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MONTE RANSOME JOHNSON

# ARISTOTLE ON TELEOLOGY

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# Aristotle on Teleology

MONTE RANSOME JOHNSON

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Monte Ransome Johnson

*Seattle*

*December 2004*

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# Abbreviations

<i>Anima</i>	<i>De Anima</i> (On the Soul)
<i>Ath</i>	<i>Athenian Constitution</i>
<i>Cael</i>	<i>De Caelo</i> (On the Heavens)
<i>Cat</i>	<i>Categoriae</i> (Categories)
<i>Div</i>	<i>De Divinatione per Somnium</i> (On Prophecy in Sleep)
<i>EE</i>	<i>Ethica Eudemeia</i> (Eudemean Ethics)
<i>GA</i>	<i>De Generatione Animalium</i> (Generation of Animals)
<i>GC</i>	<i>De Generatione et Corruptione</i> (On Generation and Destruction)
<i>HA</i>	<i>Historia Animalium</i> (History of Animals)
<i>IA</i>	<i>De Inessu Animalium</i> (On Animal Progression)
<i>Insomn</i>	<i>De Insomniis</i> (On Dreams)
<i>Int</i>	<i>De Interpretatione</i> (On Interpretation)
<i>Juv</i>	<i>De Juventute et Senectute</i> (On Youth and Old Age)
<i>Long</i>	<i>De Longitudine et Brevitate</i> (On Length and Shortness of Life)
<i>Mech</i>	<i>Mechanica</i> (Mechanics)
<i>Mem</i>	<i>De Memoria et Reminiscentia</i> (Memory and Recollection)
<i>Meta</i>	<i>Metaphysica</i> (Metaphysics)
<i>Meteor</i>	<i>Meteorologica</i> (Meteorology)
<i>Motu</i>	<i>De Motu Animalium</i> (On Animal Motion)
<i>MM</i>	<i>Magna Moralia</i> (Great Ethics)
<i>Mund</i>	<i>De Mundo</i> (on the Cosmos)
<i>NE</i>	<i>Ethica Nicomachea</i> (Nicomachean Ethics)
<i>PA</i>	<i>De Partibus Animalium</i> (On the Parts of Animals)
<i>Phys</i>	<i>Physica</i> (On Nature)
<i>Poet</i>	<i>De Poetica</i> (Poetics)
<i>Pol</i>	<i>Politica</i> (Politics)
<i>Post</i>	<i>Analytica Posteriora</i> (Posterior Analytics)
<i>Prior</i>	<i>Analytica Priora</i> (Prior Analytics)
<i>Prob</i>	<i>Problemata</i> (Problems)
<i>Protr</i>	<i>Protrepticus Philosophias</i> (Exhortation to Philosophy)

<i>Resp</i>	<i>De Respiratione</i> (On Respiration)
<i>Rhet</i>	<i>Ars Rhetorica</i> (Art of Rhetorical)
<i>SE</i>	<i>Elenchi Sophistici</i> (Sophistical Refutations)
<i>Sens</i>	<i>De Sensu et Sensibilibus</i> (On Sense and Sensibilia)
<i>Somn</i>	<i>De Somno et Vigilia</i> (On Sleep and Waking)
<i>Top</i>	<i>Topica</i> (Topics)

Aristotle is cited according to book and chapter, as well as page, column, and line, in the edition of I. Bekker (*Aristoteles Graece ex recensione Immanuelis Bekkeri*, 2 vols., Berlin, 1831). All translations are mine, based on the editions in the *TLG* (*Thesaurus Linguae Graecae canon of Greek authors and works*, 3rd edn. Oxford, 1990), unless otherwise noted.

All other abbreviations of classical works follow those in the *LSJ* (*Greek-English Lexicon*, compiled by H. G. Liddell and R. Scott, rev. H. S. Jones, 9th edn. Oxford, 1940). References to earlier Greek philosophers are to *DK* (*Die Fragmente der Vorsokratiker*, ed. H. Deals and W. Kranz. 3 vols. 6th edn, Berlin, 1951) References to Plato are to the page, column, and line numbers found in the *OCT* (Oxford Classical Texts, *Platonis Opera*, ed. J. Burnet, 5 vols. Oxford, 1900–22). References to Greek commentators are to the *CIAG* (*Commentaria in Aristotelem Graeca*, ed. H. Diels. Berlin, 1892–1909).

