

PHILOSOPHICAL NOTES

PLATONIC AND ARISTOTELIAN VIEWS ON NATURAL TELEOLOGY

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Abstract: In this paper, I have attempted to show that the typological distinction formulated by Coleridge between the two traditions into which Western philosophy is divided – Platonism and Aristotelianism – is clearly visible in the context of natural philosophy as well. I have shown how, in their efforts to explain the complexity of natural phenomena, the two traditions formulated teleological theories that share certain elements while differing in fundamental respects. Having analyzed the two distinct modes of teleological thinking, I have gone on to show how both are superseded by the philosophical implications of Darwin’s theory of evolution by natural selection, which replaces finalist explanation with a naturalistic one.

Keywords: Platonism, Aristotelianism, teleology, Darwinism, naturalism.

In one of his famous *Table Talks* (2 July 1830), Samuel Taylor Coleridge advances one of the most enduring typological distinctions in the history of Western philosophy. He proposes that all thinkers fall irreducibly into one of two camps – Platonist or Aristotelian – and that this division is not a matter of intellectual choice but of innate cognitive disposition: “Every man is born an Aristotelian, or a Platonist. I do not think it possible that anyone born an Aristotelian can become a Platonist; and I am sure no born Platonist can ever change into an Aristotelian.”¹ For the Platonist, explains Coleridge, reason is a *power*, an autonomous, generative faculty capable of apprehending Ideas as constitutive, living, and essential truths, independent of sensory experience, and that makes him an expert of speculative thinking, a metaphysician *par excellence*. For the Aristotelian, reason is a *quality* or attribute of the understanding, a faculty

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¹ Samuel Taylor Coleridge, *Table Talk Of Samuel Taylor Coleridge: And The Rime Of The Ancient Mariner, Christabel, &c., With an Introduction by Henry Morley*, London, George Routledge and Sons, 1884, p. 102.

that operates by processing sense data and forming concepts. Consequently, Aristotle is seen as “the parent of science, properly so called, the master of criticism, and the founder or editor of logic”².

More than a century later, in his essay *El ruiseñor de Keats (The Nightingale of Keats)*³ Jorge Luis Borges uses Coleridge’s distinction to argue that the English mind, being constitutively Aristotelian, is structurally ill-equipped to understand Keats’s *Ode to a Nightingale*, since the poem depends on the Platonist intuition of the nightingale as an ideal, generic form, the very kind of reality that the Aristotelian temper is disposed, by its nature, to dissolve into a collection of particular birds.

Borges thus takes Coleridge’s idea a step further, transforming it into a sweeping philosophical genealogy that spans the entire history of Western thought, where we can see two distinct lineages where the persons change but the underlying metaphysical commitments persist, unbroken, across millennia: “Across the latitudes and the epochs, the two immortal antagonists change their name and language: one is Parmenides, Plato, Spinoza, Kant, Francis Bradley; the other, Heraclitus, Aristotle, Locke, Hume, William James.”⁴ The criterion of division is the problem of universals. Platonists hold that classes, orders, and genres possess genuine ontological status, and that language, far from being a merely conventional system, constitutes a map of the universe, a structural homology between word and reality. Aristotelians, by contrast, treat universals as generalizations, language as an approximative instrument, and the apparent order of the cosmos as a possible fiction of our partial cognition.

More recently, in the introductory chapter of his book *The Cave and the Light: Plato Versus Aristotle, and the Struggle for the Soul of Western Civilization*⁵, Arthur Herman advances a grand historiographical thesis, that the defining tension of Western civilization is not political, theological, or economic in its primary form, but philosophical, and that it originates in the irreconcilable opposition between the worldviews of Plato and Aristotle: “Mysticism versus common sense; religion versus science; empiricism versus idealism: [...] two contrasting but highly influential worldviews that have shaped our world, in a perpetual struggle for the soul of Western civilization.”⁶

Herman departs from Coleridge’s formulation by rejecting its determinism. Where Coleridge held that one is born either a Platonist or an Aristotelian, Herman argues that the allegiance is cultural and historical rather than innate: he traces a

² *Ibidem*, pp. 102–103.

³ Jorge Luis Borges, “The Nightingale of Keats”, in *Other Inquisitions, 1938–1952*, translated by Ruth L.C. Simms, Introduction by James E. Irby, Austin & London, University of Texas Press, 1964, pp. 121–124.

⁴ *Ibidem*, p. 123.

⁵ Arthur Herman, *The Cave and the Light: Plato Versus Aristotle, and the Struggle for the Soul of Western Civilization*, New York, Random House, 2013.

