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THE “LOGIC” OF ARISTOTELIAN CAUSALITY:
AN ANALYSIS OF THE GENESIS OF ARTIFACTS

CONTEXT AND MOTIVATION

In *Physics* II.8–9 Aristotle considers the ancient physicalist theory of the genesis and development of natural organisms. The proponents of this theory maintain that the material elements of such organisms, acting necessarily according to their natures, cause them to come into being and determine their qualities and behavior. They attribute such processes and activities to the simple causal necessity of the constituents.¹

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¹ Aristotle outlines the physicalist position as follows: “A difficulty presents itself: why should not nature work, not for the sake of something, nor because it is better so, but just as the sky rains, not in order to make the corn grow, but of necessity?” (ἔχει δ’ ἀπορίαν τί κωλύει τὴν φύσιν μὴ ἐνεκά του ποιεῖν μηδ’ ὅτι βέλπιον, ἀλλ’ ὥσπερ ὕει ὁ Ζεὺς οὐχ ὅπως τὸν σῖτον αὐξήσει, ἀλλ’ ἐξ ἀνάγκης) *Physics* II.8 198b16–19. [The current standard English translation of Aristotle’s works is the Oxford Translation. Jonathan BARNES, ed., *The Complete Works of Aristotle: The Revised Oxford Translation*. 2 vols. (Princeton: Princeton University Press, 1991).] Martha Nussbaum calls the physicalists’ view the “Democritean challenge” and explains that “Aristotle repeatedly attacks them [his predecessors in natural science] for their lack of attention to formal and final explanation, insisting that form, and not matter, is the basic explanatory principle of living beings and their activities, and that, furthermore, the growth and motion of animals and plants must be explained with reference to an end-state — the mature functioning of the adult creature, as specified in its logos.” Martha Craven NUSSBAUM, “Aristotle on Teleological Explanation,” in *Aristotle’s De Motu Animalium. Text with Translation, Commentary, and Interpretive Essays* (Princeton: Princeton University Press, 1978), 61. However, let us note that in one of his earlier articles David Balme questions Aristotle’s interpretation of the physicalist understanding of simple necessity. For Aristotle, simple necessity is an attribute of what is eternal: “The Ananke which is invoked as a part-cause of physical phenomena is not, for our purposes, adequately ex-

Aristotle argues that the physicalist account is inadequate to explain the features of natural substances. He claims that we must rather look to the fully developed living organism found only at the end of the process, but which is both logically and ontologically prior to the elements. He invokes and gives primacy to a necessity which he calls hypothetical: the necessity that the materials out of which an object is constituted be present if that object is to exist.²

The above two kinds of necessity correspond to a division of Aristotle's four causes into material and moving, on the one hand, and formal and final, on the other. The physicalist adherents of simple necessity maintain that the constitutive materials and their motions are the primary explanatory devices. Aristotle and the proponents of hypothetical necessity, however, believe that the form of the fully developed organism and the activity of the parts for the sake of the final product are fundamental in understanding what is taking place. They claim that all natural substances possess a proper and irreducible form and that all natural processes, and in particular those of living organisms, are directed to the good of the product.³

plained by A. He tells us what it is not rather than what it is. It is not the Ananke which governs the unalterable uniformities — whether the truth of axiom, of mathematics and of apodeixis, or the unvarying motions of heavenly bodies: this is the Ananke of τὰ ἀίδια, things which can never be otherwise, and it is called 'simple' necessity." David M. BALME, "Greek Science and Mechanism, I: Aristotle on Nature and Chance," *The Classical Quarterly* 33 (1939): 130.

² Aristotle offers the following argument: "As regards what is of necessity, we must ask whether the necessity is hypothetical, or simple as well. The current view places what is of necessity in the process of production, just as if one were to suppose that the wall of a house necessarily comes to be because what is heavy is naturally carried downwards and what is light to the top, so that the stones and foundations take the lowest place, with earth above because it is lighter, and wood at the top of all as being the lightest. Whereas, though the wall does not come to be without these, it is not due to these, except as its material cause: it comes to be for the sake of sheltering and guarding certain things." (Τὸ δ' ἐξ ἀνάγκης πότερον ἐξ ὑποθέσεως ὑπάρχει ἢ καὶ ἀπλῶς; νῦν μὲν γὰρ οἴονται τὸ ἐξ ἀνάγκης εἶναι ἐν τῇ γενέσει ὡσπερ ἂν εἴ τις τὸν τοῖχον ἐξ ἀνάγκης γεγενῆσθαι νομίζοι, ὅτι τὰ μὲν βαρέα κάτω πέφυκε φέρεσθαι τὰ δὲ κοῦφα ἐπιπολῆς, διὸ οἱ λίθοι μὲν κάτω καὶ τὰ θεμέλια, ἢ δὲ γῆ ἄνω διὰ κουφότητα, ἐπιπολῆς δὲ μάλιστα τὰ ξύλα· κουφότατα γάρ. ἀλλ' ὅμως οὐκ ἄνευ μὲν τούτων γέγονεν, οὐ μὲντοι διὰ ταῦτα πλὴν ὡς δι' ὕλην, ἀλλ' ἔνεκα τοῦ κρύπτειν ἅττα καὶ σώζειν.) *Physics* II.9 199b34–200a7. David Balme explains that according to Aristotle the materials are necessary as a *sine qua non*: "But all sublunary phenomena are governed by 'hypothetical necessity', which has nothing in common with simple necessity except the sense of τὸ μὴ ἐνδέχεσθαι ἄλλως ἔχειν. By 'hypothetically necessary' A. means 'necessary as a *sine qua non*': on the hypothesis that a man is to be created, blood and bones are necessary. The emphasis is on 'hypothetical'." BALME, "Greek Science and Mechanism, I: Aristotle on Nature and Chance," 130.

³ Such an interpretation of Aristotle's position, in which form is ultimately irreducible to the materials, is proposed by Allan GOTTHELF in "Aristotle's Conception of Final Causality," *Review of Metaphysics* 30 (September 1976): 226–254; reprinted, with a postscript, in *Philosophical*

The issue of which kind of necessity is at work in nature and which corresponding causes are primary, present in antiquity and explicitly formulated by Aristotle, is not only of historical interest. It is of importance today and has been made even more timely by the discoveries of modern science and the success that the understanding of nature it offers has enjoyed in the practical domain. It is of particular interest now because of the tendency in modern natural science to analyze phenomena into their parts to the detriment, it may be claimed, of a more comprehensive and holistic understanding of natural processes and entities. A classical example of such a physicalist perspective may be found in the thought of Descartes; the first edition of James Watson's pioneering work offers a more recent formulation of basically the same views; and in David Papineau we can find a current advocate of a similar reductionist view.⁴

For Aristotle, however, providing a fundamental account or explanation of any phenomenon consists in, and indeed is equivalent to, identifying its causes. When the ancient materialists he is considering reduce the account of natural coming-to-be to simple necessity, they are in fact opting for an explanation in terms of only two of the Aristotelian causes, the matter or materials and the mover or source of motion; for Aristotle this means that they believe these two factors to be sufficient to understand the phenomena in question. He claims that they are indeed necessary, but insufficient; according to him the form and the end are in fact more important and are indispensable in explanations of natural phenomena and hence in their understanding.⁵

Issues in Aristotle's Biology, eds. Allan Gotthelf and James Lennox (Cambridge: Cambridge University Press, 1987), 204–242. John Cooper advocates a similar view, but emphasizes the relationship between the process and the good that results from it for the organism in question. See, for example, John M. COOPER, "Aristotle on natural teleology," in *Language and Logos*, eds. Malcolm SCHOFIELD and Martha Craven NUSSBAUM (Cambridge: Cambridge University Press, 1982), 197–222. A potential difficulty for Aristotle is his own theory of spontaneous generation, which would seem to violate teleological principles. James Lennox considers this issue and explains how spontaneous generation fits into Aristotle's general theory. James LENNOX, "Teleology, Chance, and Aristotle's Theory of Spontaneous Generation," *The Journal of the History of Philosophy* 20 (1982): 219–238.