Further information on texts and translations, commentaries, other classical writers, and secondary sources, is provided in the Bibliography.

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# Introduction

The reason why an introduction appears first, although it is typically written last, could be as follows: genetic and explanatory orders are reversed in complex creations. In the order of exposition, that which something is for—its end—comes first, and the features necessitated by this condition follow. Accordingly, I will take the opportunity of this introduction to indicate the purpose of this book, which is twofold: (1) to determine how ends are used by Aristotle as explanations in natural philosophy, and (2) to determine what the limits of that kind of explanation are. Ends and limits are concepts that Aristotle himself brings together in several crucial passages that bear on his teleology.<sup>1</sup>

A thorough study of Aristotle's teleology can tell us a lot about Aristotle's philosophy, about Greek philosophy generally, and even about contemporary philosophical, scientific, and ethical problems of scientific explanation and causality. As I argue in the conclusion, it can also change the way we view and relate to nature.

How can a study of teleology contribute to our understanding of Aristotle or his place in Greek philosophy? The answer to this question might be thought too obvious. In a recent comprehensive study of cause and explanation in Greek philosophy, covering more than a millennium, teleology is said to be the central issue.<sup>2</sup> Teleology is thought by many to be the key to Aristotle's thought.<sup>3</sup>

<sup>1</sup> 'We seek the reason why up to this point, and then we think we know, when it is not the case that this either comes about or is because something else does; for the last term is in this way an end and a limit' (*Post* i 24, 85<sup>b</sup>27–30); 'all practical processes of thinking have limits—they all go on for the sake of something else, and all theoretical processes come to a close in the same way that accounts do' (*Anima* i 3, 407<sup>a</sup>23–25); 'nature flees from the infinite; for the infinite is imperfect, and nature always seeks an end' (*GA* i 1, 715<sup>b</sup>14–16); 'all living things both move and are moved for the sake of something, so that this is the limit of all their movement—that for the sake of which' (*Motu* 6, 700<sup>b</sup>15–16); 'the reasonable person, at least, always acts for a purpose; and this is a limit, for the end is a limit' (*Meta* i 11, 994<sup>b</sup>16); 'For the end is a limit (τὸ γὰρ τέλος πέρας ἐστίν)' (*Meta* ii 2, 994<sup>b</sup>16); 'we apply the term "limit" . . . also to the end of each thing, and of this nature is that towards which the movement and action are' (*Meta* v 17, 1022a4–7), 'there is an end of the things we do, which we desire for its own sake . . . we do not choose everything for the sake of something else, for then the process would go on to infinity, so that our desire would be empty and vain' (*NE* i 1, 1094<sup>a</sup>18–21).

<sup>2</sup> 'Whether . . . nature is such as to be completely describable without remainder in terms of purely mechanical laws of working, or whether rather nature demands to be understood in teleological terms, is the central question of Greek philosophical science' (Hankinson 1998, p. 6).

<sup>3</sup> 'If Aristotle is known for anything, it's his teleology' (Gotthelf and Lennox 1987, PIAB, p. 199); 'This most teleological of all thinkers, at least by reputation and upon the basis of many texts in his corpus' (Oates 1963, p. 251); 'Aristotle—the arch teleologist' (Veatch 1992, p. 55); 'much else in Aristotle's thought, from his ethical theory to the theory of substance . . . depends centrally on his natural teleology' (Gotthelf 1997, p. 82); 'The intuitive notion of functions and what they explain is basically Aristotelian' (McLaughlin 2001, p. 211).

Despite near unanimity on the importance of teleology to Aristotle, there is no consensus, but rather widespread disagreement, both about the general character of Aristotle's teleology, and about many specific issues. A comprehensive study of his remarks is needed in order to resolve several persistent interpretative problems and technical difficulties that can no longer be resolved in a piecemeal fashion, since the central issue is how apparently mutually exclusive conceptions of teleological explanation can be reconciled in a coherent interpretative framework. Is teleology about causation or explanation? Does teleology exclude or obviate mechanism, determinism, or materialism? Is teleology focused on the good of individual organisms, or is god or man the ultimate end of all processes and entities? Is teleology restricted to living things, or does teleology apply to the cosmos as a whole? Does teleology identify objectively existent causes in the world, or is it merely a heuristic for our understanding of other causal processes? Even apart from these issues debated with extraordinary depth in the community of Aristotle and Greek philosophy scholars, there are serious popular misconceptions about Aristotelian teleology that must be addressed. For example, Aristotle is often characterized as a naïve or uncritical teleologist. Detractors reject his supposed panglossianism,<sup>4</sup> mysterious entelechies, magical pneuma,<sup>5</sup> obscure natures, hidden essences,<sup>6</sup> backwards causation,<sup>7</sup> animism,<sup>8</sup> and anthropomorphism.<sup>9</sup> Even supporters have sometimes understood his teleology to necessitate such undesirable doctrines as vitalism,<sup>10</sup> creationism,<sup>11</sup>

