle should have left it at that. But, to take a yet further step in the same direction, he asks us to perform a thought experiment (199b28–30): we are invited to imagine the craft of shipbuilding as being present not in the shipbuilder, but in the timber itself. If that were so, and the moving cause had become a source of change internal to the matter instead of external to it, we would see ships grow naturally out of piles of planks. This particular image may sound too bizarre to be helpful, and it is a pity that Aristotle did not instead choose for his example a material which could more easily be imagined as shaping itself from inside, such as a lump of clay growing into a pot, the potter's craft having been implanted in it instead of imposed from outside. Even then what such thought experiments reveal, and conceivably are designed to concede, is that the craft–nature gap could never be closed altogether. Provided that they illuminate the continuum of purpose between artificial and natural processes, they have done their job.

But is not the kind of purposiveness that is present in nature exactly where this analogy fails? The most obvious of objections to Aristotle's reasoning is that purpose is present in craft precisely because of the involvement of a human craftsman with an intellect. And is not it his most central thesis that this craftsmanship has no analogue in nature, god being entirely detached from the natural world? Without the admission of a creative or productive intellect operative in natural processes, how can purpose exist in nature? And how can the craft analogy be of any assistance?

Here is Aristotle's enigmatic remark on the question (199b26–8):

It is ridiculous for people not to believe that something is coming about for a purpose if they do not see that the moving cause has deliberated. Yet craft too does not deliberate.¹⁹

Craft does not deliberate? But of course it does, at least in our everyday experience of crafts on which Aristotle's methodology leans so heavily. Scholars have, in my view, generated unnecessary difficulties over the interpretation of this admittedly dark remark. It is regularly suggested that Aristotle has in mind an idealized picture of the craftsman. This ideal practitioner's skill has developed to such a high degree that he no longer has to ask himself how to perform a particular operation, that is, to deliberate: he just goes ahead and does it.²⁰

¹⁹ ἄτοπον δὲ τὸ μὴ οἶσθαι ἕνεκά του γίγνεσθαι, ἐὰν μὴ ἴδωσι τὸ κινεῖν βουλευσάμενον. καίτοι καὶ ἡ τέχνη οὐ βουλεύεται.

²⁰ The best defence of this interpretation known to me is Broadie 1990. I am grateful to Sarah Broadie for correspondence on this and related issues.

The trouble is that to the best of my knowledge nowhere else in the Aristotelian corpus has such an idealization of craft yet been found.²¹ Quite apart from the fact that few of us would put our lives in the hands of a surgeon who did not deliberate before amputating a leg, or of an airline pilot who did not choose a flight path before take-off, Aristotle himself again and again depicts the operations of craft precisely in terms of deliberation.²² Deliberation is how we choose the best means to a given end, and the presence of deliberation in a process is therefore a salient sign that it is end-directed. However, for reasons we have yet to discover, Aristotle says in the quoted passage that crafts do not in fact deliberate.

For a more satisfactory understanding of this puzzling remark, I am convinced that we must go back to Aristotle's causal theory. In it, his debt to Plato is greater than is sometimes recognized. For Plato, a fundamental causal process is one which is analytically self-evident.²³ For example, heat makes you hot, and wisdom makes you wise. Such statements are hardly informative, and in modern usage they would not normally be deemed causal at all, but at least they seem analytically true, and for Plato that is where their great merit lies. Other, more obviously synthetic causal statements, such as that jogging makes you hot, or that studying geometry makes you wise, are more debatable precisely because they do not keep the cause–effect relation itself transparent.

Now Aristotle's ultimate commitment to this Platonic causal principle is discernible in many contexts, but none more so than *Physics* 2.3, the famous chapter in which he formally expounds his theory of four causes, and which constitutes the immediate background to chapter 8, where the puzzling remark about craft is located. One example that he repeatedly invokes there is that of the moving cause of a building (*oikia*). To answer

²¹ Robert Bolton (this volume, Chapter 2) draws attention to *Metaph.* 1.1.981b2–5, a passage in which it might be thought to be said that craftsmen act by habit rather than deliberation. I take this passage to be rather about the procedures of a mere menial worker (χειροτέχνης), who falls well below the level of a craftsman (τεχνίτης). The craftsman applies his knowledge of the relevant causal processes (981a24–30), whereas the menial worker has no such knowledge and simply follows the instructions of his site-director (ἀρχιτέκτων), thus leaving no room for deliberation.

²² Cf. n. 25 below. True, in his account of deliberation at *EN* 3.3.1112a34–b8 Aristotle allows that in certain relatively precise disciplines, such as spelling, deliberation is superfluous. But in that same context he is careful to call these disciplines 'sciences' (ἐπιστήμαι), and contrasts them with 'crafts' (τέχναι), including medicine, in which he insists that deliberation typically *is* required. What is presumably meant to be the same distinction between deliberative medicine and non-deliberative spelling is made at *EE* 2.10.1226a33–b2 (I thank Errol Katayama for the reference), this time not in terms of ἐπιστήμη vs τέχνη but of the lack of any need for reasoning when spelling (we must remember that Greek was spelt phonetically). Importantly, medicine is his favoured craft in the *Physics* when it comes to the craft–nature analogy.