⁴ DESCARTES, *Discourse on Method*, AT 45–54, in *Discourse on Method and Meditations on First Philosophy*, trans. Donald A. Cress (Indianapolis, Indiana: Hackett Publishing Company, 1980), 24–29; James. D. WATSON, *The Molecular Biology of the Gene* (1st ed.) (New York: W.A. Benjamin, 1965), 67, quoted in Hilde HEIN, "Molecular Biology vs. Organicism: The Enduring Dispute Between Mechanicism and Vitalism," *Synthese* 20 (1969): 240; and David PAPINEAU, *Thinking about Consciousness* (Oxford: Clarendon Press, 2002), Chapter 1, "The Case for Materialism."

⁵ Some recent interpretations of Aristotle place more of an emphasis on the notion of nature in his argument. This is particularly understandable in view of the fact that the dispute with the physicalist appears in the context of a discussion concerning nature. Sarah Waterlow underlines

In this article I would like to examine several aspects of Aristotle's causal theory. I take as a point of departure his dispute with the ancient physicalists about kind of necessity that operates in natural coming-to-be and about the role of the final cause. Yet it is not my purpose here to examine the dispute itself. Instead, I would like to consider its prerequisites, the chief concepts in terms of which it is formulated: the so-called four causes.

An important element in my analysis is the nature-craft analogy: Aristotle generally presupposes an analogy between natural coming-to-be and the genesis of artifacts. Furthermore, in explaining philosophical principles, he often uses artifacts as illustrations and as pedagogical devices to give the reader a sense of the notions involved. The analogy itself, however, is not proved by him; he appears simply to assume it. Although I do not intend to explore it in more detail in this article, I believe that the analogy is founded on a fundamental structural similarity between the two types of coming-to-be: both are essentially the coming-to-be of something. The genesis of anything has its proper logical structure and requirements, regardless of the sort of thing that is coming into being: coming-to-be necessarily is of something, from something, toward something, and in most cases out of something.⁶

At first glance it is striking how well-suited Aristotelian causality is to explain artefactual coming-to-be, so much so that one might almost think it was devised precisely for that purpose. Yet one must bear in mind first of all that in the history of philosophy the causes appeared as attempts to understand natural phenomena, and secondly that they were not at all original to Aristotle himself. Nevertheless, one might still ask whether thinkers did not,

the importance of what she calls *per se* natures for Aristotle's rejection of the physicalist position: "the condition for predicating *per se* unity of a complex natural being is identical with the condition for applying teleological explanation as Aristotle understands it." *Nature, Change, and Agency in Aristotle's Physics* (Oxford: Clarendon Press, 1982), 69–70. Susan Sauvé Meyer goes one step further and claims that what is involved in the physicalist position is not merely a reduction of the properties of an organism to its elementary parts, but an elimination of the very notion of nature: "The rival thesis against which Aristotle defends natural teleology is not reductionism but a variety of eliminativism." Susan SAUVÉ MEYER, "Aristotle, Teleology, and Reduction," *Philosophical Review* 101.4 (1992): 820.

⁶ See *Metaphysics* VII.7 1032a12–15: "Of things that come to be some come to be by nature, some by art, some spontaneously. Now everything that comes to be comes to be by the agency of something and from something and comes to be something. And the something which I say it comes to be may be found in any category; it may come to be either a 'this' or of some quantity or of some quality or somewhere." (Τῶν δὲ γιγνομένων τὰ μὲν φύσει γίνονται τὰ δὲ τέχνῃ τὰ δὲ ἀπὸ ταυτομάτου, πάντα δὲ τὰ γιγνόμενα ὑπὸ τέ τινος γίνονται καὶ ἕκ τινος καὶ τί· τὸ δὲ τί λέγω καθ' ἑκάστην κατηγορίαν· ἢ γὰρ τόδε ἢ ποσὸν ἢ ποιὸν ἢ πού.)

even if unwittingly, transfer to natural science modes of explanation that were used to understand human productive activity.

In the present paper I will make use of the nature-craft analogy to analyze and reconstruct Aristotle’s possible rationale for making use of the four causes, something that I would like to call the “logic” of the four causes, their intrinsic intelligible structure. In doing so I will comment on Aristotelian causality, showing the role of the causes, especially the form, mover, and end, in artefactual coming-to-be. Thus, taking artifacts as a point of departure, I would like to prepare the ground for showing the sensefulness of making use of the four causes in the explanation of natural phenomena.

In examining artefactual coming-to-be, I try to identify the causal structures that he attributes above all to natural processes. I first develop a general characterization of the four causes as they function in artefactual coming-to-be. Next, I call attention to the formal aspect of all of the causes. I devote particular attention to the final cause. This cause, above all, has been an object of dispute and I believe that an analysis of how it functions in the genesis of artifacts helps to clarify its nature in general and how it functions in natural coming-to-be. This cause, I show, is intimately related to the formal cause, or simply the “form”, in artefactual coming-to-be, so much so that the two are at times difficult to distinguish from one another.

Then I examine the relationship among the causes in artefactual coming-to-be, seeking a possible parallel to what Aristotle claims regarding the coincidence of three of the causes in natural coming-to-be. A distinction is present among them in artefactual coming-to-be that is not to be found in natural coming-to-be, due to the physical separation between the thing that comes to be and its source. Starting with this I attempt to discover further differences between natural and artefactual coming-to-be by analyzing the latter in more detail, looking at how the structures that Aristotle attributes to natural coming-to-be are present in artefactual coming-to-be. I believe that in spite of the differences between these two forms of coming-to-be there exists a fundamental similarity: in both there seems to be an intimate connection between three of the causes. Aristotle explicitly claims the existence of a coincidence in the case of natural coming-to-be.⁷ I attempt to show that

⁷ *Physics* II.7 198a22–26: “Now, the causes being four, it is the business of the student of nature to know about them all, and if he refers his problems back to all of them, he will assign the ‘why’ in the way proper to his science — the matter, the form, the mover, that for the sake of which. The last three often coincide; for the what and that for the sake of which are one, while the primary source of motion is the same in species as these.” (ἐπεὶ δ’ αἱ αἰτίαι τέτταρες, περὶ πασῶν

a similar connection is also present and very important in artefactual coming-to-be.

To put it most succinctly, I attempt to identify and make intuitively evident some of the structures and characteristics connected with the four causes that Aristotle finds in natural coming-to-be. I probe one of the members of the nature-craft analogy that Aristotle appears to presuppose and that plays an important role in his philosophical system. I do not intend to propose, defend, or argue for any particular thesis. Neither do I intend to carry out here a textual analysis of Aristotle's thought. What I propose is to carry out an analysis of artefactual coming-to-be from the perspective of Aristotelian causal theory. The motivation for this analysis is the desire on the one hand to better understand Aristotelian causal theory and on the other hand to investigate the nature-craft analogy that figures so prominently in his philosophical system, but which itself is not argued for or justified by him.

THE FOUR CAUSES IN THE GENESIS OF ARTIFACTS

The critical issue of the role of necessity versus teleology in nature that is considered in *Physics* II.8–9 arises in the context of a general discussion of the causes of natural change in the whole of *Physics* II, and it is these causes that I wish to consider now. Change of its very nature calls for an account and for Aristotle this is given in terms of the four causes. In the above two chapters he focuses specifically on the final cause, claiming that it is of particular importance in explaining natural change. In order to understand more clearly the peculiar and indispensable role that it, together with the form, plays in Aristotelian thought, I would like to consider his general theory of the causes, with particular emphasis on the identification of the basic character of each of them and the relationship between the formal and final

τοῦ φυσικοῦ εἰδέναι, καὶ εἰς πάσας ἀνάγων τὸ διὰ τί ἀποδώσει φυσικῶς, τὴν ὕλην, τὸ εἶδος, τὸ κινήσαν, τὸ οὐ ἔνεκα. ἔρχεται δὲ τὰ τρία εἰς [τὸ] ἓν πολλάκις· τὸ μὲν γὰρ τί ἐστὶ καὶ τὸ οὐ ἔνεκα ἓν ἐστὶ, τὸ δ' ὅθεν ἢ κίνησις πρῶτον τῷ εἶδει ταῦτ' οὕτως. In addition to the Oxford translation of the *Physics*, there are other English translations of this work or of parts of it that are useful in reconstructing Aristotle's thought and include comments and at times lengthy interpretational essays. Apostle's translation is especially valuable in that it attempts to be literal insofar as possible: Hippocrates G. APOSTLE, trans., *Aristotle's Physics. Translated with Commentaries and Glossary* (Grinnell, Iowa: Peripatetic Press, 1980). Charlton's translation of the first two books includes a useful introductory essay and comments: William CHARLTON, trans., *Aristotle's Physics, Books I and II, with Introduction and Notes*. (Oxford: Clarendon Press, 1970).