<sup>4</sup> 'Pangloss taught metaphysico-theologo-cosmolo-nigology. He proved incontestably that there is no effect without a cause . . . "It is proved," he used to say, "that things cannot be otherwise than as they are; for as all things have been created for some purpose, they must necessarily be created for the best purpose. Observe, for instance, the nose is formed for spectacles, therefore we wear spectacles. The legs are visibly designed for stockings, accordingly we wear stockings . . . since pigs were made to be eaten, we eat pork all the year round"' (Voltaire's *Candide, or Optimism* (1758), p. 20, trans. J. Butt).

<sup>5</sup> Balme complains: 'tradition lapsed into philosophy-fiction, inventing such *dei ex machina* as a hypostatized Nature supervising an overall teleology, or a cosmic control operated by the Unmoved Mover, or a living universe, or mysterious entelechies and magical pneuma within animals' (1980, p. 291).

<sup>6</sup> Karl Popper says, 'methodological essentialists, for instance Aristotle . . . all agreed with him [Plato] in determining the task of pure knowledge as the discovery of the hidden nature or Form or essence of things' (1945/1966, p. 31).

<sup>7</sup> 'Aristotelian goal-directed causality . . . appeared to put the cart before the horse—explaining a cause before its effects—and thus to require "backwards causation" (Buller 1999, p. 5); "[teleological explanation] might presuppose either reverse causation or minds' (Nissen 1997, p. vii).

<sup>8</sup> Gomperz speaks of Aristotle's 'extreme teleological view of nature and the, so to speak, atavistic tendency to assume the animation of all nature' (1909, p. 171); 'Aristotle argued that a falling body accelerated because it grew more jubilant as it found itself nearer home' (Skinner 1971, p. 6).

<sup>9</sup> 'Modern science arose in opposition to Aristotelian thought . . . and there has since been a pronounced tendency, already noted, to eschew Aristotelian concepts whenever possible. There have not been wanting scientists and philosophers who have insisted that the very concept of a cause is quite worthless, being "anthropomorphic" in origin' (Taylor 1967, p. 57). The charge is leveled earlier by Meyer 1919.

<sup>10</sup> For example, Rist: 'there is some kind of desire inherent in matter' (1965, p. 342).

<sup>11</sup> 'Aristotle seems to regard nature as a designing power . . . not merely an immanent force, but a person having reason and foresight' (Allan 1952, p. 33). A recent example: 'Galen did not reject Aristotelianism entirely. His explanation of natural processes such as the transformation of matter depended on Aristotelian concepts, and he was convinced, like Aristotle, that the body had been carefully

and anthropocentrism.<sup>12</sup> I try to show that all of these criticisms and interpretations are misplaced, and that they can be eliminated in the process of addressing the scholarly disputes mentioned earlier.

What can a study of Aristotelian teleology tell us about our own philosophical, scientific, and ethical problems? Because the Aristotelian corpus is a powerful investigative resource and critical tool, Aristotle's theory of teleology, in its application to such diverse disciplines as physics, biology, ethics, and politics, offers an opportunity to survey the uses and abuses of teleological reasoning across a broad spectrum of philosophical interest. It is widely held that the scientific revolution of the sixteenth and seventeenth centuries turned on the rejection of final causes and the establishment of a mechanistic world picture. A possible result of the survey is that we can better understand what renaissance and modern scientists and philosophers were positioning themselves against when they rejected final causes, if that is in fact what they have done. And it can also help evaluate in what respects their arguments were and are right and have proved productive, and in what ways they were wrong, failed to appreciate all the alternatives, and have inhibited a better understanding of what a scientific explanation is.

