

CHAPTER 6

Nature and craft in Aristotelian teleology

PART A: INTRODUCTION

(1) It used quite commonly to be argued against Aristotelian teleology that this type of explanation founders for lack of a suitable psychological basis in most of the phenomena for which it was invoked. The objection was that it does not make sense to attempt to explain *X* as happening or existing in order that *Y* should happen or exist unless one assumes that the production of *X* and *Y* is guided by thoughts, desires or conscious purposes relating *Y* as end to *X* as means. Yet Aristotle himself makes it clear that the domain in which, as he believes, teleological explanation is not merely illuminating but mandatory if we are to have any adequate scientific explanations at all, extends well beyond the domain of entities to which beliefs, desires and conscious purposes can be reasonably ascribed.¹ Nor, on the other hand, does Aristotle protect himself against the objection by introducing a supernatural being who produces or shapes phenomena in accordance with divine intent. Thus if the application of teleology does depend on the presence of psychological factors such as those mentioned, it is a dependence which Aristotle fails outright to notice. Alternatively, there is no such failure because the claimed dependence does not hold.

(2) This poses the question: Is a non-psychological teleology as intelligible as Aristotle evidently takes it to be? We may be tempted to turn a deaf ear to this question if it seems to us that in other respects Aristotelian teleological explanations are effective or at any rate more effective than alternatives given the state of knowledge. But embarrassing though it may be for Aristotelians, the question is *prima facie* a pressing one precisely for them. What makes it so is Aristotle's characteristic appeal to the notion of craft (*technê*) as analogue for his conception of nature (*physis*). Nature, in this context, is not Nature in general, or the cosmos, but the specific

¹ See *Physics* II.8, 199a20–I; b26–8.

essential nature of an individual substance, the inner principle of its behaviour and organisation. It is nature in this sense that Aristotle likens to craft – that is, to one or another specific craft; for the crafts are principles of activity vested in particular individuals who live, move, and have their being within the physical world. Craft in its active exercise is evidently end-directed, and to Aristotle the same is true of nature, although less evidently so. Thus it is craft that provides the model for nature, not the reverse. That the comparison goes in this direction might seem too obvious for mention, except that just at this point we confront what seems the most vulnerable spot in Aristotle's position. If one were to establish independently the idea of the nature of a thing as end-directed, and were then to use this conception of nature to explain what should be meant by the end-directedness of craft, one might well achieve the interesting result of having developed a notion of craft (that is, the exercise of craft) in which psychological concepts play no essential part. For generally speaking, natures are not psychological, and in this backwards analogy craft would be likened to nature. I shall return later to this possible way of conceiving of craft. Meanwhile, in Aristotle's actual account craft is the model, and the nature of a thing the *explanandum*: which is not surprising, since we have a better pre-reflective grasp of the idea of craft than we have of the idea of a thing's nature. But now the vulnerable side: isn't it also part of that familiar pre-reflective notion of craft that craftsmen are human beings operating from beliefs, desires and conscious purposes – and that without all this, craft would not be possible? But if that is so, are we not right to mistrust Aristotle's confidence that nature can be coherently treated as teleological like craft, even though the operations of nature, unlike those of craft, mostly do not depend on psychological attitudes?

(3) There are a number of problems here. I shall indicate two, with the aim of focusing on the second. First there is the traditional objection to natural teleology: 'How can a state of affairs that is at best future and at worst never occurs at all (since the end may not be realised) exert an influence in the present? Only something now can cause something now: for example, a present desire causes a movement. But nothing future can cause a present movement otherwise than as the object of something present; in which case what really causes the movement is the present item, of which the future one is only the object. So take away such present items as desire, will and conscious design, and you take away the basis for applying any explanation that refers to what is not yet.' It is sometimes commented that this argument crudely mistakes final for efficient