causes, on the one hand, and the material and moving causes, on the other. However, I do not intend to carry out here a full-blown presentation, and much less an in-depth analysis of Aristotelian causality.⁸

For Aristotle the causes (*aitia*) are intimately connected with the question *why* (*dia ti*).⁹ Questions are posed by conscious intelligent agents and in general are implicit signs of the lack of knowledge and explicit expressions of the desire to know. The question *why* in particular refers to a peculiar type of knowledge, not knowledge of a fact—the fact that something simply is or that something or other is the case—but knowledge of what stands behind or is responsible for a thing or fact—what makes something be as it is. The possession of an answer to the question *why* is, for Aristotle, the possession of understanding, and one who thinks he possesses such an answer thinks he understands. The Aristotelian causes are answers to the general question *why* and insofar as a plurality of factors is responsible for why things or facts are as they are, likewise the causes are multiple. Synthesizing the historical development of philosophical analysis up to his time, Aristotle identifies four distinct types of such factors and hence causes.

Aristotle makes frequent use of the analogy between art and nature and often uses artifacts to illustrate principles he believes to hold quite generally.¹⁰ One such application of this analogy is found in the explanation of

⁸ A classical overview of Aristotelian causality may be found in William D. ROSS, *Aristotle*. (London: Routledge, 1995), 74–78. For a more in-depth analysis of the issues involved see, for example, Richard SORABJI, *Necessity, Cause, and Blame. Perspectives on Aristotle's Theory* (Ithaca, N.Y.: Cornell University Press, 1980), especially Part I, “Necessity and cause,” and Part III, “Necessity and purpose in nature.”

⁹ Aristotle considers the causes explicitly in a number of places. Some of the passages offer only a list of the causes; others include a more extended discussion. In *Posterior Analytics* II.11 we find a list of the causes in the context of their use in the demonstration: “Since we think we understand when we know the explanation, and there are four types of explanation (one, what it is to be a thing; one, that if certain things hold it is necessary that this does; another, what initiated the change; and fourth, the aim), all these are proved through the middle term.” (Ἐπεὶ δὲ ἐπίστασθαι οἰόμεθα ὅταν εἰδῶμεν τὴν αἰτίαν, αἰτίαι δὲ τέτταρες, μία μὲν τὸ τί ἦν εἶναι, μία δὲ τὸ τίνων ὄντων ἀνάγκη τοῦτ' εἶναι, ἕτερα δὲ ἢ τί πρῶτον ἐκίνησε, τετάρτη δὲ τὸ τίνος ἕνεκα, πᾶσαι αὐταὶ διὰ τοῦ μέσου δείκνυνται) [94a20–24]. *Physics* II.3 194b16–195a3 includes a list followed by a lengthy discussion of the modalities of causality; at *Physics* II.7 198a14–22 we find a list of the causes; *Metaphysics* I.1–2 considers the relationship between the causes and *epistēmē*, knowledge in the strict sense or understanding; *Metaphysics* I.3 gives a list of the causes; and in *Metaphysics* V.2 a list of the causes is followed by a discussion.

¹⁰ Jonathan Lear also points out the instructive role of the nature-craft analogy and refers to it frequently in his interpretation: “Aristotle, I believe, relies on the analogy between art and nature to give one some idea of the form of a natural object.” Jonathan LEAR, *Aristotle: the desire to understand* (Cambridge: Cambridge University Press, 1988), 17.

change. In both of these domains, nature and art, we encounter change, and one particular type of change is the genesis of sensible, physical objects. In the coming-to-be of artifacts it is much easier, I believe, to find an account, or to find confirmational evidence for Aristotle's account. This is due above all to the fact that we ourselves are the agents in such processes and therefore have immediate observational access to the physical parts of the process for which we are responsible and direct introspective access to the noetic aspects of the process. The causal counterparts in natural coming-to-be, of whatever sort they should ultimately turn out to be¹¹, are by contrast often not directly accessible to us. Generally speaking, in Aristotle's account the craftsman, who has in his mind or in his soul an image of the artifact he wishes to make, chooses materials that, on account of their natural properties, are suitable for his purposes, and fashions and organizes them into the product by imposing upon them an artificial form (in the sense of physical structure and organization).

THE FINAL CAUSE

Due to the aforementioned accessibility of such a process, it is much easier to identify and consider the four Aristotelian causes in it. Let us begin with the *final cause* or the *end*.¹² The image or idea of the object to be made

¹¹ For example, it might turn out to be the plausible and I indeed suspect it to be the case, though I will neither explicitly claim it or investigate it in this paper, that an analogous noetic agency — something along the lines of Anaxagoras' *nous* or Aristotle's unmoved mover — is in some way responsible for what transpires in nature.

¹² Aristotle characterizes the final cause as the end or that for the sake of which (τὸ τέλος [*to telos*], τὸ οὗ ἕνεκα [*to hou heneka*]); it is the answer to the question what something is for, that is, what thing or state of affairs it leads to of itself and as such. *Physics* II.3 194b32–195a3: “Again, in the sense of end or that for the sake of which a thing is done, e.g. health is the cause of walking about. (‘Why is he walking about?’ We say: ‘To be healthy’, and, having said that, we think we have assigned the cause.) The same is true also of all the intermediate steps which are brought about through the action of something else as means towards the end, e.g. reduction of flesh, purging, drugs, or surgical instruments are means towards health. All these things are for the sake of the end, though they differ from one another in that some are activities, others instruments” (ἔτι ὡς τὸ τέλος· τοῦτο δ’ ἐστὶν τὸ οὗ ἕνεκα, οἷον τοῦ περιπατεῖν ἡ ὑγίεια· διὰ τί γὰρ περιπατεῖ; φαιμέν “ἵνα ὑγιαίνῃ”, καὶ εἰπόντες οὕτως οἰόμεθα ἀποδεδοκέναι τὸ αἴτιον. καὶ ὅσα δὴ κινήσαντος ἄλλου μεταξὺ γίγνεται τοῦ τέλους, οἷον τῆς ὑγείας ἡ ἰσχυασία ἢ ἡ κάθαρσις ἢ τὰ φάρμακα ἢ τὰ ὄργανα· πάντα γὰρ ταῦτα τοῦ τέλους ἕνεκά ἐστιν, διαφέρει δὲ ἀλλήλων ὡς ὄντα τὰ μὲν ἔργα τὰ δ’ ὄργανα); *Physics* II.7 198a20: “or we are inquiring ‘for the sake of what?’ — ‘that they may rule’” (ἢ τίνας ἕνεκα (ἵνα ἄρξωσιν)); *Metaphysics* I.3 983a31–32: “in a fourth [sense] the cause opposed

that the craftsman has in mind is the starting point of the process.¹³ This image, or more precisely its content, is an object that is indeed experienced empirically and sensibly by him, though not in the modality of the external senses, but through internal sensible experience. The object in this case is a future object and the proper way of experiencing such objects is precisely by means of the modality of anticipating imagination. Insofar as the object is something that the craftsman intends to make, it is believed by him not simply to exist elsewhere, and hence it is not merely something that he wishes to bring to empirical and sensible presence by physically going to it. It is not an object that exists in the ordinary sense of the term; it is rather something that he intends to bring into existence through his own artifactual activity. The future object is desired by him and it is this desire that initiates and sustains the productive activity. This activity terminates when the object he wanted to make exists in fact and is experienced by him no longer only in the modality of imagination, but also in the modality of external sensual experience. That is, he no longer only imagines it; he also actually sees and touches it here and now. I would claim that this object, which is first desired and then actually made by the craftsman, is the final cause or end of the productive process, that for the sake of which he acts. From a temporal point of view, it is the first cause insofar as, by being desired, it initiates the activity that leads to the final product. Furthermore, it maintains its priority throughout the process of coming-to-be insofar as it is copresent with this process and determines the activity of the craftsman at each point of the process.