²³ See further, Sedley 1991.

the question ‘What is this moving cause of this building (*oikia*)?’ by saying that it is a builder (*oikodimos*) is an excellent answer. Why? Because the causal relationship between builder and building is far from accidental, in that builders and buildings are suitably related much in the way that wisdom, as cause, is suitably related to the effect of someone’s being wise. But suppose that the builder is called Jones. To have said, instead, that the moving cause of the building is Jones would, although true, have stated a merely accidental cause. There is nothing about his being Jones that links him causally or explanatorily to the building, in the way that his being a builder manifestly does.

Nevertheless, even to refer to the moving cause of the building as ‘a builder’ falls short of the ideal answer, it turns out. Near the end of chapter 3, Aristotle writes (195b21–5):

One must always seek the ultimate cause of each thing, as in other matters. For example, a man builds because he is a builder, but the builder builds in virtue of the building craft. This cause, therefore, is prior, and the same applies in all cases.²⁴

That is, even when we nominate a builder as the cause of the building we have not gone all the way to isolating its immediate moving cause. Strictly speaking, the building craft, located in the builder’s soul, is the ultimate cause that accounts for the building. Jones builds in virtue of being a builder, and the builder builds in virtue of the building craft. We cannot continue this regress, because there is no further thing in virtue of which the building craft causes the building. With the building craft, therefore, we have found the ultimate moving cause.

This admittedly unintuitive refocusing of our causal language serves a vital purpose in Aristotle’s metaphysics. Form, he holds, is eternal. In nature, an organism’s form pre-exists it, typically by being already present in its father, who according to Aristotle was its original and external moving cause. (Try substituting the thought that your genetic code in some sense pre-existed you in your ancestors.) To throw light on this, Aristotle compares the pre-existence of form in nature to the way that in a craft the artefact’s form pre-exists the artefact itself, by being already present in the mind of the craftsman. The form of some actual building, for example, existed before it was built, namely in the mind of its builder. Thus he writes in *Metaphysics* Z.7 (1032b5–14):

²⁴ δεῖ δ’ αἰ τὸ αἷτιον ἐκάστου τὸ ἀκρότατον ζητεῖν, ὥσπερ καὶ ἐπὶ τῶν ἄλλων. οἷον ἀνθρώπος οἰκοδομεῖ ὅτι οἰκοδόμος, ὁ δ’ οἰκοδόμος κατὰ τὴν οἰκοδομικὴν· τοῦτο τοίνυν πρότερον τὸ αἷτιον, καὶ οὕτως ἐπὶ πάντων.

Health is the formula in the soul, and the science. The healthy state comes to be when the doctor has thought as follows: 'Since such and such is health, if a healthy state is to be, such and such must exist, for example a balanced condition, and if this is going to be, heat.' And so he goes on thinking until he brings it down to an end point which he can himself enact.²⁵ Thereafter, the movement towards a healthy condition which starts from this is already called production. Hence it results that in a way health comes to be from health, and building from building, namely the material building from an immaterial building. For the medical craft and the building craft are, respectively, the form of health and the form of the building. What I am calling immaterial being is the thing's essence.

Vitaly, the building craft *is* the immaterial form or essence of the building, resident in the builder's soul before he imposes that same essential form on the bricks and mortar.

In the light of all this, we can return to the enigmatic pronouncement of *Physics* 2.8, 'It is ridiculous for people not to believe that something is coming about for the sake of something if they do not see that the moving cause has deliberated. Yet craft too does not deliberate.' Aristotle does not mean to deny that the craftsman deliberates. But the craftsman is not, in the strictest sense, the moving cause. The ultimate moving cause is, as we have seen, the craft itself, identifiable with the essential form of the product resident from the beginning in the craftsman's soul. And that ultimate moving cause does not do any deliberating.

Seen in this light, Aristotle's strategy is not, as often thought, to deny that deliberation is on the one hand present in crafts but on the other hand absent from nature. His point is rather that, when you strip down to its hard core the causality by which in each of the two domains the moving cause operates, the deliberation that occurs in craft becomes a strictly ancillary factor. In craft and nature alike, an essential form serves as a moving cause which brings about its own imposition on the relevant matter. The form of the building, present initially in the builder's soul, prompts the movements which end in that same form's being fully present in the bricks and mortar. The form of pig, present originally in the piglet's father and later progressively in the piglet itself, prompts the movements which end in that same form's being fully realized in the mature adult pig.

The use of analogy, such as Aristotle's craft–nature analogy, unavoidably requires that some gap remain between the two compared items. At the same time, however, the greater the number of differences between the

²⁵ Notice how Aristotle develops this point without for a moment wanting to minimize the role of conscious deliberation in the process by which the form is transferred to the external matter. For a builder's deliberation, cf. also *PA* 1.1.639b25–30.

analogically related items that can be eliminated or marginalized, the more persuasive and informative the analogy becomes. Differences undoubtedly remain between the two processes, and the fact that deliberation plays a part in craft but not in natural processes is one of these. But such differences in Aristotle's eyes should not be allowed to mask the underlying isomorphism between the two causal processes. And pointing out that in neither case does the ultimate moving cause, namely the essential form, do any thinking helps to confirm how deep that isomorphism runs. This is why the causal structure of craft really does enlighten us about the causal structure of nature.