In part, what I want to do in this study is reopen a line of Aristotelian interpretation that originated in the early twentieth century. The interpretation I have in mind recognized that the most important feature of Aristotelian teleology is that it presents an alternative to the anthropocentric, creationist, and providential schemes of teleology that were favored by Aristotle's predecessors, and were later popular in the commentarial tradition's appropriation of Aristotle, and in the early modern period's natural theology. This point of view is clearly expressed by Zeller,<sup>13</sup> Gomperz,<sup>14</sup> and Ross.<sup>15</sup> Although the position has also been maintained more recently,<sup>16</sup> it has

designed by a provident and purposeful creator' (Nutton 2002, p. 801). Chroust 1973 has tried to commit Aristotle to such a view with his discovery of a 'teleological proof for the existence of god' in Aristotle's lost work *On Philosophy*.

<sup>12</sup> Examples: David Sedley's affirmative response to the question in the title of his paper, 'Is Aristotle's Teleology Anthropocentric?' (1991); Hughes 1975, pp. 64–5 and 1985, p. 73.

<sup>13</sup> 'The most important feature of the Aristotelian teleology is the fact that it is neither anthropocentric, nor is it due to the actions of a creator existing outside the world or even of a mere arranger of the world, but is always thought of as immanent in nature. What Plato effected in the *Timaeus* by the introduction of the world-soul and the Demiurgus is here explained by the assumption of a teleological activity inherent in nature itself' (Zeller 1883/1955, sec. 48).

<sup>14</sup> 'Aristotle's teleological interpretation of the universe outgrew the cramping bounds by which that conception had been confined in the thought of Xenophon, perhaps of Socrates. It is not man and the profit that he draws from the well-ordering of the universe that stands in the foreground of his contemplation. It is rather the well-ordered beauty of the cosmos itself that determines his judgment, wherein he resembles Anaxagoras, Diogenes of Apollonia, and Plato' (Gomperz 1909, p. 132).

<sup>15</sup> 'Aristotle's teleology is, it will be seen, an "immanent" teleology. The end of each species is internal to the species; its end is simply to be that kind of thing, or, more definitely, to grow and reproduce its kind, to have sensation, and to move, as freely and efficiently as the conditions of its existence—its habitat for instance—allow. Only once, perhaps, does Aristotle suggest (and only doubtfully) that a characteristic of one species might be designed for the sake of another' (Ross 1923, p. 129).

<sup>16</sup> Most notably by Balme 1965, Grene 1972, Nussbaum 1978, Berti 1989/90, Lennox 1992, and Wardy 1993.

neither been confirmed through a comprehensive survey of Aristotle's works, nor been brought to bear on more general philosophical issues.

For Aristotle, teleological explanations explain how animal parts and behavior are 'adapted' to their environment, and not how the environment is adapted to the needs of animals or other organisms (including humans). In this way, Aristotle's explanations are more like contemporary biological theories of evolutionary adaptation,<sup>17</sup> and quite different from either 'the teleological proof' or 'design argument' employed by natural theology,<sup>18</sup> or its contemporary cosmological counterpart, 'the anthropic principle'.<sup>19</sup>

I also believe strongly that Aristotle's teleology can change the way we view and relate to other natural entities. Aristotle defines nature as an internal principle of change, and as an end. He shows us how ends and goods can and must enter into scientific explanations. Every natural substance is an end, and is identified as the beneficiary of its own parts and motions. Aristotle thus provides us with a way to think about goods as natural phenomena, as objective causes out there in the world, and not merely as products of the human mind. Just as he shows how a thing's nature can be the basis for explaining its parts and behavior without any reference to an intelligent designer, so he shows how the nature of a thing, especially an organism, can be the basis for explaining its end and good without any reference to human interests and ends.

I contend that this presents a challenge to anthropocentrism, pervasive or dominant though it is. Anthropocentrism is the position that human beings are the center—or rather the end—of everything; everything has value or is good only in relation to human beings. Some versions of anthropocentrism are anti-teleological, such as those predicated on the reduction of the explanation of all non-human organisms to 'efficient causes'. Aristotelian arguments that expose the theoretical shortcomings of this view force us to look beyond Cartesian machines and Skinnerian behavior-systems that discount the value of all living things besides humans. Other versions of anthropocentrism are themselves teleological. For example, the Stoics

<sup>17</sup> 'Aristotelian "why" questions are quite legitimate in the study of adaptations, provided one has a realistic conception of natural selection and understands that the individual-as-a-whole is a complex genetic and developmental system' (Mayr 1983, p. 332). Adaptation refers to characteristics that improve the chance of an organism reproducing (whether physiological or behavioral), and so are favored by natural selection (cf. *Unwin-Hyman Dictionary of Biology*, second edition, 1995, s.v. adaptation). Obviously this is on the face of it very different than Aristotle's theory, but my point is that Aristotle's position is not as different from this as it is from teleological arguments in natural theology, or anthropic cosmological principles. See also: Gotthelf 1988; Lennox 1993; Depew 1997.