Yet we may note that the thing to be made (the artifact that initially is empirically and sensually available to the maker by means of the imagination) and the very same thing once it has been made (the very same artifact physically and sensibly present to the maker at the end of the productive process by means of external perception) are only relatively first and rela-

to this, that for the sake of which and the good (for this is the end of all generation and change)” (τετάρτην δὲ τὴν ἀντικειμένην αἰτίαν ταύτην, τὸ οὗ ἕνεκα καὶ τὰγαθόν (τέλος γὰρ γενέσεως καὶ κινήσεως πάσης τοῦτ’ ἐστίν)); *Metaphysics* V.2 1013a32-b3: the passage is almost identical to *Physics* II.3 194b32–195a3.

¹³ The term “idea” is not intended here in a precise sense, but rather in the sense of any content of mind. The more precise term is “image”. The term “idea” can be used in the strict sense of intelligible content if and insofar as the craftsman explicitly adverts to what he is doing and, say, verbally articulates the object that he is fashioning. This is usually the case in ordinary contexts, though it is not a necessary part of the productive process itself. I believe that the optimal precise formulation, though somewhat awkward, would be that the craftsman is imagining and anticipating (and perhaps only secondarily also speaking about) a possible future artifact.

tively final. The truly first and genuinely final cause of the process is the activity or function that the product is expected to carry out, and that it in fact carries out if the productive process was successful.

For example, if the product is an ordinary chair, the first thing desired is the activity or function of sitting, which the chair is expected to make possible. This activity or function is also the final achieved result of the chair. Its ultimate absence in the finished product would only prove the entire process of designing and making to have been pointless and a failure. It was after all for the sake of this reality that the chair was first designed and later constructed. The idea of this activity is therefore both logically and temporally prior to that of the chair itself as a physical object, and the actual empirical existence of the very same activity has a final and completive character.

A successful productive process, then, is one where the product is indeed capable of exhibiting the activity or function for which it was intended, and it results in an artifact whose being is defined by an intrinsic relationship to that activity or function. The concrete artifact has become and is something that can carry out that function. The chair is thus essentially something that can be sat upon. This ability is not merely an incidental feature, one having nothing to do with the thing itself. It is not a mere accident that a chair can be sat upon; it *is* a chair precisely because it *can* be sat upon. Indeed, if someone were to be unaware of this fact, he would be incapable of knowing that it is a chair.

Furthermore, this property belongs to the artifact itself, to the chair in this case; it is not, for example, a property of the craftsman. It is not the craftsman that makes the chair capable of being sat upon, even if he is the one who produced it. He did indeed make this particular artifact, this particular chair, yet it would be incorrect to maintain that he made the chair capable of being sat upon. He is the source of the presence in these materials of this given structure, but he is not the source of the fact that this structure in these materials possesses the property of being capable of being sat upon. This property belongs directly and immediately to the structure embodied in the materials. It is therefore the chair itself that possesses this property, precisely because it consists of the above structure in the appropriate materials. Again, it was not the craftsman who bestowed the feature upon it, not even by designing it. For if this were the case, then in principle he could bestow this feature upon anything.

THE MATERIAL CAUSE

The items that the craftsman selects to fashion the product are the *matter* or the *material cause*.¹⁴ I do not intend to consider the nature of matter in any substantial detail in the present paper, primarily because in artefactual production it does not give rise to the serious problems that appear in natural coming-to-be, where it is not just a relatively passive constituent, but also appears to play an efficient causal role. It may be briefly noted, however, that matter in general is an answer to the question what something is made of or out of. The answer that will be given, the actual matter in any given case, will be relative to the object of our inquiry. It will be that which something is made of or out of which it came to be, or possibly both. Let it be noted, however, that while the answer in the case of artifacts will be definite materials — concrete physical substances — their being the matter of the object in question refers not to their concreteness, but to their capacity to be further formed or organized. Insofar as definite materials are a constitutive part of an artefactual whole, this capacity has been actualized.

THE MOVING CAUSE

The craftsman himself is, generally speaking, the *mover*, *moving cause*, or *source of motion*, for it is he who works upon the matter to give it the desired shape and configuration.¹⁵ The craftsman in general, that is, abstracting

¹⁴ For Aristotle the matter (ἡ ὕλη [*hê hylê*]) is generally the potentiality present in things susceptible to physical change. *Physics* II.3 194b23–26: “In one way, then, that out of which a thing comes to be and which persists, is called a cause, e.g. the bronze of the statue, the silver of the bowl, and the genera of which the bronze and the silver are species.” (ἓνα μὲν οὖν τρόπον αἴτιον λέγεται τὸ ἐξ οὗ γίγνεται τι ἐνυπάρχοντος, οἷον ὁ χαλκὸς τοῦ ἀνδριάντος καὶ ὁ ἄργυρος τῆς φιάλης καὶ τὰ τούτων γένη); *Physics* II.7 198a20: “in the case of things that come into being, we are looking for the matter” (ἐν τοῖς γιγνομένοις ἡ ὕλη); *Metaphysics* I.3 983a29–30: “in another [sense, cause is] the matter or substratum” (ἐτέραν δὲ τὴν ὕλην καὶ τὸ ὑποκείμενον); *Metaphysics* V.2 1013a24–26: the passage is almost identical to *Physics* II.3 194b23–26.

¹⁵ The Aristotelian moving cause — the mover (τὸ κινῆσαν [*to kinêsan*]) — is connected with the question about the proper source of a thing, what is responsible for its having come to be. *Physics* II.3 194b29–32: “Again, [the cause is] the primary source of the change or rest; e.g. the man who deliberated is a cause, the father is cause of the child, and generally what makes of what is made and what changes of what is changed” (ἔτι ὅθεν ἡ ἀρχὴ τῆς μεταβολῆς ἢ πρώτη ἢ τῆς ἡρεμῆσεως, οἷον ὁ βουλευσας αἴτιος, καὶ ὁ πατὴρ τοῦ τέκνου, καὶ ὅλως τὸ ποιῶν τοῦ ποιουμένου καὶ τὸ μεταβάλλον τοῦ μεταβαλλομένου); *Physics* II.7 198a19–20: “[the ‘why’ also refers to] what initiated a motion, e.g. ‘why did they go to war? — because there had been a raid’” (ἢ εἰς

from his actual activity at any given moment, is the potential moving cause, insofar as he is capable of engaging in productive activity. The craftsman crafting is the actual moving cause.¹⁶ More precisely, the moving cause is the art in him, his ability to work with materials and impose order and structure upon them.¹⁷ This ability is itself intrinsically indeterminate and potential, for it is not the ability to produce only one type of object, one model of chair, for example. The general ability is specified and made determinate by the particular form in question — the form of this sort of chair — and actualized by the desire to produce a particular artifact. Indeed, Aristotle explicitly connects art with the form of the artifact that is coming to be¹⁸ and even in some sense identifies the two with one another.¹⁹

THE FORMAL CAUSE

The shape or physical arrangement that comes to be in the matter is one of the most basic ways of understanding the *form* or the *formal cause* of the

τὸ κινήσαν πρῶτον (οἷον διὰ τί ἐπολέμησαν; ὅτι ἐσύλησαν)). *Metaphysics* I.3 983a30: “in a third the source of the change” (τρίτην δὲ ὅθεν ἡ ἀρχὴ τῆς κινήσεως); *Metaphysics* V.2 1013a29–32: the passage is almost identical to *Physics* II.3 194b29–32.

¹⁶ See *Physics* II.3 195b3–6: “All causes, both proper and accidental, may be spoken of either as potential or as actual; e.g. the cause of a house being built is either a house-builder or a house-builder building.” (πάντα δὲ καὶ τὰ οἰκειῶς λεγόμενα καὶ τὰ κατὰ συμβεβηκὸς τὰ μὲν ὡς δυνάμενα λέγεται τὰ δ' ὡς ἐνεργοῦντα, οἷον τοῦ οἰκοδομεῖσθαι οἰκίαν οἰκοδόμος ἢ οἰκοδομῶν οἰκοδόμος.) Commenting on this passage Lear explains that “Aristotle does distinguish between *the potential* and *the actual* cause. The builder is the *potential* cause of the house, the builder building is the *actual* cause.” LEAR, *Aristotle: the desire to understand*, 30.