⁶ *Ibidem*, p. XXI.

continuous, transhistorical antagonism in which the same fundamental opposition resurfaces across ancient philosophy, medieval theology, Renaissance art and politics, the scientific revolution, Enlightenment political thought, Romanticism, and modern ideology. The Platonic path, in his account, is that of the religious mystic and the visionary artist, oriented toward contemplation and the speculative unleashing of human desire; the Aristotelian path proceeds through empirical sobriety, logical analysis, and a grounding commitment to observable fact. Each tradition has periodically generated attempts at synthesis, but Herman insists that the underlying antagonism has always reasserted itself: “At certain critical junctures of history, thinkers have tried to knit the two together into a single system. But each time, the old antagonism reasserts itself and the battle is renewed from generation to generation, century to century.”⁷

Of particular interest, however, is the manner in which this distinction may be found within the context of natural philosophy, in the attempts at finding an explanation of the very existence, becoming, and extraordinary complexity of nature, and especially of the living world. André Ariew, whose excellent analysis of teleological thinking I shall draw on very frequently in what follows, believes that in the Western philosophy of nature, we may easily identify two contrasting modes of thought, opposing the proponents of a materialist or naturalist worldview on one side, and those of a teleological one on the other. According to materialism or naturalism, all natural phenomena are products of the causal interactions of material objects. By contrast, for adherents of teleological thinking, the structural complexity of living beings, together with the fact that they are remarkably well adapted to fulfilling certain functions, mean that they were specially designed, either by an intelligent agent or through the action of other, non-conscious forces, for the achievement of those ends.⁸

Ariew holds that, according to this criterion – i.e., according to the manner in which they identify the source of this characteristic of living beings, namely their being designed for the achievement of a specific end – the adherents of teleological perspective may be in their turn classified into two categories: the Platonists and the Aristotelians. According to the former, who situate themselves within the tradition of Platonic thought, matter and natural causality cannot account for the order, complexity, and finalism present in the world; hence the intervention of a supernatural intelligent agent is required, a demiurge who constitutes the source of the world’s order, complexity, beauty, functionality, and directionality. By contrast, according

⁷ *Loc. cit.*

⁸ These issues, as well as other ideas addressed in the present paper, have also been discussed in several of my other works, previously published in Romanian, such as: Sergiu Bălan, “Ideea de teleologie în filosofia biologiei”, in Alexandru Surdu, Sergiu Bălan, Mihai Popa (eds.), *Studii de teorie categoriilor*, vol. VII, Bucharest, Editura Academiei Române, 2015, pp. 57–76; Sergiu Bălan, “Platon, Aristotel, Paley și argumentul proiectului inteligent”, *Cercetări filosofico-psiologice*, Tome XII, no. 1, 2020, pp. 21–31.

to the members of the second group, who draw their inspiration from Aristotelian philosophy, there is no need to introduce a supernatural agent into the explanation, since the structural and functional complexity of the living world can be accounted for through the teleological action of an internal force that represents a natural manifestation of living beings and that governs their transformations and optimal functioning.⁹ In the words of John S. Wilkins, these are the two types of teleological explanations that can be found in the Western philosophy of biology: the external and the internal. According to the external (Platonic) teleological explanation, finality is imposed from without, by a rational agent who possesses intentions and ends of his own. By contrast, in the context of functional (Aristotelian) teleological explanation, what we are in fact dealing with is an internal causal explanation, constructed in terms of the value of the thing that is to be explained.¹⁰ Let us examine more closely what this distinction amounts to.

In the *Phaedo*, Plato draws, through the words of Socrates, a distinction between two types of causes: those that operate in the absence of any intention, and those that operate in accordance with a plan, in a deliberate manner and with a view to the achievement of an end.¹¹ For the question: ‘why does a man grow?’, Socrates offers an answer that appeals to the first type of causality:

I thought before that it was obvious to anybody that men grew through eating and drinking, for food adds flesh to flesh and bones to bones, and in the same way appropriate parts were added to all other parts of the body, so that the man grew from an earlier small bulk to a large bulk later, and so a small man became big.¹²

Plato goes on to argue, however, that this explanation, while not erroneous, is insufficient for a genuine understanding of the thing to be explained, and stands in need of supplementation by one that makes reference to ends and values: “If then one wished to know the cause of each thing, why it comes to be or perishes or exists, one had to find what was the best way for it to be, or to be acted upon, or to act.”¹³ Yet these ends and values in terms of which the causes of things’ existence are to be understood are not inherent to things themselves, but are rather the result of the action of a transcendent entity that selects and establishes them: “[...] it is Mind that directs and is the cause of everything [...] I thought that if this were so,

⁹ André Ariew, *Teleology*, in D.L. Hull, M. Ruse (eds.), *The Cambridge Companion to the Philosophy of Biology*, Cambridge, Cambridge University Press, 2007, pp. 160–181.

¹⁰ John S. Wilkins, *Evolution and Philosophy. Is There Progress and Direction in Evolution?*, 1997, available on-line at: <http://www.talkorigins.org/faqs/evolphil/teleology.html>

¹¹ Cf. Michael Ruse, *Darwin and Design: Does Evolution Have a Purpose?*, Cambridge, MA, Harvard University Press, p. 13.