GLOBAL TELEOLOGY

Metaphysics Λ.10 is the vital culminating chapter of Aristotle's theology, and in it he speaks fairly explicitly of a global teleology, attributing cosmic goodness to what he calls 'the nature of the whole' (1075a11–25):

We must consider also in which way the nature of the whole (ἡ τοῦ ὅλου φύσις) possesses the good and the best – whether as something separated and by itself, or as its arrangement. Or is it in both ways, like an army? For an army's goodness is in its ordering and is also the general. And more the general, since he is not owing to the arrangement, but the arrangement is owing to him. All things are in some joint arrangement, but not in the same way – even creatures that swim, creatures that fly, and plants. And the arrangement is not such that one thing has no relation to another. They do have a relation: for all things are jointly arranged in relation to one thing. But it is like in a household, where the free have least licence to act as they chance to, but all or most of what they do is arranged, while the slaves and beasts can do a little towards what is communal but act mostly as they chance to. For that is the kind of principle that nature is of each of them (τοιαύτη γὰρ ἐκάστου ἀρχὴ αὐτῶν ἡ φύσις ἐστίν). I mean, for example, that at least each of them must necessarily come to be dissolved; and there are likewise other things in which all share towards the whole.

This passage has been unwelcome to Aristotelian scholars who deny that – following Plato's lead – he advocates a global teleology, and some have sought to show that no such teleology is intended. Just what structures he might mean to include in this cosmic nature, if such he intends, is uncertain, and not a topic on which I plan to dwell at length here, but the broader context leaves no doubt that it starts with the divine Unmoved Mover and the celestial movements it inspires, and that it extends down to terrestrial ecology, with a particular emphasis on the kinds of movement

manifested at the level of animals.²⁶ My aim in this final section is not to explore the cosmological detail, but rather to provide confirmatory evidence that Aristotle really does think there is, in addition to individual natures, a global nature, causally governed by the Unmoved Mover. This global nature brings with it a global teleology, and here once again Aristotle is closer to his Platonic roots than is generally conceded.

I shall start this time from *Physics* 2.4–6, and from Aristotle's denial there, in response to the atomists, that luck could ever account for the structure of the world taken as a whole. The atomists' position on this is set out, with some derision, in chapter 4 (196a24–35):

Some people consider the fortuitous the cause of this heaven and of all the worlds, explaining that it was fortuitously that there arose the vortex and the motion which separated things and set the universe in this arrangement. This is pretty amazing. For on the one hand they say that animals and plants neither are nor come to be by luck, but that either nature or intelligence or some other such thing is their cause (it not being just anything that arises from each seed, but an olive tree from this one, a man from that one), yet on the other hand they say that the heaven and the most divine of perceptible things came to be fortuitously, without any cause comparable to that of animals and plants.

Aristotle here finds it inconsistent of materialists to recognize the role of purposive processes and structures within our world, yet to deny an analogous cause of the vastly superior and more ordered²⁷ structure of the world itself. When he speaks of the atomists admitting that animals and plants are the products of 'nature or intelligence or some other such thing', he can hardly be talking about the origin of species, which he knows they would have vehemently denied to be the work of a creative intelligence. He must rather be invoking their agreement that individual animals and plants today come into being, not by luck, but either through natural propagation, or, as implied by his example of olive trees, thanks

²⁶ See fuller discussion in Sedley 2000b, where I argue in particular that the second reference to 'nature' (retaining unemended the MS reading τοιαύτη γὰρ ἐκάστου ἀρχὴ αὐτῶν ἡ φύσις ἐστίν at 1075a22–3) enables us to recognize a second reference to global nature. Bodnár 2005, 18–19, is right, I think, to reply that the sentence *could* still be read as referring to individual nature. But it becomes much the less natural reading, because 'the nature of the whole' is the announced topic. My preferred reading also gives the ensuing clause (on which Bodnár does not comment) much more point: that each organism is eventually dissolved is hardly an obvious example of the kind of principle *its* nature is but nicely illustrates the eternal recycling of the elements that is part of the global teleology (above, p. 8), with a distant echo of Plato's assertion that the matter we are made of has been 'borrowed' from the world (*Ti.* 42e6–43a1), implying that it must be duly returned.

²⁷ This point about greater orderliness is made explicit in the version of the argument at *PA* 1.1.641b10–23, discussed below.

to the intelligent operations of farming.²⁸ This is meant to show that they perfectly well understand the notion of luck and correctly avoid applying it to familiar purposive processes, yet they misapply it when it comes to the origin of the cosmos.