¹⁷ *Physics* II.3 195b21–25: “In investigating the cause of each thing it is always necessary to seek what is most precise (as also in other things): thus a man builds because he is a builder, and a builder builds in virtue of his art of building. This last cause then is prior; and so generally.” (δεῖ δ' αἰεὶ τὸ αἴτιον ἐκάστου τὸ ἀκρότατον ζητεῖν, ὥσπερ καὶ ἐπὶ τῶν ἄλλων (οἷον ἄνθρωπος οἰκοδομεῖ ὅτι οἰκοδόμος, ὁ δ' οἰκοδόμος κατὰ τὴν οἰκοδομικὴν· τοῦτο τοίνυν πρότερον τὸ αἴτιον, καὶ οὕτως ἐπὶ πάντων)).

¹⁸ *Metaphysics* VII.7 1032a32–b2: “[F]rom art proceed the things of which the form is in the soul. (By form I mean the essence of each thing and its primary substance.)” (ἀπὸ τέχνης δὲ γίνετα ὅσων τὸ εἶδος ἐν τῇ ψυχῇ (εἶδος δὲ λέγω τὸ τί ἦν εἶναι ἐκάστου καὶ τὴν πρώτην οὐσίαν)).

¹⁹ *Metaphysics* VII.9 1034a21–24: “And it is clear also from what has been said that in a sense everything is produced from another individual which shares its name (natural products are so produced), or a part of itself which shares its name (e.g. the house produced by reason is produced from a house; for the art of building is the form of the house)” (δῆλον δ' ἐκ τῶν εἰρημένων καὶ ὅτι τρόπον τινὰ πάντα γίνετα ἐξ ὁμωνύμου, ὥσπερ τὰ φύσει, ἢ ἐκ μέρους ὁμωνύμου (οἷον ἢ οἰκία ἐξ οἰκίας, ἢ ὑπὸ νοῦ· ἢ γὰρ τέχνη τὸ εἶδος)).

product.²⁰ However, like all of the other causes and notoriously even more so, the formal cause is analogous; it includes any manifestation of order or structure whatsoever. Number and shape are among the simplest kinds of form, and simple numerical multiplicities and geometrical objects are the most basic sorts of structured objects. In the aforementioned example of a chair we have a relatively simple physical form, a static structure. As such it does not involve any relative motion of the material parts: the full reality connected with the chair, that of being sat upon, is fundamentally a static reality. This can be contrasted with, say, a bicycle, an artifact that possesses a dynamic form: its corresponding reality, that of being used as a means of locomotion, does indeed involve the relative motion of its physical parts and of the bodily parts of the one who rides it. Both objects involve forms in the sense of orderings of physical parts, and these forms are sufficient to construct the corresponding objects. Yet in the former case the ordering is essentially static and atemporal, while in the latter case it is essentially dynamic and temporal. A purely physical arrangement would be sufficient to characterize the former; in the case of the latter such a characterization would be inadequate to describe the full reality of the artifact. The explicit temporal factor must be added and is indispensable.

However, let us note that even in this limited context form of its very nature possesses an intelligible character. While one can speak of a merely sensible form, as the structure or order that is available, say, to visual sense, the mere sensible possession of such a sensible form by a knowing subject does not produce understanding, for it does not provide an answer to the question why, or indeed to any other question. Understanding is essentially

²⁰ The Aristotelian formal cause — the form (τὸ εἶδος [*to eidos*]) — corresponds to the question what a thing is. In general it refers to the principle in things that accounts for and reflects their particular way of being. *Physics* II.3 194b26–29: “In another way, the form or the archetype, i.e. the definition of the essence, and its genera, are called causes (e.g. of the octave the relation of 2:1, and generally number), and the parts in the definition” (ἄλλον δὲ τὸ εἶδος καὶ τὸ παράδειγμα, τοῦτο δ’ ἐστὶν ὁ λόγος ὁ τοῦ τί ἦν εἶναι καὶ τὰ τούτου γένη (οἷον τοῦ διὰ πασῶν τὰ δύο πρὸς ἓν, καὶ ὅλως ὁ ἀριθμὸς) καὶ τὰ μέρη τὰ ἐν τῷ λόγῳ); *Physics* II.7 198a16–18: “The ‘why’ is referred ultimately either, in things which do not involve motion, e.g. in mathematics, to the ‘what’ (to the definition of straight line or commensurable or the like)” (ἢ γὰρ εἰς τὸ τί ἐστὶν ἀνάγεται τὸ διὰ τί ἔσχατον, ἐν τοῖς ἀκινήτοις (οἷον ἐν τοῖς μαθήμασιν· εἰς ὀρισμὸν γὰρ τοῦ εὐθέος ἢ συμμετρου ἢ ἄλλου τινὸς ἀνάγεται ἔσχατον)); *Metaphysics* I.3 983a27–29: “In one of these we mean the substance, i.e. the essence (for the ‘why’ is referred finally to the formula, and the ultimate ‘why’ is a cause and principle)” (μίαν μὲν αἰτίαν φημὲν εἶναι τὴν οὐσίαν καὶ τὸ τί ἦν εἶναι (ἀνάγεται γὰρ τὸ διὰ τί εἰς τὸν λόγον ἔσχατον, αἴτιον δὲ καὶ ἀρχὴ τὸ διὰ τί πρῶτον)); *Metaphysics* V.2 1013a26–29: the passage is almost identical to *Physics* II.3 194b26–29.

the grasping by the mind and the expression in language of order of any kind, even of a simple static ordering present as a sensible shape. In the above examples the sensible forms of a chair or of a bicycle are already more than merely sensible. When we use the terms “chair” or “bicycle” in linguistic discourse, the sensible forms are already subsumed by acts of naming and hence of understanding.

THE FORMAL CHARACTER OF ALL THE CAUSES

From the above it can be seen that all of the causes ultimately have a formal character,²¹ even, I would argue, the apparently least formal of them, the matter. All of them are the cognitive and general grasping of something definite. The differences among the individual kinds of causes are due to the distinct characters of the corresponding questions asked and the responses given.

In the case of matter, for example, its general character—that is, its “form”—is on the one hand that of being an answer to the question what something is made of, and on the other that of being a constituent of what is inquired about. Any particular answer to a question about the matter of a concrete thing will always be something that has the form of a particular type of constituent: wood, marble, bronze, etc. Such a definite constituent to be sure possesses a particular form, yet it is not this form that makes it be material. Being material refers to a general feature of any concrete constituent. A particular constituent—the wood, the marble, or the bronze—is material because it is that *out of which* the thing is made. That is, because of its relative and constitutive character with respect to the original object of inquiry, it also possesses the more general character and hence the “form” of matter: the form of being a constituent of the whole product.

To be matter or material, then, is to possess a definite feature—and definiteness is the essential characteristic of anything that is formal. This defi-

²¹ Lear makes a similar point: “The so-called formal, efficient, and final causes are (at least in the wide variety of events that occur within the natural world) three different aspects of form itself. Aristotle says that these three causes ‘often converge on one thing.’ The one thing is form, and ‘often’ covers *all* cases of natural generation and creation of artefacts. So although Aristotle can talk about the three causes which coincide, he can also talk about the *primary* cause. He is not then picking out one of four causes for special honor: he is citing the one item, form, which can be considered either as the form it is or as the efficient cause or as the final cause. The form really is the why of a thing.” LEAR, *Aristotle: the desire to understand*, 27.

niteness is what gives the feature a formal character, even if the feature itself involves further indefiniteness, that of the additional particular forms that the matter can take on. In spite of this indefiniteness, however, what is not indefinite is the fact that this thing *can indeed* take on the various further modifications and enter into the constitution of further realities or more complex objects.