¹² *Phaedo*, 96c-d (trans. by G.M.A. Grube), in Plato, *Complete Works*, Edited, with Introduction and Notes, by John M. Cooper, Associate Editor D.S. Hutchinson, Indianapolis/Cambridge, Hackett Publishing Company, 1997. All subsequent quotes from Plato are from this edition.

¹³ *Phaedo*, 97c-d.

the directing Mind would direct everything and arrange each thing in the way that was best.”¹⁴

In other words, the fact that a man acts as he does cannot be explained solely through the action of causes belonging to the first category – i.e., through the natural and physiological laws governing the activity of his muscles – but requires the introduction into the explanation of causes of another kind, belonging to the category of intentions, which would account for, among other things, the reason he chose some actions and not others. As Michael Ruse observes, Plato holds that some things are to be understood in terms of their inherent value for us, while others must be regarded as causes that make possible the future realization of our intentions, that is, the attainment of our value-defined ends. In the context of the discussion in the *Phaedo*, eating and drinking constitute causes (in the first sense) of the growth and development of the organism; but since development is itself a value and an end, it is equally proper to say that these are actions we perform *for the purpose of* growing and developing, and that they are therefore phenomena causally explained through the second type of causality, that of finality: the cause of our eating is that we have as our end the goal of growth and development. This second mode of understanding causality is coherent only if we are willing to invoke values and ends; once these are eliminated from the explanation, we are left with no recourse but the first type of causal relation.¹⁵

This way of understanding causality raises, however, a problem of principle, as Ruse observes, for it appears to reverse the temporal succession between cause and effect: the cause is a future event, while the effect occurs in the present. This happens because, when evaluative criteria are involved – criteria that shape human desires – the explanation will invariably refer to the goals and objectives of the agents concerned, which are projected into the future. But human desires and needs presuppose the existence of a consciousness that constitutes the source of intentions: value judgements concerning purposes imply the existence of a mind. This fact immediately raises a specific problem – one that lies at the root of most controversies surrounding teleological thought: it is evident that it is not the human mind that constitutes the source of those arrangements which impose order upon things and prescribe their future development toward a determinate end (for instance, it is not the human mind that has assigned to man the goal of growth and maturation). What, then, is the source of these arrangements?¹⁶

Plato offers an answer to this question in the dialogue *Timaeus*, where he explains in greater detail what he understands by the ‘Mind’ mentioned in the *Phaedo*. It is not the human mind, but the mind belonging to a transcendent creative divinity – a Demiurge – who is to be understood neither as identical with any of the deities of the Greek pantheon, nor as a prefiguration of the monotheistic

¹⁴ *Phaedo*, 97c.

¹⁵ M. Ruse, *Darwin and Design*, p. 14.

¹⁶ *Ibidem*, pp. 14–15.

divinity of the Judeo-Christian tradition. He is not a creator of the world *ex nihilo*, but rather an agent who designs and introduces order into a pre-existing chaotic world, with the ultimate purpose of bringing that world to perfection:

The god wanted everything to be good and nothing to be bad so far as that was possible, and so he took over all that was visible [...] and brought it from a state of disorder to one of order, because he believed that order was in every way better than disorder.¹⁷

In this ordering activity, the Demiurge takes the Ideas as his model and source of inspiration, though in place of the immutable Forms he might have chosen a different source, such as becoming:

So whenever the craftsman [*dēmiurgós*] looks at what is always changeless and, using a thing of that kind as his model, reproduces its form and character, then, of necessity, all that he so completes is beautiful. [...] Well, if this world of ours is beautiful and its craftsman good, then clearly he looked at the eternal model. But if what it's blasphemous to even say is the case, then he looked at one that has come to be. Now surely it's clear to all that it was the eternal model he looked at [...] This, then, is how it has come to be: it is a work of craft, modeled after that which is changeless and is grasped by a rational account, that is, by wisdom.¹⁸

In the *Timaeus*, Plato revisits also the distinction between the two types of causes: the secondary causes (which he terms “auxiliary”), devoid of necessity, which merely determine phenomena, and the fundamental causes, which afford us genuine understanding of why phenomena occur as we observe them. The latter – which are explicitly described as the products of intelligent agency oriented toward ends – are the ones that ought to constitute the legitimate object of inquiry for the rational investigator of nature, who “is a lover of understanding and knowledge”, and therefore “must of necessity pursue as primary causes those that belong to intelligent nature, and as secondary all those belonging to things that are moved by others and that set still others in motion by necessity”. Accordingly, he should attempt to “describe both types of causes, distinguishing those which possess understanding and thus fashion what is beautiful and good, from those which, when deserted by intelligence, produce only haphazard and disorderly effects every time.”¹⁹

For Plato, it is not only phenomena in the living world that require explanation in terms of final causality; those belonging to the inorganic domain likewise should be interpreted in terms of purposes, values, and ends. According to Michael Ruse,

¹⁷ *Timaeus*, 30a (trans. by Donald J. Zeyl).

¹⁸ *Timaeus*, 28a-29b.

¹⁹ *Timaeus*, 46d-e.