By the close of chapter 6, Aristotle has developed his own account of luck (*tuchē*) and the fortuitous (*to automaton*),²⁹ which for present purposes I shall not keep distinct. Luck is an accidental moving cause. As I understand him, the lucky outcome always has a *per se* cause: for example, collecting a debt has as its *per se* cause the antecedent desire, or need, to collect the debt. When you go to the marketplace to buy bread and happen to see your debtor, your desire to buy bread accidentally coincides with that desire or need. This reapplies the causal principles we met above (pp. 15–17): when a flute-player builds a building, the flute-player accidentally coincides with the builder, so that the moving cause of the building is *per se* a builder, and only accidentally a flute-player. Builder and building are (as their very names reveal) suitably correlated as cause and effect, whereas flute-player and building are not. Likewise the desire to collect the debt is suitably correlated, as cause, to collecting the debt, as effect, whereas the desire to buy bread is not.

At the end of his excursus on the fortuitous (*Ph.* 2.4–6), Aristotle returns to this theme of the cosmos itself (198a5–13):

Since the fortuitous and luck are causes of things of which intelligence or nature *could* be the cause, whenever something accidentally becomes the cause of these same things, and since nothing accidental is prior to things that are *per se*, it is clear that the accidental cause is not prior to the *per se* cause either. Hence the fortuitous and luck are posterior to intelligence and nature. So however much it might be true that the fortuitous is the cause of the heaven, it is necessary that intelligence and nature are prior causes, both of many other things and, especially, of this universe.³⁰

Aristotle means the following. Lucky or fortuitous events are, on his analysis, events that lead to the accidental fulfilment of a pre-existing natural

²⁸ See Wardy 2005 for the complications surrounding the question to what extent Aristotle can comfortably regard olive trees and other cultivated varieties as either 'natural' or 'artificial'. It seems likely, nevertheless, that at least for dialectical purposes he is here treating the propagation of the olive as artificial (and hence the effect of *nous*), that of man as natural.

²⁹ I gratefully borrow this translation of τὸ αὐτόματον from Sharples 1983.

³⁰ ἐπεὶ δ' ἐστὶ τὸ αὐτόματον καὶ ἡ τύχη αἰτία ὧν ἂν ἡ νοῦς γένοιτο αἰτίος ἢ φύσις, ὅταν κατὰ συμβεβηκὸς αἰτίον τι γένηται τούτων αὐτῶν, οὐδὲν δὲ κατὰ συμβεβηκὸς ἐστὶ πρότερον τῶν καθ' αὐτό, δῆλον ὅτι οὐδὲ τὸ κατὰ συμβεβηκὸς αἰτίον πρότερον τοῦ καθ' αὐτό. ὕστερον ἄρα τὸ αὐτόματον καὶ ἡ τύχη καὶ νοῦ καὶ φύσεως. ὥστ' εἰ ὅτι μάλιστα τοῦ οὐρανοῦ αἰτίον τὸ αὐτόματον, ἀνάγκη πρότερον νοῦν αἰτίον καὶ φύσιν εἶναι καὶ ἄλλων πολλῶν καὶ τοῦδε τοῦ παντός.

or psychological goal. Hence, even if our world were assumed to have had an origin, and luck were hypothesized to have played a part in that origin, this would still amount to a concession that the goal accidentally fulfilled by it was already operative before luck intervened to bring it to fruition.

This concluding argument is an easily overlooked but important indication as to how we are to understand Aristotle's foregoing notion of luck. It might have been – and has been – thought that when Aristotle makes luck a moving cause which accidentally coincides with the *per se* cause, the *per se* cause need not actually exist.³¹ But the present argument would make no sense unless he were assuming that, on the contrary, the *per se* cause must be an actual one. Your desire or need to collect the debt may not have been operative before you saw your debtor, but, once you saw him, that *per se* cause kicked in and led to its own proper effect, the completion of the transaction. Or, even supposing it did not, it was a sufficiently actual presence in the story to explain why we call it 'lucky' that you saw your debtor and collected the debt: without there actually being that antecedent desire or need, there would have been nothing lucky about it at all. Likewise, Aristotle is now telling us, there would be nothing 'lucky' about the world's coming into being unless there had been an antecedent moving cause of the world, whether that cause be intelligence or nature.

One might respond that some lucky events produce desirable results that were neither desired nor needed in advance. For example, in the Chinese fable recounted by Charles Lamb, when a house complete with its pigsty burnt down and roast pork was accidentally discovered,³² prior to the lucky event there was neither a desire nor a need for roast pork. Aristotle will have to reply that, if the event is to count as lucky at all, it must have fulfilled an antecedent goal under *some* description: if not the goal of eating roast pork, at least that of eating nutritious or tasty food. If no such goal had existed, under any suitable description, what could be counted lucky about the event? Likewise for the world's origin (assuming for the moment that it had one), we cannot intelligibly invoke the fortuitous or luck as cause without assuming that, under *some* description, an antecedent goal was being fulfilled by it. And as soon as the atomists concede that, they have collapsed back into the correct position that they were earlier represented

³¹ This may be the one major point on which I part company with the excellent analysis of Aristotelian chance in Judson 1991. As I understand him (esp. p. 92), Judson sees chance events as having no operative *per se* cause at all. This might indeed have been what Aristotle meant, but the concluding argument of 2.6 seems to me to exclude it.