Something similar is true of the other causes. The characteristic fulfillment of a given artifact, its end, is necessarily expressed in general terms and has a formal character: sitting, riding, etc. Likewise, the mover or source of the artifact, the general artistic ability specified by the particular form of this artifact, is of a formal nature. As regards the formal cause itself, its general character—the form of a form, so to speak—is that of being the order or structure of the thing itself. It identifies, for example, the way in which the proximate materials are organized to yield the thing in question.

Each of the causes has a formal character and each of them, precisely because of this character, is capable of producing understanding in a cognitive subject. Yet at the same time each cause has a partial character insofar as it unveils one aspect of the thing in question among many. Each cause contributes what is specific about it to the overall understanding of the thing in question. However, all of the causes taken together possess the same character as each taken singularly. They have a formal and general character and are capable of producing understanding: the inquirer believes that he understands, i.e. he thinks he knows why the thing is as it is, from the various points of view given by the different causes. If the list of questions posed by the inquirer is exhaustive in kind, then the possession of adequate answers to them all will produce formally complete understanding. And Aristotle claims that these questions and their answers ultimately are four in kind.

CAUSAL DISTINCTION AND COINCIDENCE

Aristotle clearly maintains that in the case of natural things three of the causes, the form, the mover, and the end, coincide with one another as regards content.²² This might seem to suggest that such a coincidence is not always the case, particularly with regards to artifacts. Indeed, an initial exami-

²² *Physics* II.7 198a24–26: “The last three often coincide; for the what and that for the sake of which are one, while the primary source of motion is the same in species as these.” (ἔρχεται δὲ τὰ τρία εἰς [τὸ] ἓν πολλάκις· τὸ μὲν γὰρ τί ἐστὶ καὶ τὸ οὗ ἕνεκα ἓν ἐστὶ, τὸ δ’ ὅθεν ἢ κίνησις πρῶτον τῷ εἶδει ταῦτὸ τούτοις).

nation of artefactual coming-to-be would seem to confirm this. In the example considered above, for instance, and in the coming-to-be of artifacts in general, it would appear that the four causes, and in particular the above three, are distinct in a way that is not the case in products of nature. Nevertheless, a closer examination will show that in spite of the distinction, a fundamental coincidence may be found.

In natural coming-to-be we find a manifest oneness. No obvious external factor is involved in the process: everything that is taking place seems to be spatially restricted to the one sensible natural object. In addition to this physical coincidence, we also have the aforementioned unity or coincidence of causal content claimed by Aristotle. In artefactual coming-to-be, however, we find a patent twoness, that of the craftsman and the artifact, and it is this twoness that is the basis for the spatial differentiation of the causes.

The source of coming-to-be is, generally speaking, located in the craftsman, while the genesis of the product is located in the physically distinct artifact that is coming to be. The craftsman acts upon materials that are physically distinct from him, fashioning them by means of his bodily movements, and these in turn have a source within him. In this way he imposes on them the desired form, in the simple sense of a shape, configuration, or arrangement. This takes place in a process that is temporally extended, and thus the desired final form gradually emerges.

However, if this source is to be the origin of the concrete artifact it must be ontologically proportionate to it, that is, it must include within itself the being of the artifact: in this case, its basic empirical and physical structure. The idea of a table, for example, will never be the source of the coming-to-be of a chair. The basic structure of the artifact is precisely its form, which is present in the idea or image possessed by the craftsman and progressively comes to be present in the materials.

The productive process directed by the craftsman is the coming to be of a particular artifact and its identity is determined by that fact. What is present at any temporal phase of that process is not just any chance thing; it is the artifact in question in the course of coming to be. And so, for example, while we may say that what we have before us is merely a square piece of wood with two legs attached, this is not a complete account. What we have, in fact, is a chair “in the making”. In order to be properly understood, the present phase of the process, and any other intermediate phase, must be taken as a temporal part of a larger whole. Its character and identity is relative to that of the final product, the finished artifact.

The intermediate product is not a chair properly speaking and hence the term chair cannot be applied to it in an unqualified sense. However, it would likewise be misleading to say that it is not a chair in any way. It would be more appropriate to say that it is "not yet" a chair or that it is something "on the way" to becoming a chair. It will become a chair. That is, a true chair will come to be in the physical space that it occupies.²³ Yet unlike what takes place in the case of natural things, this will not happen by itself, but due to the activity of the craftsman.

THE TRANS-TEMPORAL WHOLE

The object present here and now is part of what may be called a trans-temporal whole. This whole includes the entire process of the coming-to-be of a chair, a process that is identified in terms of its terminal stage, attained when the productive process has come to an end. Every temporal part of the process may be treated as an independent physical object, though each is dependent in a fuller sense on the whole of which it is a part. The nature and identity of the object present at every part of the process, the "what it is" of what is before us here and now, is that of the final product of the process.

The critical point here is that the content-term "chair" is in fact the one that most appropriately describes any of the objects present at any interim temporal phase of the process. This is not because the physical and sensible form of a chair is actually present in those phases. In fact, it is not present. What is actually present, while it is something concrete, does not possess its own identity or its own name. Yet the identity that most appropriately and truly belongs to it and the name that most correctly describes it is that of the terminal product, of the chair in this case.

Let us further note that the application of the term "chair" to this interim object and hence the attribution to it of the form of the final product, chair, is no longer a purely sensible characterization, since the sensible form is in fact not present in it. The attribution is intelligible and the attributed form is an intelligible form. It refers not so much to what we can perceive, but to something that we know *about* what we perceive. The object that is actually present before us here and now, while it does possess a definite form in the sense of a shape, structure, or configuration, does not possess the sensible

²³ On the condition, to be sure, that the process follows its ordinary course.

form of a chair. Yet it can be said to truly possess the intelligible form of a chair insofar as understanding what it is involves knowing that it is part of the process of the coming-to-be of a chair—of the making of a chair, to be more precise. Therefore, we can truly call it a chair, adding the necessary qualification of “in the making” or the like. Unawareness of the relationship between this interim object and a chair, regardless of the degree of actual physical resemblance to a chair, would imply a lack of understanding of what in fact is taking place and of the actual character of this object here and now precisely as interim and as a part of a greater whole.

DESIRE AND MOTION

The source of motion, the particular artifact imagined or anticipated by the craftsman, is present in him and we can call this an idea. The ontological requirement of a proportionate form in the craftsman is dictated by the character of the artifact, which requires a proper source of being. However, a mere idea in the mind of a craftsman, that is, the mere thought or image of the artifact, is insufficient to produce it, since it is only an object of cognition. Mere ideas in this sense are not motive forces. Desires are such forces. While an idea is a necessary condition for the existence of the motion, it is insufficient by itself to produce and sustain it. Motion commences and endures only insofar as the craftsman begins and continues to desire to bring the imagined object into actual empirical existence. The source of the motion in the craftsman is therefore the desire for the artifact. The form-containing idea must be subsumed by a desire, becoming its object, if it is to become a motive force for the coming to be of an actual physical artifact, an object of external sensual perception. Thus, while the craftsman is usually considered to be the mover in a general sense, because he is the possessor of the desire, it is the desire itself that is the source of motion in a more precise sense.

What is desired, the object, is a moment of the desire. That is, it is an inseparable and non-independent part of the reality of a desire. It is clear that any desire necessarily is a desire for something. A desire, in turn, is the sort of thing that of its very nature produces motion toward what is desired. Just as desire cannot truly be desire if it does not have an object, so too it fails to be a genuine desire if it does not produce motion. This motion—initiated, sustained, and directed by the desire—is defined by the object of the desire, desire in itself being objectless and hence indefinite.

To recapitulate, then, we have seen the need for a proportionate source of the form or structure that is coming to be in the artifact during its process of coming to be. This form must already exist somehow if it is to come to be here and now empirically, sensibly, and physically. And since it is the craftsman who is responsible for the process, it is he who must have this form present in him. This presence takes the form of an idea, which is the cognitive presence of an object of whatever kind. Yet since an idea by itself is not capable of bringing anything into existence, the activity of the agent requires not only the cognitive presence of the object, but also its volitive presence: the known or imagined object must also be an object of desire.