Plato's argument proceeds in two steps. In the first, he seeks to demonstrate that there are certain aspects of the world that cannot be understood as effects of the mere play of chance; in the second, he moves from this apparently irreducible complexity of the world toward a teleological explanation of this distinctive feature of its nature.²⁰

As Ruse reminds us, the first step of the Platonic argument has been referred to as the 'argument to design / order / complexity', since it takes as its starting point the observation that the world presents a certain appearance and seeks to demonstrate that it exhibits an ordered character or, as some authors say, an 'organized complexity', 'apparent organized complexity', or 'adaptive complexity' which cannot be the product of chance, but must rather be the outcome of a design, a fact that itself demands explanation. The second step is known as the 'argument from design', and leads us from the complex, organized character of the world toward an explanation of that character. Ruse, however, regards the reasoning involved in this step as "almost trivial", since it is obvious that, if we grant the genuine existence of a design underlying the world, it necessarily follows that there must exist a designer (though the precise nature of that designer is a separate matter). In his view, the real difficulties begin precisely at this point. Does the complexity exhibited by the natural world necessarily entail that it must be grounded in a design? Or, conversely, is it even so obvious that the world exhibits complexity? Plato appears to have given scant attention to these questions, for his primary concern was to argue from the (contestable) existence of a design that there must be a transcendent, intelligent designer who is its author, prescribing to the world a determinate end and thereby rendering its teleology an external one.²¹

It is precisely this characteristic of Platonic theory that was taken up most emphatically by the modern (pre-Darwinian) and contemporary (post-Darwinian) proponents of what is known as the 'intelligent design' hypothesis, among whom the English theologian William Paley (1743–1805) is the most celebrated figure.

Paley's teleological argument, set forth in his book on *Natural Theology* (1802)²², and subsequently adopted by the majority of proponents of intelligent design theory, is one that appears deceptively simple, grounded as it is in the idea of the complexity of the world. It rests upon a reasoning by analogy, i.e. an analogy between living beings and the products of human technology. If we were to encounter a stone lying upon the ground during a casual walk through a garden, we would find it perfectly natural that it should be there, and we would not trouble ourselves with questions concerning how it came to occupy that particular place; whereas, if under identical circumstances we were to come upon a watch, it would be entirely natural to suppose that it could not have come to be there by chance, as a product

²⁰ M. Ruse, *op. cit.*, pp. 15–16.

²¹ *Ibidem*, pp. 16–17.

²² Cf. W. Paley, *Natural Theology, or Evidence of the Existence and Attributes of the Deity, Collected from the Appearances of Nature*, Oxford, Oxford University Press, 2006.

of the random play of hazard and the blind action of natural forces. The existence of the watch is far more satisfactorily accounted for by the hypothesis of an intelligent designer who conceived and built it with a view to the attainment of its purpose – that of indicating the precise time – such that

the inference, we think, is inevitable; that the watch must have had a maker; that there must have existed, at some time and at some place or other, an artificer or artificers who formed it for the purpose which we find it actually to answer; who comprehended its construction, and designed its use.²³

By analogy with the watch, Paley argues in a Platonic manner that the existence of the living beings, which exhibit a degree of complexity vastly exceeding that of any timepiece, compel with still greater force the conclusion that there must exist an artificer who designed and brought them into being with a view to the attainment of the ends proper to them.

This way of reasoning, which concludes that there must exist a maker of the watch, given that the watch exists, or an intelligent designer, inasmuch as living beings display a high degree of design complexity, has been named by André Ariew an ‘inference to the best explanation’ (IBE): the truth of a hypothesis is inferred from the fact that it accounts for the phenomena in question more satisfactorily than any rival hypothesis. In this sense, Paley holds that the hypothesis of the existence of a Creator explains the complexity and apparent design of living beings more adequately than any alternative hypothesis.²⁴

IBE inference differs from inductive arguments in that, whereas in the case of induction the force of the reasoning derives from the number and quality of observed instantiations of the phenomenon to be explained, in the case of IBE it is permissible to infer the existence of objects that are unobserved and unobservable. Having presented his argument, Paley enumerates eight conditions that might be invoked as circumstances capable of invalidating it, yet which in reality cannot constitute serious objections to the inference. Under the first item of his list, he asserts that the conclusion would not be weakened by the fact that “we had never seen a watch made; that we had never known an artist capable of making one; that we were altogether incapable of executing such a piece of workmanship ourselves, or of understanding in what manner it was performed.”²⁵

Another objection that Paley seeks to forestall is the one according to which the existence of an intelligent designer of the watch or, by analogy, of living organisms would not be necessary if we could identify a watch endowed with the capacity for self-replication. He enquires what the implications would be of supposing that “the person, who found the watch, should, after some time, discover, that, in

²³ *Ibidem*, p. 8.

²⁴ A. Ariew, *op. cit.*, p. 163.

²⁵ W. Paley, *loc cit.*

addition to all the properties which he had hitherto observed in it, it possessed the unexpected property of producing, in the course of its movement, another watch like itself; (the thing is conceivable)²⁶.