<sup>18</sup> 'The world exhibits teleological order (design, adaptation); therefore, it was produced by an intelligent designer' (Alston 1967).

<sup>19</sup> 'It is not only that man is adapted to the universe. The universe is adapted to man. Imagine a universe in which one or another of the fundamental dimensionless constants of physics is altered by a few percent one way or the other? Man could never come into being in such a universe. That is the central point of the anthropic principle. According to this principle, a life-giving factor lies at the center of the whole machinery and design of the world' (J. A. Wheeler, 'Forward', in Barrow and Tipler 1986, p. vii).

embraced a cosmic teleology which held that all plants and animals function primarily for the sake of humans. Aristotelian arguments can show that such versions of teleology are theoretically incoherent and scientifically unsound.

Some influential scholars have even maintained that Aristotle's own teleology is anthropocentric. One of my main objectives is to refute that interpretation. It is true that there are passages in which Aristotle discusses the value of natural things like plants and animals to humans, treating such entities as instrumentally valuable. These passages deserve our closest attention because they show a philosopher whose inclinations go the other way grappling with a view virtually unanimously held by his predecessors. But it would be a grave mistake to infer from Aristotle's discussion of the instrumental value of plants and animals that Aristotle therefore holds that such natural substances do not at the same time have intrinsic ends independent of their instrumental value to humans. For Aristotle insists that these ends are in the final analysis more important, even for human success, than the instrumental uses of natural things. While the artificial ends of plants and animals are only instrumentally useful to us, the natural ends of plants and other animals are intrinsically valuable and, as objects of contemplation, have paramount significance for the ultimate end of human life.

Aristotle gives good reasons—scientific and ethical reasons—why we ought to value other natural things more for their own ends than for what we can do with them. Sure enough, humans need to use natural substances, including other organisms, instrumentally. The development of techniques of hunting, agriculture, and animal husbandry is a clear manifestation of that need. But Aristotle argues that these techniques, like all technologies, have a natural limit, the transgression of which is *contrary to nature* and ignoble. That limit is what is necessary for our survival and functioning, in accordance with our own natural needs and functions (which, Aristotle holds, can be objectively determined for humans, just as it can for other animals).

We have overcome the Aristotelian view that the earth is at the center of the spatial universe, but we still need to come over to the Aristotelian view that humans are not at the center of the axiological universe. Thus I think that a study of Aristotelian teleology, in addition to being an intrinsically valuable exercise, can be justified instrumentally on the grounds that it has something to show us about our relationship to nature.

I conclude this introduction with an abstract of the argument that follows. Aristotle holds that natural science is knowledge that comes about through demonstration of the causes of natural kinds. Most important is 'the cause for the sake of which'—the end. The identification of a natural end initiates the process of explanation and constitutes the basis for all objective knowledge about natural kinds—stars, elements, plants, animals, humans, and cities. The determination of the ends of natural kinds also indicates how other causal factors, such as matter and necessity, are to be integrated into an explanatory account of their parts and behavior.

Aristotle is commonly considered the inventor of teleology, although the exact term ‘teleology’ originated in the eighteenth century. If teleology means the use of ends and goals in natural science, then Aristotle should be regarded rather as a critical innovator of teleological explanation. Teleological notions were widespread among his predecessors, but Aristotle rejected their conception of extrinsic causes such as mind or god as the primary causes for natural things. Aristotle’s radical alternative was to assert nature itself as an internal principle of change and an end, and his teleological explanations focus on the internal and intrinsic ends of natural substances—those ends that benefit the natural thing itself. To these he contrasted incidental ends of natural things, such as possible uses of the thing that do not serve its own functions and interests.