THE FULL WHOLE.
SUBJECTIVE AND OBJECTIVE PERSPECTIVES:
INTENDED AND INTRINSIC ENDS

A proper understanding of any phenomenon requires an identification of the appropriate and full whole to which it belongs. The appropriate whole in the case of productive activity includes the agent, his desire, the object of that desire, and the temporal process initiated, directed, and brought to a termination and completion by the agent.

This whole can be viewed from two perspectives, or analogously, the product of the process can be seen in two ways. First of all, it can be seen from the subjective perspective of the agent, the craftsman. The product is what is ultimately desired as the terminus of the entire productive activity. In this sense the product is an *intended* or *desired* end, something relative to the agent and present to him. This intended end exists as an object of the craftsman's desire. The faculty by means of which it is present to him is the anticipating imagination. The object of the desire is the artifact as an imagined possible future object to be brought into actual physical existence through the craftsman's activity. The intended end, insofar as it is the object of his desire, is really an aspect of the agent as a mover. Yet it is important to note that what is cognitively present to him is not just an artifact somewhere and nowhere. He imagines a real artifact, that is, a material object in the world. To be sure, it is not actually present here and now. It is a possible future thing, a concrete physical object. A such, it has the modality of being that is characteristic of future things and states of affairs: that of being imaginatively anticipated. And this possible future object—particular and

empirical—is an end in the numerical or sequential sense of being a last element, for it is the final element in the activity that is directed by the desire. It is also an end in a completeive sense in that it is the fulfillment of a desire and of the activity that corresponds to that desire.

Secondly, however, the product can also be viewed as part of the process itself. The process can be taken in abstraction from the activity of the agent. We can thus consider only the trans-temporal result of the craftsman's productive activity. This is the perspective of the object that is coming to be. When regarded in this way, the process is taken as a complex trans-temporal object that has two definite and identifiable temporal endpoints. At one extreme we have the materials that will be used to make the artifact, deprived of their final structure or form. At the other extreme we have the finished artifact, fully formed and structured. The process is the intermediate sequence of states of affairs linking these two endpoints. As we have seen, each of these states of affairs, each element in the set—in the trans-temporal continuum—is a real thing, an intermediate or interim physical object.

With respect to this objective process the final product also has the character of an end. It is not an intended end, however, for we have abstracted from the craftsman and his desire. It is what may be called an *intrinsic* or *quasi-natural* end. It is intrinsic in that its final character is due to its position within the process itself, irrespective of the activity of the agent. It is a part of the internal structure of the process. It is quasi-natural in that it is part of the “nature”, as it were, of the process: the process is indeed a sequence of states of affairs that leads to a concrete artifact, and this, as we have seen, defines the sort of thing it is. This “nature” or “quasi-nature” is taken in abstraction from the desiderative and directive activity of the craftsman and agent. The product, as the temporally last state of affairs, is a privileged and peculiar member of an ordered continuum, the set of states of affairs that comprise the process.

However, having introduced this distinction a problem seems to arise. What is the relationship between the intended end and the so-called intrinsic or quasi-natural end? It would appear that we have identified two distinct objects that have the character of an end. What in fact is the difference between them and how are they related to one another? The first of these, the intended end, seems to be a part or aspect of the mover. It reflects the fact that any desire, which intrinsically is a source of motion in a cognitive agent, is always a desire *for* something and the motion that it produces is always a motion *toward* something. The intended end is an attribute of

a mover, because the desire of which it is a part is truly and actually present in him. If it bears a reference to the motion, it does so insofar as it and its elements are desired, and this takes place for the sake of the final product that is desired through the motion.

An intrinsic or quasi-natural end, however, is above all an attribute of the objective process. Secondly, it is a feature of the thing that is coming to be at any moment in the process. This thing is an objective part of the continuum of states of affairs that constitutes the process. Each such thing, each element of the process, precisely as such an element, is something on the way to becoming something. On the one hand, the process as a whole can be said to be for the sake of something. On the other hand, any interim product can also be said to be for the sake of something, precisely insofar as it is intermediate, transient, and in the course of changing and developing toward something definite. Its end and its fulfillment is the final product. Thus, this final product is not present physically or sensibly anywhere in the interim object. However, the final product can legitimately be attributed to the interim object in virtue of the fact that the latter is a part of a process that does include the final product. Here too we have a noetic attribution, just as we saw in the case of the intelligible form. We are attributing to the interim object a feature that is not physically and empirically present in it, but is related to it essentially.

The work of a craftsman can fail for any of a number of reasons. First of all, the plan might prove to be defective: an artifact constructed according to plan might not perform the function for which it was intended. Secondly, the productive activity itself might be flawed, due to inadequate materials, faulty instruments, or insufficient ability on the part of the craftsman. For our present purposes, let us assume that the craftsman succeeds in producing the artifact he intended to make. In this ordinary and typical case, within the superior whole that includes the process and the craftsman along with his activity, the intended end coincides materially, as regards content, with the intrinsic or quasi-natural end, though formally they are two distinct objects. The first is what the craftsman desires and belongs to the domain of the anticipating imagination. It is what he is seeking to bring into actual physical existence in the future through his productive activity. The second is what he actually succeeds in bringing into existence and belongs to the domain of the real, of sense perception. It is an element, albeit a peculiar and privileged one, of the productive activity viewed as a distinct and integral whole. The intended end truly has the character of an end, since it is both the

numerically last element, that at which the agent aims, and a culmination or completion. Yet at the same time it is an aspect and a part of the source of the motion. Indeed, as a necessary element of desire, it is in fact inseparable from it, though it can be considered separately through the abstraction characteristic of thought and of speech. The intrinsic or quasi-natural end also has the character of an end, but it is an element of the real and empirical productive process and it is genetically inseparable from it. It is related to the intended end as its realization or actualization. Indeed, the whole perceptible process is an actualization of the entire imagined and anticipated process.

CAUSAL COMPLEMENTARITY AND COINCIDENCE

The above remarks call attention to an intimate relationship—a complementarity, in fact—between the moving cause and the final cause in artefactual production. In such activity, while the two causes are distinct in nature they are identical in content, for the object of the desire is identical with the terminus of the motion produced by that desire. The relationship between them is analogous to the classical relationship between matter and form. Just as matter and form are correlative constitutive principles in an artifact, together making up the whole object, so too the mover and the end are also correlative genetic principles, for the mover in the precise sense is the craftsman's desire, and desire is of its very nature correlative to the object desired, which in this case is materially identical with the empirical end, that at which his desire-driven activity aims and for the sake of which it exists. Ultimately, the source of this complementarity is the correlative character of activity and passivity, of making and being made.

Furthermore, I would claim that the above distinction of the final cause into two elements, an intentional or cognitive element that is part of the mover and an empirical and sensibly perceptible element that is part of the actual productive process, is a necessary aspect of any process of coming-to-be. It results from the ontological requirements of coming to be in general: a necessary condition for coming-to-be is the pre-existence in some other modality of that which is to come to be. Being cannot come to be from non-being. This requirement is particularly obvious in the case of artefactual coming-to-be because of the general causal separation that is characteristic of it: the craftsman and the artifact are two distinct physical entities. It is

because of this explicitly sensible separation and the empirically evident presence of these two elements that an analysis of artefactual coming-to-be is of such interest.

In addition to the above causal complementarity as regards the moving and final causes, there is also an underlying causal coincidence in artefactual genesis that is similar to what Aristotle attributes to natural coming-to-be. It consists of the ubiquity and identity of form, even in the most basic sense of form as shape, and it can be found even in an artifact as simple as a chair. In spite of the spatial separation of the causes, located either in the craftsman or in the artifact, we nonetheless find a fundamental unity and identity of mover, end, and form. In such coming-to-be the source of motion, the end of the motion, and what is in the process of coming to be all involve one and the same object, possessing the same form—both in the simple morphological sense of the shape and in the fuller noetic sense of the intelligible structure—and hence the same name. The form is the principle of the identity of the thing and what its name signifies.

First of all, the source is the desire of the craftsman, which is a desire for a concrete artifact. The objective content of this desire is the artifact as imagined and anticipated. This is a sensible object, grasped by the anticipating imagination, and of necessity it has a form, construed as a shape. Secondly, the end of the motion is precisely the same, the concrete artifact—a physically instantiated form—but viewed as that toward which the motion is directed. Hence its form is the same as that of the desired object. Finally, the actual empirical object that is coming to be also has the same form, provided that the resulting artifact is indeed what the craftsman intended to make.