causes: efficient causes cannot operate unless as already existent, but the whole point about final causes is that they can (not that this 'can' attributes some extraordinary capacity); thus surprise here simply betrays failure to grasp the idea of final causality. But this response is itself inadequate insofar as it suggests not only that a final cause is not an efficient cause but that a final cause can function on its own without an efficient cause. No doubt that would make sense if one could indeed intelligibly think of a final cause as a surrogate efficient, something planted there in the future and backhandedly stirring things up in the present. That is what the objection rightly finds to be nonsensical. But in Aristotle, final and efficient causality are complementary: the end is an end of or for an agent, and the agent as such is bent on an end. And this complementarity is general, applying where will or desire is present, but also where they are not. Thus it is not as if the absence in a given case of empirical psychological factors forces us into the following choice: *either* (a) there is only a final cause functioning in a vacuum (which is absurd), *or* (b) final causality does not obtain at all, *or* (c) final causality does obtain, but only through the medium of a specially postulated empirically unidentifiable desire or the like. These options are not exhaustive unless one assumes that it is only in virtue of a desire or conscious purpose that an agent can be an end-oriented efficient cause of some objective which in turn functions as final cause of that active efficiency. In other words, the assumption is that intentionality – or more precisely, end-wardness – must be mental or grounded in the mental, in the sense of requiring a mental representation of the end.

(4) However, Aristotelian teleology clearly dispenses with this assumption. That brings me to the second problem: does non-psychological end-directedness make sense? This paper is not an attempt at a general answer to this question; it has the narrower purpose of examining for coherence one example of the view at issue – a surely paradigm example, though, since Aristotle is the greatest historical exponent of this way of thinking. A verdict on coherence requires consideration of the relation between Aristotle's doctrine of natural teleology and his use of the craft analogy. That is my concern in what follows. I shall mainly consider two questions: (i) Does the doctrine depend on the craft analogy? (ii) Does the craft analogy import undesirable psychological elements into the doctrine? If the answer to the first question is No, then it does not matter if the answer to the second is Yes. I shall, however, argue that the answer to the first is Yes, and to the second No (respectively in Parts B and C). I shall then (Part D) consider further problems arising from the craft analogy.

PART B: IS THE CRAFT ANALOGY NECESSARY?

(5) In what sense might Aristotle's teleology be said to depend on the craft analogy? Does he, for instance, need the analogy in order to prove that the operations of nature, as of craft, must be explained by reference to the end; or is it in order to illustrate the meaning of this claim, the truth of which is assumed? In one passage² he uses the analogy by way of proof, arguing that since nature resembles craft in ways that are not in question, it also resembles it in being teleological. For the most part, however, he seems to employ the analogy with purely illustrative intent. This is the use which I am mainly concerned to justify in the present section (and to question in Part D below). An excellent starting point is at hand in John Cooper's paper 'Aristotle on Natural Teleology'.³ By a very clear and thorough argument Cooper shows a way in which we may understand Aristotelian teleology without tacit appeal to psychological factors. The argument rests on Aristotle's view that the species are eternal. Cooper presents it as a fundamental fact of the Aristotelian universe that the organic forms realised at any given time should never not be realised through individuals of the relevant kinds. This fact, on Cooper's account, is what we would probably call an ultimate law of nature. That it obtains is not something that can be explained. In particular, it cannot be explained as due to the movements and properties of the inorganic materials to be found in the universe. Cooper stresses, as others have done,⁴ that given the evidence available to Aristotle it would be entirely reasonable to conclude that the behaviour of inorganic materials could not account for the formation, preservation, and propagation *in saecula saeculorum* according to kind, of those highly organised self-maintaining systems we call living creatures. On the other hand, to put this down to sheer accident is simply absurd. Moreover, even if (as is assumed not to be the case) organic phenomena could be explained materialistically in terms of the coming together of inorganic elements each pursuing its own natural course, the biological *viability* of the resultant wholes would still be an accidental by-product of the workings of those simpler natures. For what would be explained would only be the individual positionings of the elements which, positioned as each is, happen to compose viable organic

² *Physics* II.8, 199a8–20.

³ In Schofield and Nussbaum, 1982, 197–222, reprinted in Cooper, 2004, 107–29. Page references are to the reprint.