³² Lamb 1823. Prior to that they had eaten their pork raw. The humorous twist to the tale is that thereafter, whenever they wanted roast pork, they would burn the house down.

as unreasonably resisting. That is, they will be treating the world's origin as on a par with the regular regeneration of life forms within our world, which even hardened materialists such as they are must admit is not purely fortuitous.

On this hypothesis that the world had a beginning,³³ when Aristotle says that *intelligence and nature* are prior to any luck that might have been involved, he means priority in a temporal sense: an intelligent and natural goal must have already existed at a time before the world's creation. But his own preferred view, outside this adversarial context, is that the world in fact had no beginning. On that hypothesis, what does he mean by saying that intelligence and nature are causes of the world prior to any luck that might be involved? For the point of the argument would be lost if these were not causes he intended here to advocate in his own voice.

This time the priority must be causal or explanatory, rather than temporal. The world is an eternal purposive structure, causally dependent on intelligence and nature. The 'intelligence' (*nous*) he intends cannot be a Platonic Demiurge: instead, he can only be referring to that detached divine intellect the Prime Mover, which as the ultimate source of all change he does indeed consider causally prior to the world, and, as the ultimate model for emulation, the *per se* cause of all the changes lower down the scale. But he has also concluded that *nature* is a prior cause in relation to the world. The world taken as a whole, he must mean, is no accidental structure, but manifests natural purpose just as much as individual organisms do.

This reading is confirmed by a closely parallel text, taken from a key methodological chapter, *On the Parts of Animals* I.1 (641b10–23):

Moreover, nothing abstract can be an object studied by physics, because nature does everything for a purpose. For just as in artefacts art is present, in things themselves there appears another such principle and cause, *which, like the hot and the cold, we have from the universe* (ἣν ἔχομεν καθάπερ τὸ θερμὸν καὶ τὸ ψυχρὸν ἐκ τοῦ παντός). Hence it is more reasonable for the heaven to have come to be by the agency of such a cause, if it has come to be, and to be because of such a cause, than mortal animals. At any rate, what is ordered and definite is much more evident in celestial things than as belonging to us, whereas what belongs more to mortal beings is variability over time, and the fortuitous. Some say that although each animal is and comes to be by nature, the heaven has been formed in the way it is from luck and the fortuitous. Yet nothing whatsoever in the heaven appears the result of luck and disorder.

³³ For this as a hypothesis that Aristotle takes seriously enough to work with in a context like the present one, cf. *PA* I.1.641b10–23, quoted below on this page.

Here the closing critique of the atomists³⁴ plainly corresponds to the one we have just met in *Physics* 2.4 and 2.6. It differs in arguing just that the *heaven* cannot be the product of luck or the fortuitous, and not this time explicitly extending that conclusion to the causation of the entire world, but we need not doubt that the two passages share a common agenda and are to be read in the light of each other.

In leading up to his refutation of the atomists, Aristotle's second sentence supplies a premise that was not explicit in the other passage. Final causality, he asserts here, is primarily present in the world as a whole, and in beings like us only derivatively, just as the hot and the cold in us are derivative from cosmic hot and cold. This inference is an unnoticed (as far as I am aware) direct descendant of the classic argument placed in the mouth of Socrates by Xenophon (*Mem.* 1.4.8) and Plato (*Phlb.* 29a9–30d9).³⁵ It occurs in a chapter of Xenophon frequently echoed by Aristotle in his biological writings.³⁶

Do you think that there is nothing wise anywhere else? And this despite your knowing that there is a lot of earth, of which you have just a little portion in your body, a lot of moisture, of which you have just a tiny bit, and that each of the other things too is huge whereas your body has been fitted together by acquiring a tiny portion of them? Yet intelligence alone, it turns out, you think exists nowhere, and that you laid your hand on it by some stroke of luck? And that it is due to some kind of unintelligence that these vast masses of limitless amount are well arranged?

Just as the water, earth and suchlike in our bodies are derived from the great cosmic masses of these same stuffs, Socrates argues here, so too our intelligence must be inferred to be derivative from a great cosmic intelligence which is responsible for the world's good ordering.

Aristotle's version replaces water and earth with two of his own elementary powers, the hot and the cold, and also replaces intelligence with final causality, in conformity with his by now familiar modification of Platonic teleology to remove conscious purpose from nature. But his argument is unmistakably in the same tradition.³⁷ Aristotle's prioritization here of

³⁴ Although I agree with Lennox 2001a, 136, that *PA* 1.1.640b4–17 is not specifically targeted at Democritus, it seems overcautious (pp. 136 and 145) to extend the same doubt to the present passage or to its doublet in *Ph.* 2.4.

³⁵ The same Socratic argument was later elaborately reworked by the Stoics as the very basis of their theology: see Sedley 2005.

³⁶ E.g. compare *Mem.* 1.4.6 on the arrangement of teeth, with Aristotle, *Ph.* 2.8.198b24–6, *PA* 3.1.661b6–9, and, on eyebrows and eyelashes, with *PA* 2.15.658b14–26.

³⁷ Johnson 2005, 136–7 with n. 9, translates ἔχομεν . . . ἐκ τοῦ παντός not 'we have from the universe' (as I do above, along with all other translators I have consulted, including now Lennox 2001a), but 'we ascertain from the universe', describing the sentence as 'obscure', as it would indeed be, thus translated.

cosmic teleology over that of individual natural processes³⁸ is a vital but under-appreciated motif, to which I now return.