Aristotle’s use of ends was subsequently conflated with incompatible ‘teleological’ notions, including proofs for the existence of a providential or designer god, vitalism and animism, opposition to mechanism and non-teleological causation, and anthropocentrism. I aim to correct these misrepresentations through an elaboration of Aristotle’s methodological statements, as well as the explanations actually offered in the scientific works. Although Aristotle’s philosophy sometimes suffers from failed extrapolation of teleological principles, still it succeeds in challenging the anthropocentric conception of nature, and rising above the banal perspective which views all natural things as instruments for human ends, to a loftier viewpoint from which natures can be observed and appreciated as their own goods.

In the first chapter, I offer a brief overview of the controversial history of the interpretation of Aristotelian teleology. The Greek, Arabic, and Latin commentarial traditions sought to unify Aristotle’s thought with the Platonic demiurge, Islamic faith, and the Christian god, and used his philosophy to develop arguments or proofs for the existence or the qualities of god. In the early modern period, this effort flourished in the discipline of natural theology, which pointed to natural things as evidence of god’s design and providence. The term ‘teleology’ was invented in this context. Philosophers such as Bacon, Descartes, and Spinoza criticized the excesses of teleology and final causes in natural science, and painted a mechanistic world picture that they opposed, rhetorically at least, to the scholastics’ dependence on final causes. Eventually, Kant was compelled to confront the apparent antinomy between teleology and mechanism in the finale to his critical philosophy, *The Critique of Teleological Judgment*. Kant endorsed the heuristic value of teleological explanation, and considered humans the ultimate end of nature. These influences are sources of possible confusion and anachronism in the interpretation of Aristotle. One can get a clearer picture of Aristotle’s own concerns by examining a text written in the milieu of Aristotle’s own school, Theophrastus’ *Metaphysics*. Theophrastus expresses reservations and concerns about the excessive use of teleological principles and slogans, and about the extent to which the universe can be characterized as ordered for the sake of some overall purpose or good. I argue that these are concerns that Aristotle shared with his colleague and successor, and addressed in his own works.

In the second chapter, the way is cleared for a discussion of Aristotle's teleology by introducing in broad terms his conception of cause and explanation. Aristotle says that all causes (including nature, necessity, luck, and so forth) fall under 'four headings'. The causes are crucial to scientific knowledge: demonstration involves a syllogism in which a cause is the middle term. It is necessary to see how this works for three other kinds of cause, before introducing teleological explanations and describing how the cause 'for the sake of which' should work in demonstrations. Aristotle himself raises the most important issues that uniquely pertain to this latter kind of explanation, such as temporal sequence, and integration with material and efficient causation. The chapter ends with a discussion of the crucial distinction between explanatory and non-explanatory causes (or intrinsic and incidental causes), and how these relate to theoretical and practical knowledge.

In the third chapter, we will discuss at length the specific terms and concepts of Aristotle's teleology. Teleological explanations involve what Aristotle consistently calls 'the cause for the sake of which'. This locution is said to have two senses: aim and beneficiary. The distinction has major and underappreciated significance for the interpretation of Aristotle's teleology. But its importance can be seen in connection with other teleological terms and phrases, such as the methodological principle that 'nature does nothing in vain', normative terminology such as 'good' and 'noble', and the family of terms containing the root TELE-, including the noun *telos* ('end'), the adjective *telion* ('complete'), and the verb *teleiousthai* ('to complete').

In the fourth chapter, we discuss Aristotle's dialectical interrogation of his predecessors. Some of the most important discussions of teleological ideas occur in the context of Aristotle's criticisms of his predecessors' accounts of natural things. According to Aristotle, Empedocles tried to account for natural things by the cause of luck, Anaxagoras by intelligence, Plato by form, and Democritus by necessity. Aristotle co-opts what is successful in these strategies, but at the same time criticizes them for failing to account for the regularity with which natural things are generated for the sake of their own ends. By examining these criticisms, one can see how Aristotle could have dealt with other philosophers whom later commentators have considered teleological (such as Diogenes of Apollonia in his use of intelligence and air, and Xenophon's Socrates in his postulation of a providential god designing and arranging everything for the sake of humans). Aristotle considers these causes—luck, intelligence, and god—to be extrinsic causes that cannot on their own present a satisfactory explanation of natural kinds such as plants and animals. His own proposal is that nature is an internal principle of change and an end, and that it is with reference to such a cause that natural phenomena and their regularity must be explained.

Having discussed the history, terms, logic, and available alternatives to Aristotelian teleology, in Part II we examine the actual teleological explanations offered by Aristotle of natural substances. The order in which the examination