⁴ E.g. Gotthelf, 1976; Waterlow, 1982, ch. 2.

unities. The unities as such would not be explained. And that, for Aristotle, is no less absurd, given that these supposed ‘by-products’ are, in his view, *eternally* reinstantiated. But the only alternative to treating the eternal reinstantiation as a brute fact unencompassed by any explanation, is to treat it, itself, as a basic principle *of* explanation. So instead of thinking of it as belonging on the level of what it makes sense to try to explain in terms of matter and to bemoan it as inexplicable if such explanation fails to fit, we should rather think of the behaviour of matter as explicable in terms of *it*. Thus we move to saying that it is *because* there are, and eternally are to be, such organised living systems, that the materials which form their bodies, food, and environment arrange themselves in ways that make it true that those systems are and will be. In other words: since they are and are to be, and since this cannot happen unless the materials behave in certain ways, the materials must behave in those ways – in *order that* the forms be realised.

(6) This analysis is broadly in the spirit of the texts,⁵ and, as Cooper points out,⁶ it has the merit of showing how a rational teleology need owe nothing to psychological assumptions. Granted that under certain intellectual conditions it is only reasonable to apply teleological explanation to organic phenomena, then *not* to apply it, given such conditions, would be (one might argue) so unacceptable that even if the psychological assumptions were legitimately available their addition could hardly strengthen the already adequate case for *teleology*. But now how does Aristotle’s craft analogy fare in the light of all this? On Cooper’s account it seems inessential. Thus Cooper writes: ‘... one must reject the suggestion that is sometimes made that this analogy is central and fundamental to Aristotelian teleology.’⁷ The dismissal is surprising. For surely it is Aristotle’s own texts that cumulatively make the suggestion, through frequent emphatic occurrences of the analogy. Cooper correctly points out that at least one of Aristotle’s arguments for natural teleology does not rely on the analogy.⁸ However, it does not follow that Aristotle’s full view can be properly represented without it. It is possible, of course, that he gives the analogy more prominence than it deserves for the amount of good it does; but why should one suspect this? One motive, if not reason, that might weigh with an apologist for Aristotelian teleology would be the thought that the craft analogy carries unwanted psychological implications.

⁵ But for an important qualification, see paras. 8–9 and note 9.

⁶ Cooper, 2004, 128–9.

⁷ Cooper, 2004, 107–8, footnote 2.

⁸ *Physics* 11.8, 198b32–199a8.

(7) Unwanted implications or not, I shall now argue that the craft analogy, though possibly dispensable to some versions of natural teleology, makes an essential contribution to the Aristotelian version. This contribution is, however, of metaphysical rather than scientific significance. Hence it may well be overlooked in the context of the debate on the scientific merits of teleological as opposed to, say, mechanistic explanation. Aristotelian teleology, as clarified by Cooper, rests on two presumptions whose reasonableness depends on empirical evidence together with certain extrapolations from this. One is that the living forms are never not instantiated; the other that this fact cannot be explained in terms of the material components. There is also the consideration that in biology, teleological explanations are found to work well; for example, they generate predictions, and the predictions are often confirmed. Now the empirical facts (or presumed facts) that make teleology scientifically attractive do not in themselves dictate any underlying metaphysic. Indeed, there is no reason why the teleologising scientist, any more than his mechanising counterpart in some other age (or other field of phenomena), should embrace any particular metaphysics at all. To give a non-teleological example: the reactions of a compound at various temperatures are explained in terms of molecular theory. That explanation is consistent with distinct metaphysical positions regarding the ground of what are empirically identified as causal connections. Thus one may suppose a non-empirical bond or tie by which a molecular re-arrangement is directly 'powered' by a change in temperature; or that the sequent phenomena are 'powered' to occur in the sequence by the will of God alone; or that the sequence reflects a relation between universals; or that nothing whatever is the case beyond the fact that, this time too, an event of the first type is followed by one of the second.

(8) Natural teleology is likewise open to a variety of metaphysical interpretations. For example, one might hold that it is inherent in the nature of something called 'the Universe' that certain forms be always realised. On that view, the form-realising behaviour of materials has a single metaphysical ground, namely the nature of the Universe. If the realising of some specific form is to be considered a goal, then it is a goal for the Universe, an imperative incumbent upon the cosmos.⁹ It is not a