According to Ariew, far from constituting a counter-argument for Paley's reasoning, this hypothesis serves him only to reinforce the IBE inference, and does so on three grounds. First, it underscores once again that the force of the inference is independent of whether or not instantiations of the phenomenon have been observed, that is, whether or not anyone has witnessed a watchmaker in the act of crafting watches. Second, the discovery of a watch possessed of the capacity for self-replication would lend still stronger support to the conclusion that an intelligent designer exists, while further undermining the hypothesis that a watch might be the product of the blind operation of natural forces. For if the probability that the interplay of natural forces could produce a watch by chance is already vanishingly small, the probability that those same forces could produce one that is additionally equipped with the capacity for self-replication is smaller still: the more intricate the composition and functioning of an object, the more compelling the evidence for the existence of an intelligent designer. Third, the greater the complexity of the watch design, the more formidable the undertaking of constructing it, and the deeper our admiration for its maker. If the construction of an ordinary watch is, in principle, an enterprise within the reach of anyone who acquires sufficient expertise in the field, the fashioning of one endowed with self-replicating capacity would lie altogether beyond human ability, which affords us some measure of the extraordinary powers of the divine watchmaker who is capable of bringing such a thing into existence. The more complex the design, the more accomplished the designer must be.²⁷

It is upon these last two considerations that Paley constructs his teleological argument, drawing an analogy between mechanisms and living organisms, on the grounds that "for every indication of contrivance, every manifestation of design, which existed in the watch, exists in the works of nature; with the difference, on the side of nature, of being greater and more, and that in a degree which exceeds all computation."²⁸ In the remainder of his work, he endeavours to prove, by means of a wealth of examples, that organs, tissues, organisms, and ecosystems are vastly more complex than clockwork mechanisms, even those hypothetically endowed with self-replicating capacity, and therefore it follows that we are compelled to accept the IBE inference concluding in favour of the existence of an intelligent and benevolent designer of living beings.

Although, at the time of its formulation, Paley's argument appears to have enjoyed considerable fame, its success depends, as in the case of any IBE argument, upon the relative success of competing hypotheses, a circumstance that constitutes the fundamental limitation of this mode of inference. Should a superior competing

²⁶ *Ibidem*, p. 11.

²⁷ A. Ariew, *op. cit.*, pp. 163 sq.

²⁸ W. Paley, *op. cit.*, p. 16.

hypothesis emerge, as was the case when Darwin advanced the theory of evolution by natural selection, then Paley's inference, according to which an intelligent designer must exist (setting aside the further demonstration still required that this designer is one and the same as the transcendent creator-deity of Christianity), together with all arguments of a similar character, becomes untenable as an IBE argument.

The second group of teleological theories comprises those grounded in the idea of internal causality, whose source and model is to be found in Aristotelian philosophy. As a disciple of Plato, Aristotle inherited a great many ideas from his predecessor; yet with respect to teleological thought, he introduces a fundamentally new manner of approaching the problem. This novelty has its origins in the Aristotelian theory of the four *aitia* – a term rendered only approximately by the word 'causes' – and in particular in the discussion of the fourth of these, the so-called 'final cause', or *telos* of a thing: its reason for being, the answer to the question 'for what purpose does this thing exist?'. As Aristotle himself explains: "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)"²⁹.

From Plato, Aristotle inherits the idea of an analogy between natural phenomena and the works of craftsmen and artists, that we have already encountered in Paley's argument. In the book on the *Parts of Animals*, he compares the characteristics of living organisms to those of the products of a carpenter's labour, pieces of furniture, even though "in the works of nature the good and that for the sake of which is still more dominant than in works of art."³⁰ In either case, it is not sufficient to enquire solely into the material causes of things; the *telos* must always be kept in view. Just as a carpenter cannot satisfactorily account for the form of a piece of furniture merely by describing how he employed his tools to produce it, but must instead make reference to the function the object is to fulfil, to its purpose, so too the student of nature is obliged to incorporate into his explanation the functions that the various parts of an animal's body are meant to perform, that is to say, their purpose or finality.³¹

Although he employs, like his master, the analogy with the craftsman's art, Aristotle does not intend to infer from it the existence of a Demiurge as the author of the design of living beings and of the world as a whole. As Michael Ruse points out, in Aristotle's case the argument proceeds from complexity rather than from design, and teleology carries a naturalistic meaning: the final end is less the product

²⁹ *Physics*, II, 3, 194b, 34–35, trans. by R.P. Hardie and R.K. Gaye, in *The Complete Works of Aristotle*, The Revised Oxford Translation, edited by Jonathan Barnes, Vol. 1, Princeton, NJ / Chichester, Princeton University Press, 1995. All subsequent quotes from Aristotle are from this edition.

³⁰ *Parts of Animals*, I, 1, 639b, 19–21, trans. by W. Ogle.