Clearly the world as a whole is structured in many ways that are regularly beneficial to life, including the availability of natural resources, and the eternally recurrent intertransformation of the four simple bodies that underlies the weather cycle, this latter dependent in turn on the daily and annual cycles of the sun. If Aristotle conceded that these advantageous cosmic structures require no teleological explanation, he would be playing into the hands of his opponents by implying that advantageous structures in individual organisms might equally well be understood as non-purposive.³⁹ Worse still from his point of view, he would be making the teleologically governed perpetuation of species in the sublunary world dependent on an overall cosmic arrangement whose own eternity was itself not explicable in terms of purpose but just a matter of brute fact. It is easy to see why Aristotle wants to avoid any such dependence of the teleological on the non-teleological, and why instead we have just seen him, on the contrary, emphasizing that biological teleology is derivative from a prior cosmic teleology.

Just such a derivation had been a prominent feature of the key background text, Plato's *Timaeus*. There, the world's goodness is the primary explanandum, and that same world's comprehensive stocking with organic species, each elaborately engineered to suit its specific function, is in turn explained by its contribution to that goal. Readers of Aristotle have had difficulty in believing that he can have inherited any such prioritization from his teacher, because his zoological treatises rarely mention global teleology⁴⁰ and instead concentrate on the functioning of individual organisms in their own right. But we should not be misled by this emphasis, because it too has its background in Plato. Although the *Timaeus*, taken as a whole, leaves no possible doubt about the subservience of zoological to global teleology, it is its long treatments of anatomy at 69c5–86a8 and 90e1–92c3 that correspond functionally to Aristotelian zoology, and these sections have very

³⁸ This prioritization reflects Aristotle's pronouncements (*Mete.* 1.1.338a20–b22, 339a5–9) on the correct order of study, with celestial motion preceding zoology and botany. See further, Burnyeat 2004, 13–24; Falcon 2005, 2–13.

³⁹ Indeed, not just equally well, but *a fortiori*, since Aristotle here makes sublunary teleology dependent upon its cosmic counterpart. This prioritization does not, however, mean that an organism is so structured as to put its cosmic role before its own self-interest (as Pellegrin 2002 and Johnson 2005 have understood me as intending in Sedley 1991), but that the goal of godlikeness is most fully achieved by the main cosmic structures, from the celestial spheres downwards, and only secondarily and derivatively by organisms like ourselves.

⁴⁰ Indeed, the one notable exception, widely cited, is *PA* 4.13.696b25–32, on the inconvenient positioning of the shark's mouth underneath, partly in order to spare other species.

little indeed to say about the global perspective. Like Aristotle's biological works, they are squarely focused on individual bodily functioning. Provided that Aristotle's physical and theological writings supply the missing global perspective on teleology, the relative restraint shown in the biological treatises should be read as symptomatic, not of his emancipation from Plato but, if anything, of a continuing debt to him.⁴¹

There is, as I have said, a pronounced reluctance among scholars to attribute to Aristotle any such global teleology, but various further considerations confirm that he intended it. In addition to the above passage (which as far as I know has not previously been invoked in the debate), and the matching passage from *Physics* 2.6 (195a5–13), in what follows I shall be briefly revisiting some of the other texts that point to a global teleology. Opponents of an Aristotelian global teleology have had no trouble in picking these passages off one by one, explaining each either as a temporary aberration on Aristotle's part, or as admitting of a more innocuous interpretation.⁴² My reply is not that they cannot, at a stretch, be read in these alternative ways, but that their cumulative effect is far more powerful than that of any one taken individually, and such as to make any such escape implausible.

To this cumulative evidence, add the remarkable lack of counter-evidence. Precisely one passage has been cited as actually contradicting any idea of global teleology. This is *Ph.* 2.7.198b8–9, where in a summary of the four causes the final cause is summed up as 'because it is better thus, not absolutely (*haplōs*), but relatively to the being of each thing'.⁴³ If 'each thing' means each individual organism taken severally, Aristotle could indeed be denying a global teleology, even if he will at the same time unfortunately be rejecting his own thesis (*GA* 2.1.731b24–732a1) that animals' drive to reproduce is for the sake of perpetuating their species. But where does his emphasis actually lie? The terminology indicates that he is working with the familiar 'absolute–relative' distinction. So when he here asserts that the good served in his teleology is always relative, not absolute, his target could well be Plato's insistence that some decisions, for example

⁴¹ Cf. the valuable remarks in Falcon 2005, 8–9, about the probable dependence of Aristotle's order of exposition on Plato's.

⁴² I have defended a global-teleology interpretation in Sedley 1991 and 2000b, and I consider Cooper 1982, Kahn 1985, Code 1997, 130, and Matthen 2001 at least broadly in the same camp. The primary critics to whom I am referring here, are Wardy 1993, Judson 2005, Bodnár 2005, Johnson 2005; cf. also Pellegrin 2002, although he does not discuss the passages I rely on (he also seems to be incorrect, in n. 17, to place Sorabji 1980, 147 n. 8, in the former camp).