⁹ Cooper's language often leans in this direction; e.g., (my emphasis): '... it is an inherent, non-derivative fact *about the natural world* that it consists in part of natural kinds and *works to maintain them* permanently in existence ... it is a fundamental fact *about the world* ... that *it* maintains forever these good life forms' (121). But strictly speaking Aristotle's metaphysical pluralism implies

goal for the circumscribed physical entity whose behaviour and development are teleologically explained as being necessary for the realisation of the form. For if the goal is the Universe's goal, the physical entity and its behaviour are means or instruments employed by the Universe; and instruments do not 'have' a goal in the sense in which what uses them has. To make the point we need not imagine the Universe to be a thinking being with conscious purposes, any more than we need suppose a transcendent God who intends that the forms be realised and consequently wills that matter falls into the necessary patterns. The point is threefold: firstly, that the conditions under which it is appropriate to apply teleological explanation as analysed by Cooper may be satisfied even on the assumption that it belongs to *the* nature of *the* Universe that organic forms be always realised; secondly, that such an assumption is thoroughly un-Aristotelian; thirdly, that it fails to be Aristotelian not because the Universe is conceived of as a conscious being (this is not necessary to the assumption), but because there is no place here for Aristotelian natural substances. According to the picture just sketched, the realisation of some given form is a goal served by, but not grounded in, the natures of whatever physical objects behave in the appropriate ways. Are we now even entitled to think of these as having *natures* at all, in Aristotle's sense? For what he means by a 'nature' is not merely a set of dispositions to behave in certain ways, but the inner source of such behaviour.¹⁰ In particular, a nature is the source of the changes by which relatively undifferentiated matter develops into a given form. To speak of the physical thing as the source of its changes in this way is to say more than that it exhibits change that cannot be accounted for by external physical factors. That is an empirical matter, and is compatible with the metaphysical view that all changes are grounded in the nature of the Universe. The Universe thereby becomes the one substance, according to Aristotle's equation of *being a substance* with *being a source of change*.¹¹ Ordinary physical objects, on this view, must be construed as modes of that substance, they being merely subjects of change, not metaphysically independent sources.

(9) The difference between this and the metaphysical teleology of Aristotle may be illustrated by reference to the logical difference between two ways of representing goals, one predicative, one propositional.

that there are as many fundamental facts as there are distinctive organic kinds: for each kind the fact that *it* is always instantiated.

¹⁰ *Physics* II.1, 192b13–23.

¹¹ *Physics* II.1, 192b33; cf. 193a9–10 and 20.

Within a general Aristotelian perspective, it is common ground that (let us suppose) relatively undistinguished blobs of matter (e.g., frog-spawn) change and develop in ways which one cannot begin to explain in terms solely of what is present – the shape, weight, viscosity, temperature, etc. – but which fall into place in the light of our knowledge that what each blob will eventually have become is a frog. Should we then say that the goal is *that there should be (or have become) a frog*; or is it rather *to be (or: have become) one*? The former represents an end logically appropriate for the Universe as agent; the latter for an Aristotelian natural substance, which in this example is precisely that potential frog on the way to becoming what it is *its* goal to become, namely an actual one: which actuality, if achieved, is achieved not merely *for* it but *by* it. Now this is the conception that the craft analogy is surely intended to hammer home: the conception, namely, of particular physical things as themselves metaphysical centres or agents of their development towards form. For the craftsman too is a source of change operating as one of many within the order of nature. The difference is that his goal is not to have become a so and so, but to have made something into a so and so by the practice of his art. So far as natural objects are concerned, one might easily suppose them to be mere subjects of change, who knows what the source of it? But with craft, the functions of *source* and *subject* are clearly partitioned, since in general the development for which craft is responsible is located in an object external to the craftsman.¹² By taking craft as model for the specific natures of particular physical objects, Aristotle unambiguously declares their status as metaphysical centres of activity. Without the craft analogy we should still have teleological explanation, but not the Aristotelian concept of natural substances.