³¹ *Ibidem*, I, 1, 641a, 7–17.

of a Demiurge's agency than an aspect of the way nature itself operates. For Aristotle, the final cause – or the good – consists in the proper functioning and well-being of the individual organism, and it is for the sake of this that organs and their specific functions exist. Their value lies in the manner in which they serve this end; it is internal and constitutive of beings and things, belonging to their very ontology, rather than – as in Plato – externally imposed by an intelligent designer pursuing ends of his own. This is all the more notable given that Aristotle appears primarily concerned with teleology at the level of living organisms, and far less with any teleology that might be discerned at the level of the Universe as a whole, as is the case with Plato: it is not universal teleology, but that of individuals, that holds the Stagirite's attention.³² In all likelihood, this is because for Aristotle the Universe is eternal, so that there is no need to inquire into how or why it came to exist and to be organized as we observe it; whereas for his master the world has a beginning, a fact that raises the question of its creation and of the purpose for which it was created, that is, precisely the question of universal teleology.

As Ariew points out, two senses of biological teleology may be distinguished in Aristotle: the formal and the functional. In the case of formal teleology, the *telos* is an inherent property of the processes of biological development, explaining developmental phenomena by reference to the biological needs of the organism. In the second sense, that of functional teleology, the *telos* derives from the relationship between the various parts of an organism and their respective functions, considered from the perspective of the organism's overall well-being.³³ He further holds that in Aristotle's *Physics* we may distinguish three types of teleological argument concerning living beings: (1) the teleological argument from flourishing, (2) the teleological argument from hypothetical necessity, and (3) the teleological argument from pattern.³⁴

(1) The teleological argument from flourishing is a functional one. Aristotle asks whether materialist explanations grounded in the laws of nature, which presuppose material causation, might not be deemed insufficient to account for certain anatomical arrangements that ensure the survival and well-being of living organisms. He observes that materialists are frequently compelled to invoke chance in order to explain the difference between a well-suited arrangement and a less successful one. Is it reasonable, for instance, to suppose that mere accident determines the dental arrangement of carnivores, with sharp teeth at the front and flat ones at the back? Aristotle asks:

Why then should it not be the same with the parts in nature, e.g. that our teeth should come up of necessity – the front teeth sharp, fitted for tearing, the molars broad and useful for grinding down the food – since they did not arise for this end, but it was merely a coincident result; and so with all other parts in

³² M. Ruse, *op. cit.*, pp. 17–19.

³³ A. Ariew, *op. cit.*, pp. 173–174.

³⁴ *Ibidem*, pp. 174–176.

which we suppose that there is purpose? Wherever then all the parts came about just what they would have been if they had come to be for an end, such things survived, being organized spontaneously in a fitting way; whereas those which grew otherwise perished and continue to perish.³⁵

In other words, arrangements that prove to be fitting are ‘adaptive’, that is, they have appeared for the survival and well-being of the organism and of the species.

(2) The teleological argument from hypothetical necessity appears in *Physics*, Book II, Chapter 9, where, in discussing necessity, Aristotle states that “What is necessary then, is necessary on a hypothesis, not as an end. Necessity is in the matter, while that for the sake of which is in the definition”³⁶, meaning that the existence of necessity must be admitted by hypothesis, but not as an end, a *telos*, for necessity appears in the process, while the final cause is present in our account of the process. Therefore, it must be admitted that what in nature is understood as being necessary

is plainly what we call by the name of matter, and the changes in it. Both causes must be stated by the student of nature, but especially the end; for that is the cause of the matter, not vice versa; and the end is that for the sake of which, and the principle starts from the definition or essence.³⁷

Therefore, hypothetical necessity is that form of constraint which bears upon the matter of which an organ is composed, given the end that organ must fulfil, from the perspective of both functional and formal teleology. The argument from hypothetical necessity is also directed against materialist explanations of complexity: material causation and the play of chance are insufficient for a proper understanding of how multiple necessary conditions for the proper functioning of an organ come to be simultaneously realized, and we must therefore consider that all material elements happen to be in the right place at the right time for the sake of bringing about the survival and well-being of the living organism.³⁸

(3) In the teleological argument from pattern, Aristotle observes that both in purposive human action and in the developmental processes of living beings, certain patterns may be discerned: patterns in the arrangement of parts, and patterns describing the sequential order of the stages of a process. He infers teleology from the very existence of these regularities, whether in the arrangement of parts or in the succession of stages within a process. Such patterns are visible in the construction of houses, in the growth of leaves to shelter fruit with their shade, in roots descending

³⁵ *Physics*, II, 9, 198b, 23–33.

³⁶ *Physics*, II, 9, 200a, 13–14.

³⁷ *Physics*, II, 9, 200a, 31–34.