⁴³ διότι βέλτιον οὕτως, οὐχ ἁπλῶς, ἀλλὰ τὸ πρὸς τὴν ἐκάστου οὐσίαν. The interpretation I offer here is largely identical to that in Sedley 1991, 190.

that the world should be spherical, were made by the Demiurge on the grounds that certain properties are intrinsically better than their alternatives, not because they do anyone or anything any good. Alternatively, or in addition, he could be extending from ethics to physics his critique of Plato's transcendent and absolute Good, whose alleged unattainability by us in his view makes it teleologically irrelevant (*EN* 1.6.1096b32–5). Either way his emphasis is on denying that his teleology involves any non-relative good. Hence there is no reason why, when he insists instead that the good served is 'relative to the being of each thing', his reference should be assumed to be limited to each discrete individual taken severally, and not more broadly to 'everything' – individuals, species and the world's entire contents alike.⁴⁴ This one passage then, in the absence of supporting evidence, falls far short of undermining the considerable weight of testimony in favour of a cosmic teleology, to which I now return.

In a much-discussed passage of *Physics* 2.8,⁴⁵ Aristotle maintains explicitly that in nature *all* regular events must be for the sake of something, and he includes under that generalization the specific case of rainfall. Summer rain, he allows, is rare, and he is ready to treat its occurrence as a mere accident. But winter rain, on which the growth of crops depends, is regular, and this he makes clear does serve a purpose. What purpose?⁴⁶ Elsewhere, when considering rainfall in its own right,⁴⁷ he is interested only in invoking the material processes of evaporation, condensation, and so forth. But that localized non-teleological perspective is perfectly compatible with another which sees weather as part of an inherently purposive cosmic nature, one

⁴⁴ This is, among other things, an answer to the question posed by Judson 2005, 360, why on an interpretation such as mine Aristotle would have written 'of each thing' rather than 'of something'. There is no reason to take the former to refer purely internally to individuals' self-benefit.

⁴⁵ I have discussed this passage at length in Sedley 1991, following the lead of Furley 1985.

⁴⁶ For the interpretation that the purpose served is water's return to its natural place, see Wardy 1993, 20–1. His primary text for this, *Cael.* 4.3.310a34–b16, may indicate no more than that the return of a simple body to its natural place is a return to 'form' in the literal sense of 'shape', and it is therefore probably not associating form with the final cause; but the chapter taken as a whole does, I think, tend to favour a teleological interpretation (e.g. the comparison to the potentially healthy becoming actually healthy, 310b16–19). Admittedly (cf. *GC* 2.10.337a1–15), the result of *all* elements returning to their natural places would be an entirely inactive and thus ungodlike sublunary world, but Aristotle presumably does regard it as better that at any rate most earth is at the centre, most water at its surface, most air above that, and most fire at the periphery. Since (cf. *Ph.* 8.2.252b21–3, 8.4.255a10–15, b29–31) water is not a self-mover, it must, strictly speaking, be moved by one or more external movers. Hence water's regular redistribution by rainfall to its proper place, the surface of the earth, will have as its moving cause the movements in the heavens (cf. *Mete.* 1.2.339a30–1, etc.). This makes rain not an autonomous mover driven by its own ends but part of an overall good cosmic distribution of the simple bodies (to the right places, at the right times, in the right quantities, etc.) orchestrated from the top down, and having among its innumerable beneficial outcomes the nourishment of plants.

⁴⁷ *Somm.* *Vig.* 3.457b31–458a1; *APo.* 2.12.96a2–6; *PA* 2.3.653a2–8; *Mete.* 1.9.346b21–36.

which among other things supports agriculture, as the reference to making the crops grow strongly suggests. We might think of Aristotelian rain as like human sweat.⁴⁸ Viewed in isolation, sweat is a liquid moved by purely material causes such as heating, cooling, evaporation and weight. Nevertheless, its occurrence is at the same time part of a purposive biological structure within which it serves an obviously beneficial end. In Aristotle's world, rain is very much like that.

A similar dual-perspective explanation accounts for another feature of cosmic teleology, one which Aristotle explicitly advertises in *Politics* 1.8, to the incredulity of many of his admirers. Lower species exist for the sake of higher ones (1256b10–22):

Even at the moment of childbirth, some animals generate at the same time sufficient nutriment to last until the offspring can supply itself – for example all the animals which produce larvae or lay eggs. And those which bear live young have nutriment within themselves for their offspring for a time, the substance called milk. Hence it is equally clear that we should also suppose that, after birth, plants exist for the sake of animals, and the other animals for the sake of mankind – domesticated animals for both usefulness and food, and most if not all wild animals for food and other assistance, as a source of clothing and other utilities. If, then, nature makes nothing incomplete or pointless, it must be that nature has made them all for the sake of mankind (ἀναγκαῖον τῶν ἀνθρώπων ἕνεκεν αὐτὰ πάντα πεποιηκέναι τὴν φύσιν).