PART C: A NON-PROBLEM OF THE CRAFT ANALOGY

(10) It would be unfortunate if the craft analogy, necessary as I have argued it to be, should finally prove dependent on psychological assumptions alien to Aristotelian teleology. This is now the question. Let us start with the consideration that this analogy is a complex package containing very much more than the elements of belief and desire sometimes deemed necessary for teleology to make sense. If these are what have to be invoked to support the notion of goal-directed natural processes, why say more

¹² *Physics* II.1, 192b15–20; *Metaphysics* XII.3, 1070a7.

than that such processes are like the operations of a consciously purposeful agent? Why confine attention to craft, when so many of our deliberate ends and means owe nothing to special expertise? Why not take going to a neighbour's house in order to find out the latest news? Here are some reasons. (a) The world of craft is divided into craftsmen of *various kinds*, each *qua* craftsman seriously dedicated to his own speciality. So it is with the world of natural substances. For each individual there is the circumscribed end proper to its specific definable essence, and for each an equivalently circumscribed range of means. There are no amateurs here, or dilettanti. (b) The matchless professionalism of healthy natural substances is shown in the *regularity* of their behaviour. Craft, with its rules and repeatable applications, echoes this, even though a realistic view of human history must allow that crafts develop, discovering not only new methods but new horizons. (c) Nature makes *correct* moves, and so does craft. That is to say: while a craftsman may make mistakes, his claim to the title, as Thrasymachus pointed out in the *Republic*,¹³ depends on knowledge, not on misjudgment. Those who think that teleological explanation needs psychological assumptions are concerned with beliefs (as well as with desires, intentions, conscious purposes). But to play the desired explanatory role, the beliefs need not be correct. It can hardly be that the image of the craftsman is invoked mainly to supply the element of belief; for it is of the essence of beliefs that they can be false, whereas it is of the (normative) essence of craft that it is not mistaken. (d) The metaphysical *unity* of an Aristotelian nature is mirrored by the teleological unity of craft-cognition with craft-goal. By this I mean that the knowledge exercised in craft is normally developed precisely with a view to the craftsman's purpose. This is true not only of the necessary causal generalisations, but also of the particular observations required for applying these in an actual situation. The cognitive system exists and operates only as called upon for the end. Idealised, this concept approximates to the concept of an Aristotelian nature, where the end and the capacity to realise it are perfectly integrated. It is not as if the capacity, in any given case, could have been used to some other end, or is more than is needed for this. Contrast, in this respect, both nature and craft with what we may call 'ordinary' human purposive action, where, as likely as not, the relevant desire or interest and the relevant beliefs or cognitive states, were developed independently and come together by an external synthesis.

¹³ 340c-e 1. Cf. *Nicomachean Ethics* vi.2, 1139b15-16, where craft is said to be one of the states 'in which the soul grasps *truth* through affirmation or denial' (my emphasis).

(e) 'Ordinary' purposive actions are usually explained by saying that the agent desired so and so or had a reason for pursuing so and so. Such statements do not as a rule appear in explanations of the activities of natural substances, since in general we do not think that these operations express desires or reflective concerns. But the same is true of the operations of craft, considered simply as such. There is a sense in which the craftsman as such is *too* practical to be animated by desire or reasoned concern for the end. To say of someone that he operates as a builder is already to have implied that he pursues the builder's typifying end (not merely that he exercises the special skills). The builder as such cannot *want* to build houses in any sense in which wanting to build houses could *explain* building by *the builder*. As such, the builder has no motive for building, but either simply builds or is simply a potential builder with the skill to build. Nor is it his business, *qua* builder, to have reasons for building. The builder here is, of course, an abstraction, and it is only to this abstraction that these remarks apply. They are not meant to suggest that a human individual might not engage in builder-activity for some reason, or because he wanted to do this work or have its product. Yet even a tree would have to be more than a tree if it were a tree because it desired to be a tree. This is not because trees are incapable of psychological attitudes such as desire, but because even the desires of such organisms, were they to have them, would already be expressions of their perfect tree-form-seeking tendency, hence not explanatory of it.