³⁸ Cf. Ariew, *op. cit.*, p. 175.

into the depths of the soil to nourish the plant, in nests built by birds for the laying of their eggs, or in the web woven by spiders:

If then it is both by nature and for an end that the swallow makes its nest and the spider its web, and plants grow leaves for the sake of the fruit and send their roots down (not up) for the sake of nourishment, it is plain that this kind of cause is operative in things which come to be and are by nature. And since nature is twofold, the matter and the form, of which the latter is the end, and since all the rest is for the sake of the end, the form must be the cause in the sense of that for the sake of which.³⁹

These were, in broad outline, the two main versions of teleological thinking in pre-Darwinian thought. In the view of the biologist Ernst Mayr, no other *Weltanschauung* has exercised a greater influence on the biological sciences than that grounded in teleological thinking. In one form or another, it constituted one of the few fundamental ideas concerning the living world and the Universe that Western culture developed in a substantial way, and it was the dominant paradigm of biological thought before Darwin.⁴⁰

Thomas Henry Huxley, one of the earliest and most enthusiastic advocates of Darwin's theory of evolution by natural selection, summarizes the 'teleological argument' as it was employed in pre-Darwinian biology in the following terms: "an organ or organism (A) is precisely fitted to perform a function or purpose (B); therefore it was specially constructed to perform that function."⁴¹ In the very same context, however, we also learn something about his own understanding of biological teleology, and about the reason why he was so immediately enthused upon reading the book Darwin published in 1859: "That which struck the present writer most forcibly on his first perusal of the *Origin of Species* was the conviction that Teleology, as commonly understood, had received its deathblow at Mr. Darwin's hands."⁴²

Under these circumstances, we may naturally ask what Darwin's own position was with regard to teleological thinking in biology, and what influence his ideas exercised on this subject.

Darwin's part in the debate over teleology is very concisely explained by Daniel Dennett as follows: "One of Darwin's most fundamental contributions is showing us a new way to make sense of 'why' questions. Like it or not, Darwin's idea offers one way – a clear, cogent, astonishingly versatile way – of dissolving

³⁹ *Physics*, II, 8, 199a, 26–33.

⁴⁰ Cf. Ernst Mayr, "The Idea of Teleology", *Journal of the History of Ideas*, Vol. 53, No. 1 (Jan.–Mar., 1992), pp. 117–135.

⁴¹ Thomas H. Huxley, *Lay Sermons, Addresses and Reviews*, New York, D. Appleton and Company, 1893, p. 301.

⁴² *Loc. cit.*

these old conundrums.”⁴³ This new way of thinking consists in replacing the very question: rather than answering ‘why...?’ questions with responses that begin with ‘because...’, it proposes to replace them with questions that begin with ‘how...?’, to be answered in a historical manner, “by telling a story about how it came to be that God created us and the rest of the universe, without dwelling overmuch on just why God might want to have done that.”⁴⁴ More precisely, Darwin drew on the idea of evolution by natural selection to show how species have been modified over time through the operation of a mechanism capable of producing these effects without the intervention of any final cause. He succeeded in describing how a blind force, rather than an intelligent designer, was capable of producing adaptations and morphological and functional modifications in living species. In this situation, Dennett argues, the challenge to the theoretical imagination of the natural philosopher has been reversed: “given all the telltale signs of the historical process that Darwin uncovered – all the brush-marks of the artist, you might say – could anyone imagine how any process *other* than natural selection could have produced all these effects?”⁴⁵

In order to appreciate the importance of Darwin’s idea and the inversion of thinking that he proposes, it is necessary to understand this novel way in which he conceives of the relationship between order and design. For Aristotle, order is regularity, identifiable in the patterns we have already discussed, while design is the *telos* – that is, the exploitation of order in view of the attainment of an end, as is evident in any artefact. Darwin, however, proposes that we observe the historical process in which, given sufficient time for the mechanism of evolution by natural selection to exert its effects, purposeless and unintentional regularity gradually gives rise to products of evolution that exhibit not merely regularity but design adapted to an end. Before the emergence of Darwin’s theory, the distinction between order and design was not altogether clear, since both were held, in the spirit of Paley’s thinking, to emanate from the divine will; Darwin, however, succeeded in reducing teleology to non-teleology, showing how apparent design can arise from the very order of the laws of physics and how, ultimately, order can emerge from chaos without any need for the intervention of a supernatural rational agent, a designer who imposes teleology upon the world.⁴⁶

How exactly does Darwin achieve this reversal of perspective? It was noted earlier that two general modes of teleological thinking may be distinguished: one in which the *telos* is external – characteristic of Plato and Paley – and one in which finality is immanent, as in Aristotle. The present context concerns the first of these; and we have seen, in the case of Paley, that the force of his inference to the best

⁴³ Daniel C. Dennett, *Darwin’s Dangerous Idea. Evolution and the Meanings of Life*, London, Penguin Books, 1996, p. 25.

⁴⁴ *Ibidem*, p. 24.

⁴⁵ *Ibidem*, p. 47.