Here Aristotle follows Xenophon's Socrates (*Mem.* 4.3) in bringing the entire natural hierarchy within the scope of his teleology, which is itself given a manifestly anthropocentric focus. The food chain, and all other cases of inter-species dependence, are cases of nature's purposiveness, with man the ultimate beneficiary standing at the very top of the hierarchy. Once more, the 'nature' in question can hardly be identified with the natures of the individual plants and animals, or, for that matter, human nature. For Aristotle certainly does not think it is any part of the nature of the plants and lower animals to serve the interests of their predators, human or other;⁴⁹ and although it *is* part of human nature to exploit them, Aristotle's point is evidently not that here: for example, plants exist for the

⁴⁸ I choose this analogy as easier to illustrate than Aristotle's own chosen example, breathing *PA* 1.1.642a31–b4.

⁴⁹ On this cf. Pellegrin 2002, 312, who cites the case of the camel, pointing out that at *PA* 2.14.674b2–4 its tongue is said to be adapted to dealing with spiny plants, rather than the plants' being adapted to being eaten by the camel. But I see no conflict with the global-teleology interpretation, which is about how cosmic nature integrates the natures of individual divine and sublunary substances into a single system, and not about what determines those individual natures in the first place (see esp. Sedley 1991, 190–1).

sake of animals in general, he is telling us, and that aspect of the hierarchy could hardly be part of human nature. Rather it is the complex cosmic nature that is manifested in the world's inter-species ecology.⁵⁰

The question has been asked⁵¹ how this food-chain teleology can be reconciled with the internal teleology that dominates Aristotle's biological works. If pigs grow and function for slaughter and human consumption, how can they at the same time grow and function for their own wellbeing? This should not ultimately prove to be a problem for Aristotle. The natural strivings of living things are for survival, maturation and propagation. It is not in the pig's nature to queue up at the slaughterhouse. Nevertheless, the fact that the world actually contains pigs, and potentially contains roast pork, is a systematically beneficial feature of it, which Aristotle could not consistently with his teleological outlook consider merely fortuitous. Just as the nature of an animal can be invoked to explain why it has the parts that it does, so too the nature of the world, including its goal-directed structure with man at its apex, can be invoked to explain why it contains the species, weather systems and other amenities that it does. This in no way conflicts with strivings of a quite different kind, those of the pig itself, to perfect and perpetuate its own form rather than sacrifice those aspirations at the human dinner table. Here once more Aristotle's teleology can be best understood by adopting a dual perspective, combining the local and the global levels of explanation.

How, finally, can the world as a whole have a 'nature'? The natures in which Aristotle's chief interest lies are those of individual organisms, and the world is not for him, as it had been for Plato, a living organism. In *Metaphysics* Λ.10, however, when speaking of the world's nature as embodying cosmic good, he compares it not to the nature of an animal, but to the hierarchical structure of an army or household. And in *Politics* 1.2 he makes it clear that a city or household – itself a non-organic structure, despite consisting primarily of organisms – does have a nature, one which is indeed prior to the natures of its individual human components, since

⁵⁰ Judson 2005, 357–8 offers a new strategy for disarming the passage. Aristotle's words here are 'reflecting the viewpoint of the household manager or statesman: he is simply considering how many animals *can* be used for human ends, and reacting to the thought that some animals are, for example, too fierce to be so used'. But this does not sit very comfortably with Aristotle's insistence (however questionable) that nearly all animals are for the benefit of mankind, with no apparent emphasis on the rare exceptions. The last clause of the passage 'it must be that nature has made them all for the sake of mankind', also remains, in my view, a severe obstacle both to this and to two other contemporaneous attempts (Bodnár 2005, 23–4; Johnson 2005, 229–37) to read the passage as describing little more than how we do in fact adapt animals to our own use.

⁵¹ Esp. Wardy 1993.

the latter are its parts. Specifically (1252b30–4),⁵² this nature is the social or political system's completed form, also identifiable with its final cause. It seems then that any natural collective system composed of discrete natural substances, be it an army, a household, a city or a world, has as its 'nature' its own complex functionality, this being, irreducibly, an end over and above the individual functionality of its various components.⁵³

⁵² διὸ πᾶσα πόλις φύσει ἔστιν, εἴπερ καὶ αἱ πρῶται κοινωναίαι. τέλος γὰρ αὕτη ἐκείνων, ἡ δὲ φύσις τέλος ἔστιν. οἷον γὰρ ἕκαστόν ἐστι τῆς γενέσεως τελεσθείσης, ταύτην φάμεν τὴν φύσιν εἶναι ἕκάστου, ὥσπερ ἀνθρώπου ἵππου οἰκίας.

⁵³ For the close analogy between the hierarchical structure of such 'systems' and that of an individual organism like man, cf. *EN* 9.8.1168b31–2, 'Just as a city is thought to be above all its most authoritative element, and likewise every other system, so too in the case of man' (ὥσπερ δὲ καὶ πόλις τὸ κυριώτατον μάλιστ' εἶναι δοκεῖ καὶ πᾶν ἄλλο σύστημα, οὕτω καὶ ἄνθρωπος). For the notion of 'nature' in the *Politics*, including the analogy between political and zoological taxonomy, see also Lloyd 1993.