(11) Point (e) above is the direct claim that the craftsman as such cannot be said to have the psychological attitude of desire for the craftsman's goal. Some of the previous points should help to construct a similar case regarding other psychological attitudes. Aristotle says that craft does not deliberate.¹⁴ He might have added that in paradigm cases the craftsman in action does not even have thoughts about whatever it is he does that constitutes his exercise of skill, except under two circumstances: one, where he is still learning, and the other, where he is demonstrating so as to teach the art. But in the first case he is less than a craftsman, and in the second case more. With regard to the ascription of belief, two features should cause us to hesitate. No doubt we are concerned with an idealised case of craft but it is in terms of such that imperfect cases are to be understood. First, there are no mistakes; secondly, there is perfect fit between the cognitive system and the end to be achieved. But now where

¹⁴ *Physics* II.8, 199b26–8.

the question of error does not arise, is there need or room for the notion of belief (at any rate so far as this involves the idea of a true-or-false mental representation)? And where the cognitive material is wholly at the service of a given end, is there room for ascribing a factual (or proposition-asserting) attitude such as the word 'belief' commonly implies? To answer 'Yes' with confidence one would have to be sure that our distinction between belief and, say, desire (which distinction plays a significant part in determining the meaning of 'belief') could still be drawn in the case mentioned. But would that be possible if the alleged belief had no life or history of its own independent of that one conative context?

(12) These remarks are only pointers, but pointers in a direction which for the present limited purpose is perhaps sufficiently clear. We have at any rate shifted the burden of proof to those who would deny what is here suggested: namely, that craft is non-psychological in precisely those respects in which craft is most suited to provide the model for an Aristotelian nature.

PART D: FURTHER CONSIDERATIONS

(13) I have argued that Aristotle's craft-analogy for nature does not introduce the psychologism sometimes feared. But his use of the analogy is by no means all plain sailing. Here I shall examine some problematic ramifications. In the first place, the concept of craft is supported by presuppositions which on reflection might lead one to question the propriety of using it to further our understanding of nature. One such presupposition of course is that a natural order is already there, providing conditions for the growth and exercise of human skill. Even if craft is itself an expression of *human* nature, craft is a rationally organised attempt to control objects and forces already at work independently. Thus craft is a fitting analogy for the nature of a non-human natural substance only to the extent that we can conceive of such a substance as depending for its orderly development on natural qualities and relations of natural objects other than itself: which objects, in this context, are regarded as materials for the realisation of the natural form in question. Aristotle finds no trouble in understanding the world of nature in this way. Nor, I think, should he, so far as method is concerned. Someone might object that if non-human natures in general are to be conceived on the model of the craftsman, then the presupposition just mentioned will force us round in a circle when we come to analyse craft. But the objection is superficial: although we cannot make sense of craft without presupposing natures

which craft has not touched, there is no incoherence in treating the latter as also craft-like in turn. For it is not in the same conceptual breath that we both oppose and liken them to craft. Even if natures are craft-like, it is not on account of this resemblance that nature is a precondition for craft. The dependence here considered of craft upon what is not craft can be grasped without circularity as well by Aristotelians as by those philosophers who claim to find nothing craftsmanlike in nature.

(14) But there is another presupposition which gives rise to doubts less easy to weigh. Just as craft depends on a world of non-human substances confronted as independently there, so craft assumes non-craft on the human side as well. Craftsmen must know what nature makes possible given the human will to guide and divert natural processes towards human objectives. But the objectives themselves ultimately rest on principles belonging to no special craft. The craftsman, whatever his kind, aims at some good; but to say this is to say more than that the craftsman aims at the end that defines the craft. For the end aimed at is not good because in that craft it is the end aimed at; rather, it is aimed at because it is of value as answering to some human need, passion or interest. No doubt if the carpenter were nothing but a carpenter, the good as conceived by him would be nothing other than the production of cabinet work; but the same would be true, *mutatis mutandis*, of the craftsman, if such there were, whose *métier* was to blow curious arrangements of soap-bubbles. In fact, however, it is good or useful that certain articles are produced, because these articles are regularly wanted for reasons having nothing to do with the craft of their production. This is by contrast with the hypothetical case where one can say no more than that the defining end of some conceivable craft *would* be good if its products *were* of any importance. Now the real carpenter, an intelligent human being, operates as such: that is, with an eye to the needs that called forth the exercise of his craft in the first place. While expertise may be necessary to convert, say, the need for shelter and for various utensils into practicable objectives, one does not have to be an expert to appreciate the desirability of such products. This rests with the judgment of those who are not carpenters, or not merely carpenters. Aristotle, as everyone knows, takes such judgments to be grounded in a conception of human happiness or the good of man *qua* man. The lowly carpenter may not give this much thought in the sense of concerning himself with some all-round definition; but he responds to market forces, or ignores them at his peril, both with respect to what he makes, and to its timing and quantity. Thus it is only in a highly abstract sense that a given type of craftsman always produces the

same. There are times when he produces nothing even though awake and physically capable, and so far as he does produce, the character of his objective is constantly subject to re-interpretation such as never occurs in the non-human world according to Aristotle's view.