⁴⁶ *Ibidem*, pp. 64–65.

explanation depends on the strength of the competing hypotheses. It is precisely here that the importance of Darwin's contribution becomes apparent: he succeeded in producing a competing, naturalistic hypothesis – one in which it is not pure chance that explains the existence and functioning of all living organisms. Darwin's explanation is in fact composed of two complementary ideas. The first can be found in his celebrated metaphor of the tree of life, which holds that all species of living organisms are related to one another by virtue of sharing a common ancestor, an idea that offers an alternative to the hypothesis according to which species are the immutable and eternal products of divine acts of creation. The second is the idea of evolution by natural selection, according to which organisms possess heredity, variability, and adaptation. Individuals possessing traits that confer an advantage in the competition for the limited resources of the environment in which they live will survive and reproduce at the expense of those that lack such traits. If this process is repeated over a sufficient span of time, any given species will undergo spectacular morphological and functional modification over time.⁴⁷

Taken together, these two ideas yield an IBE hypothesis that rivals both the materialist explanations of the existence of complex adaptations in living beings and the intelligent Creator hypothesis advanced by Paley. The idea of the tree of life proves to be a stronger hypothesis than Paley's not because living beings display a perfection of design that testifies to the existence of an intelligent designer, but precisely because they are imperfect – because the solutions arrived at through the processes of evolution are imperfect, strange, and bizarre. Living beings are far from perfect creations, and one may reasonably ask why a perfect, omnipotent, and omniscient designer would have chosen precisely these odd, inefficient, and imperfect solutions rather than ones vastly superior. The biologist Stephen Jay Gould points out that *On the Origin of Species* contains an impressive collection of examples of such imperfections, which furnish abundant evidence in support of the view that “ideal design is a lousy argument for evolution, for it mimics the postulated action of an omnipotent creator. Odd arrangements and funny solutions are the proof of evolution-paths that a sensible God would never tread but that a natural process, constrained by history, follows perforce.”⁴⁸ No scientist or natural philosopher, believes Gould, understood this truth better than Darwin did.

With regard to the second type of teleological thinking, in which the *telos* is immanent, we have seen that Aristotle considers such explanation necessary in two situations: to account for functional arrangements, and to understand the developmental patterns common to members of a species. Ariew argues that Darwin's theory of evolution by natural selection offers an alternative explanation to the Aristotelian

⁴⁷ A. Ariew, *op. cit.*, pp. 168–169.

⁴⁸ Stephen Jay Gould, *The Panda's Thumb: More Reflections on Natural History*, New York / London, W.W. Norton and Company, 1980, pp. 20–21.

teleological hypothesis of functional arrangements.⁴⁹ According to the argument from hypothetical necessity, for Aristotle the explanation of a structure or functional arrangement lies in its finality, that is, matter exists in a given form in accordance with the end it must serve: the end takes precedence over matter, and pre-exists it. For Darwin, there is a sharp distinction between the internal conditions that determine variability and the external conditions that bring about the selection of useful adaptations, such that the explanation of the growth and development of an organism is entirely independent of the explanation of how an adaptation comes to be selected. When explaining how a species becomes so well adapted to its environment, Darwin has no need to explain how variations arise, since these pre-exist selection. Moreover, whereas for Aristotle the function an organ must perform determines the material of which it is composed, for Darwin the relationship is reversed: it is matter that determines function. The variations in the traits of individuals are determined by causes that pre-exist their selection.⁵⁰

Therefore, in the spirit of Huxley's view, contemporary scholars are generally of the opinion that the theory of evolution by natural selection succeeded in naturalizing teleology. This, Ariew argues, is only partially true, for there are elements of classical teleology that Darwin retains, such as the explanation of morphological and functional traits in terms of their utility (though without any further appeal to a *telos* that governs the development of the individual, as in Aristotle). Darwinian theory does indeed offer an alternative to the classical teleological arguments, both Platonic and Aristotelian, that proceed from functional arrangements. On the other hand, once Darwin establishes a sharp separation between the internal conditions of individual development and the external conditions that determine whether a given trait will be selected or not, it follows that it should come as no surprise that he – lacking as he did the genetic explanation of heredity and variability – says nothing about the mechanisms that govern development, and thus leaves this type of teleological argument essentially untouched.⁵¹

It may accordingly be said that Darwin, by virtue of his new theory, refuted both Plato's argument and Paley's, but only partially those of Aristotle, so that Huxley's claim holds true only to a certain extent. We might therefore expect that in the period following the publication of *On the Origin of Species*, teleological thinking would steadily lose ground, giving way to naturalistic explanations, and so it did, to a degree, the notable exception being the contemporary resurgence of 'intelligent design theory', which has been gaining increasing traction and popularity especially in the religious circles from the United States. It represents nothing other than a revival of Paley's argument, inferring the existence of an intelligent designer from the fact that the living world exhibits a complexity too great and too 'irreducible'

⁴⁹ A. Ariew, *op. cit.*, p. 177.

⁵⁰ *Ibidem*, p. 178.

⁵¹ *Ibidem*, pp. 179–180.

to be explained by the play of nature's blind forces. The essential difference is that Paley claimed to demonstrate that the intelligent designer is the Christian God, whereas contemporary proponents of this theory are more reticent on the question concerning his attributes.