We may formulate the above in terms of questions, the answers to which in fact are the causes. What is it that the craftsman is making? The answer is a chair. What does his activity lead to? It is also a chair. What is the source of his activity, the source of the object that is coming to be, and the source of the artifact once it has been completed? These are all the chair that he desires to bring into existence. What does the actual productive process lead toward? Once again, it is a chair. In all of these cases the answer to the question is the same, the concrete artifact.

And so the craftsman first imagines a particular sensible thing. He desires to fashion the same particular sensible object. The thing that comes to be through his productive activity is likewise sensible and particular. Finally, the end or goal of the activity of making is the sensible and particular object, and the corresponding end of the passivity of being made is the sensible and

particular product. The entire process of making and each of its parts, from the initial stages of planning to the final realization of the artifact, revolves around the particular sensible object.

What then does the coincidence really consist of? Do we in fact have the same particular in each case? In other words, is the content of each cause in such coming to be, apart from the material cause, indeed one and the same particular? What is the common or coinciding element? Is it a sensible particular or an intelligible object? I would claim that it is the former. When we speak about it, to be sure, the intelligible dimension necessarily comes to the fore. Yet before turning to the intelligible structure of what is taking place by thinking and speaking about it, we are in the empirical realm of sensibility. This, however, is entirely sufficient for the activity of production. Before engaging in productive activity we imagine the thing to be made. Next, we desire to make it—precisely the same thing. Then we engage in actually fashioning it. Finally, we have the artifact sensibly present before us and recognize it as what we imagined and anticipated at the beginning. All the time we have one and the same object, though in distinct views, as it were, or through different modalities.

It would appear, therefore, that even in artefactual coming-to-be a peculiar coincidence of three of the Aristotelian causes takes place. What these causes have in common is the particular and concrete thing that is coming to be. It is present in various ways in each of the causes, yet in each case it ultimately refers to the structure of the thing—form in either the morphological sense or the full noetic sense.

RECAPITULATION AND CONCLUSION

The materialist account of natural coming-to-be, as Aristotle understands and presents it in *Physics* II.8–9, consists of a reduction of the features and activity of natural things to those of their material constituents, with the consequent limitation of explanation and understanding to two of the four Aristotelian causes, material and moving. Aristotle claims that all four causes must be given wherever possible, and that while the above two causes do tell us something about what has taken place, they do not offer a full account. Such an account requires above all that the formal and final causes be given. The four causes therefore provide the Aristotelian context for considering and criticizing the materialist account of natural genesis and behavior. When

these causes are seen as complementary and not competing, it becomes possible both to appreciate the ancient materialist account, and indeed any materialist account, as saying something true about nature and at the same time to see it as incomplete, as not yielding full understanding of what in fact has occurred.

How these causes operate can be seen in the analysis of artefactual coming-to-be, which is paradigmatic in Aristotle’s thought. Here most of the essential elements of what he takes to be a full explanation of coming-to-be can be identified. In particular, even after a cursory examination we can see the primacy of form, quite evidently present, both in one of its analogous senses—the morphological sense of form as shape—and in something like its full sense—the form of an artifact as its full intelligible reality.

The above analysis, by examining artefactual coming-to-be, has provided a glimpse of what I have called the “logic” of the causes, i.e. the internal structure, sense, and validity of the four Aristotelian causes. In general Aristotle makes a number of claims regarding coming-to-be, particularly natural coming-to-be. Moreover, he assumes an analogy between nature and craft, one that he does not appear to justify explicitly. I have examined some of these claims as they apply to artefactual coming-to-be. I have looked at the genesis of artifacts from the perspective of what Aristotle purports to be the case in natural coming-to-be in order to identify and describe those structures better and more clearly.

What I have offered is not so much an argument for a given thesis as a descriptive analysis of a given phenomenon (artefactual genesis) from a particular perspective (Aristotelian causal theory). This analysis has brought to the fore various aspects and structures of the phenomenon in question. What has emerged is, I hope, an interesting picture of the process in which an artifact come to be. One of its important elements is the peculiar coincidence and intrinsic relationship among three of the causes.

What are the principal results of the above analysis? There are several. First of all, it has provided information about the structure of artefactual coming-to-be, making use of Aristotle’s philosophical apparatus, yet probing deeper than Aristotle himself does and thus revealing several additional aspects of such coming-to-be. Secondly, it has shed light upon the apparatus itself by showing some facets of Aristotelian causal theory. Thirdly, it has also helped to clarify somewhat the nature-craft analogy—through a closer examination of one of its members. I would suggest as a possible overall conclusion that the nature-craft analogy is philosophically more significant

and far-reaching than would appear to be the case at first glance. What I believe has surfaced, though I admit that I have not justified it fully, is that the structures found in the analysis of the genesis of artifacts can be generalized, *mutatis mutandis*, to coming-to-be of any sort whatsoever, including above all natural coming-to-be.

While the study is not fully conclusive, I believe it shows that artefactual coming-to-be is indeed a good model for natural coming-to-be and not merely a pedagogical device. What would eventually be required as a supplement is a more careful investigation of the role of the Demiurge or Divine Craftsman in both Aristotelian and Platonic thought and an analysis of coming-to-be from the perspective of such a Craftsman.

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„LOGIKA” ARYSTOTELESOWSKIEJ PRZYCZYNOWOŚCI –
ANALIZA GENEZY ARTEFAKTÓW

Streszczenie

Spór Arystotelesa ze starożytnymi fizykalistami przekazany w *Fizyce* II.8–9 dotyczy roli przyczyny celowej w przyrodzie. W artykule analizowana jest arystotelesowska teoria przyczyn jako szerszy kontekst tego sporu. Przyjmując analogię między naturą a sztuką oraz uznając paradygmaticzny charakter tworzenia artefaktów, autor stara się uzasadnić arystotelesowską teorię przyczyn. Badana jest geneza artefaktów z punktu widzenia tych aspektów teorii Arystotelesa, które są wyróżnione w jego wyjaśnieniu naturalnego powstawania. Omawia się zasadniczy charakter każdej przyczyny, różnice między przyczynami oraz swoistą zbieżność między trzema z nich, komplementarność między przyczyną sprawczą a celową, naturę i rolę pragnienia w procesie powstawania oraz prymat formy. Wprowadza się pojęcie pełnego czasowego przedmiotu (trans-temporal whole). Wskazuje się na konieczność uwzględnienia pełnego przedmiotu – obejmującego cały proces powstawania, wraz z jego źródłem – jako stosowny kontekst dla właściwego rozumienia powstawania. Przedstawia się także rozróżnienie pomiędzy perspektywą obiektywną i subiektywną, które jest szczególnie przydatne w wyjaśnianiu przyczynowości celowej.

THE "LOGIC" OF ARISTOTELIAN CAUSALITY:
AN ANALYSIS OF THE GENESIS OF ARTIFACTS

Summary

The present paper, taking as a point of departure Aristotle's dispute with the ancient physicalists in *Physics* II.8–9 about the role of the final cause in nature, examines the context of the problem, his theory of the causes. Aristotle assumes an analogy between nature and craft and takes the production of artifacts to be paradigmatic. With these assumptions as guiding principles, the paper attempts to motivate his causal theory and propose what may be called a "logic" of the causes. It examines artefactual coming-to-be more closely, focusing on the aspects of Aristotle's account that are highlighted in his explanation of natural coming-to-be: the basic character of the causes, the peculiar distinction between the causes and the accompanying the deeper coincidence among three of them, the complementarity between the final and moving causes, the nature and role of desire in coming-to-be, and the primacy of form. It introduces the notion of a trans-temporal objective whole and shows the need to consider the full whole — which includes the entire process of coming-to-be together with its source — as the proper context for a full understanding of coming-to-be. It also points out the importance of the distinction between the objective and subjective perspectives, especially useful in understanding final causality.

Słowa kluczowe: Arystoteles, filozofia przyrody, przyczyny, analogia natura-sztuka, artefakty.

Key words: Aristotle, philosophy of nature, cause, nature-craft analogy, artifacts.

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