(15) In short, the specific crafts are not autonomous but operate within limits set by what Aristotle calls '*phronêsis*': wisdom about the whole of practical life. It is true that Aristotle sometimes follows Plato in a schematic division of labour: the carpenter is one entity, and the being who dictates the when, where, and how much of the carpenter's activity is another – the *politikos*, whose concern is for the good in all its aspects.¹⁵ But that is for the purpose of analysis only. The actual carpenter has to be something of a *politikos*: not necessarily a 'statesman' in some high sense, but a social being. His excellence in his particular trade depends in part on this, for who would employ a carpenter who understood nothing but carpentry? More to the point, such a notion is hardly intelligible. Craft is essentially practical, or (to speak more abstractly) a source of orderly change. That is the basis of the analogy with nature. But from craft alone nothing comes about.¹⁶ For even if *what* the craftsman does in making what he makes can be explained by the principles of his craft, *that* these principles operate at all, and when and to what degree, depends on ulterior values. This is by contrast with the nature of a natural substance, which is not merely an inner principle of change, but, as Aristotle says, an innate *impulse* (*hormê*) of change,¹⁷ so that the characteristic developments must occur in the absence of physical impediment. When, as in *Metaphysics* Z.7,¹⁸ Aristotle compares the active essence of a natural thing with 'the form in the soul of the craftsman', he speaks as if the craft-form itself holds all that it needs to function as efficient cause of the product. In effect, then, Aristotle here treats craft as conceptually isolable from those non-technical factors that set its objective. But this is to distort the notion of craft, if (as I argue) we cannot make sense of craft otherwise than as practical, and further cannot make sense of craft as actively practical without noting its dependence on something other than itself, namely general practical wisdom. This is not to say that this isolated notion of craft may not illustrate something of what Aristotle understands

¹⁵ See, e.g., *NE* 1.2, 1094a26ff.

¹⁶ Cf. *NE* vi.2, 1139a35–7: 'Thought by itself sets nothing in motion; thought that sets in motion is for the sake of something and practical [sc. in the narrow sense in which *praxis* is concerned with the good of man as man]. For this also controls productive thought [i.e. craft] . . .' (trans. C. Rowe).

¹⁷ *Physics* 11.1, 192b18–19. ¹⁸ 1032a32–b1.

by 'nature'; but it does mean that he cannot safely *model* nature on craft, since if we take one thing as model for another, we expect the latter's structure to exhibit all that is essential in the former. If the natures of things really paralleled human crafts, then (as has already been indicated) nature would not behave with the massive constancy that is its hallmark. And the parallel also undermines that metaphysical pluralism which, as I suggested in the second section, the craftsman analogy helps to sustain. We now see that this help is afforded only by a notion of craft plucked out of the system of conceptual connections that give it life. For considered in the round, a craft is more like an organ than it is like an independent substantial principle. With an organ there must be a user who rationally coordinates the use of it with the use of others. The user of a craft is the social individual, who stands in this relation to many crafts, although his involvement with them takes different forms depending on which are practised by him and which by others. Once this line of thought is applied to nature, it becomes tempting to postulate a single universal natural principle directed towards some one end to which each part of the physical world must be understood as subordinate. In a few passages Aristotle seems to move in this direction.¹⁹ We need not wonder, considering that the craft-analogy, unguarded, is bound to lead this way.

(16) I have attended so far to one point at which the concept of craft must be circumscribed if it is to play its expected part in the analogy: this was at the interface of craft with practical wisdom. But there are further necessary restrictions, of which some have to do with the specialist aspect of craft. Crafts are learnt, and they are passed on by teaching: in which respect the species of craft differ essentially from the species of nature. For it is surely of the essence of craft to be transmitted by cultural as distinct from genetic inheritance. Here, perhaps, is the ground for that special dimension of rationality that makes craft so intensely significant to the Greek philosophers. It is the dimension in which functioning in accordance with rational principles is integrated with the reflective knowledge of those principles and with the power to communicate them. Now if, as Aristotle believes, non-human natures act unawares for the sake of ends, and regularly achieve those ends by natural strategies of astounding ingenuity, then what purpose is served by reflection? It cannot be that in general reflection is necessary or even useful for accomplishing ends, since performance is faultless in countless cases where reflection never

¹⁹ E.g., *Metaphysics* XII.10, 1075a11–25.

enters. On the other hand, human beings have a nature too; for example, it is natural to them to act reflectively. But nature does nothing in vain. We must therefore suppose that human beings are distinguished by having ends that can only be achieved through reflection, and through the giving and taking of reasons. One such end that concerns us here is the transmission of forms of activity that are saved from dying with the individual only by being taught. *Reflective* rationality, according to this approach, is the means by which human nature compensates for its own failure to provide genetically all that it needs in order to flourish and continue. Non-human natures, on the other hand, are genetically adequate for their own needs, including the need to reproduce in kind. In comparing such natures to craft, Aristotle must prescind from just the feature of craft that so impressed Socrates and Plato: the craftsman's command of reasons for doing as he does.

(17) The crafts develop; and even when the principles of a craft are well worked out, further intelligence is often needed to apply them effectively; there is room for thoughtfulness, inventiveness, and an exploratory attitude to facts and objectives. With nature, by contrast, it is as if the objective has never not been finally formulated and the means completely known. Thus when Aristotle likens nature to the craftsman, he has in mind the craftsman as *already effectively in action*, and leaves out of sight the processes, with all their doubtfulness, trial and error, by which someone sets himself up so as to be thus effective: whether by learning a skill, or by analysing the objective, or by taking closer stock of the facts. It is perhaps at this stage that distinctively *mental* activity is most apparent. We wonder and deliberate, not yet being ready to act with the assurance of those whose knowledge is totally immanent in their action. The thinking in action of the utterly accomplished performer is not alongside, above, beyond, or even about his performance: it is that performance. It is the exercise of *achieved* craft that Aristotle has in mind when he compares craft with nature. The danger of the analogy is not that it will psychologise the concept of nature, but that it will de-psychologise the concept of craft.²⁰ For there is no distinguishable psychological dimension to the self-contained perfection of craft that figures in the analogy. This ideal efficiency essentially (if it is the efficiency of *craft*) rests on a great deal

²⁰ However, this remark should be balanced by the fact that in the *Ethics*, craft is often said to deliberate, and is used to illustrate ethical deliberation. It is only in the *Physics* that craft does not deliberate.

that is not itself; but to acknowledge these other aspects would be to destroy the analogy.

(18) I began this paper by considering the old-fashioned objection that Aristotelian teleology entails the psychologising of nature. Recent work in philosophy has brought about a more sympathetic attitude to teleological explanation in general; and recent scholarship has given us a more accurate understanding of Aristotle's teleology in particular, and of the place in it of the craft-analogy. But these developments generate a new question for Aristotelians, which I raise by way of conclusion. Can we really give meaning to the notion of craft that figures in his analogy? In this section I have argued in effect that the notion is a false abstraction. In that case it is not clear that we are dealing with a familiar concept at all. These considerations may set us wondering further whether the true direction of the analogy is not the reverse of what it appears. For 'craft' in this artificially truncated version is surely no easier to understand than the teleological 'nature' for which it is supposed to provide the model. Even the term is a misnomer, since the true referent is not craft as we actually find it in human craftsmen, but end-directed automation. For Aristotle, examples of this were fantasy, not fact (although he is not above using his imagination in this connection when it makes a point²¹). What paradigm of automation could he show from the real world more perspicuous or more telling than the natural activity, itself, of organisms? Thus when nature is compared to craft, it is the first that prescribes what the second must mean in this alignment. Taken in the direction in which Aristotle intended it, the analogy fails. But perhaps this argument shows that it was not needed in the first place. For could we make sense at all of what passes for craft in this context if we did not already possess the idea of a type of teleological functioning that needs no roots in reflection?

²¹ *Politics* I.4, 1253b33–1254a1.