

## TELEOLOGY PAST AND PRESENT

by Jeffrey Wattles

*Abstract.* Current teleology in Western biology, philosophy, and theology draws on resources from four main Western philosophers. (1) Plato's *Timaeus* shows how to interpret the universe as the handiwork of a purposive Creator who subordinates secondary, necessary, causes to primary, intelligent, causes. (2) Aristotle's *Physics* sets forth purpose as implicit in the nature of things. Purposes of different sorts inhere in different types of being, and everything has a natural function. Living things grow to actualize the potentials of the goal whose principle they bear within themselves. (3) Kant's *Critique of Judgment* denies that purpose is anything that human beings can know, strictly speaking. Nevertheless, purpose is a concept we must use to make sense of biological systems. (4) Hegel's *Philosophy of Nature* articulates organic systems as dialectically including and transcending mechanical and chemical systems. Teleological themes persist, in different ways, in contemporary discussions; I consider two lines of criticism of traditional teleology—by Richard Dawkins and Stephen Jay Gould—and one line that continues traditional teleology in an updated way—by Holmes Rolston, III.

*Keywords:* Aristotle; design; G. W. F. Hegel; Immanuel Kant; Plato; purpose; Holmes Rolston, III; teleology.

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Teleology, by definition, offers an account of purposive or goal-directed activity: *telos* means end or goal. Teleology is linked with many concepts in the current discussion of the relations between science and religion, including design (as contrasted with chance and necessity) and the anthropic principle (put forth as independent from the design argument for the existence of God). Indeed, the very word *organ* means tool—a teleological notion.

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Ever since Galileo banished final causes from explanation in physics and Darwin proposed a way to explain the adaptation of parts of organisms to one another and the adaptation of organisms to their environment without appeal to a Designer, thinkers have wondered what place, if any, remains for teleology as a principle of the philosophic interpretation of nature. Reductionists construct ever more sophisticated interpretations of material systems whose functions mimic the operations of organisms that others call purposive. Many contemporary biologists and philosophers of biology, including Jacques Monod and Richard Dawkins, turn to physics, chemistry, and natural selection to understand the causes of things; when they use teleological language they make it clear that they do not mean to imply anything vitalistic or supernatural behind the operations in question. Teleology, they say, is just a convenient shorthand, an anthropomorphic projection that remains rhetorically useful. Nevertheless, those who continue to believe in a Creator can hardly do without the thought that creation is purposive activity. "He established the earth; he did not create it a chaos; he formed it to be inhabited" (Isaiah 45:18 NRSV).

Does teleology have enduring value for our understanding of nature? The question is a philosophic one, and our answers to it have roots in the Western philosophic heritage, whose neglected resources, I propose, offer clarity for such a discussion. As a theist, I find many lessons in the history of teleology as developed by Plato (427–347 B.C.E.), Aristotle (384–322 B.C.E.), Immanuel Kant (1724–1804), and G. W. F. Hegel (1770–1831). Because teleology is interconnected with many other themes, its systematic context must be described a bit for each philosopher.

#### PLATO'S PORTRAIT OF PURPOSIVE CREATION

In his dialogue the *Phaedo* Plato portrays Socrates as giving an intellectual autobiography, telling of his search to understand the causes of things (Plato 2000a, 96a–100b). As a youth Socrates first tries to explain everything, including thinking and knowledge, in terms of material causes, but he cannot complete the project. Next he tries to explain everything, including facts of astronomy, in teleological terms as the product of divine, purposive Mind arranging all things for the best. He gives up on that venture, because its pioneer, Anaxagoras, after launching the project of a teleological account, shifted to a mechanistic account. Twice disillusioned, Socrates reports then discovering the forms, the intelligible essences of things, as the causes most fitting for philosophic inquiry.

Having abandoned teleology as a comprehensive principle of understanding, Socrates nevertheless sustains teleological explanation by appeal to purposive mind in his own case. He considers two explanations for his sitting there in prison. (The Athenian jury had found him guilty of atheism and corrupting the youth, and Socrates had refused to escape from

prison, which would have been a descent to the level of merely returning evil for evil.) Socrates says that it would be a mistake to explain his sitting there by appealing to bones and sinews. The mechanical explanation fails to “distinguish the real cause from that without which the cause would not be able to act as a cause” (2000a, 99b). The real cause is his ethical decision not to escape from prison.<sup>1</sup>

To develop the teleological cosmology that the young Socrates had failed to find, Plato would eventually write the *Timaeus*. In the dialogue bearing his name, Timaeus is the character who presents as “a likely story” (*mythos*), not as knowledge, the earliest well-developed, teleological, cosmological vision, a work whose influence persisted through the Middle Ages and continues today.<sup>2</sup> In a nutshell, it is a story of a Creator who ventures to replicate, in time and space, an image of eternal, heavenly patterns: “Time is the moving shadow of eternity.”<sup>3</sup>

There are three main features of the account. First, the order, beauty, and goodness manifest in the cosmos result from divinely purposive, creative acts.<sup>4</sup> Second, mechanism (grounded in the geometric structure of the elements) is acknowledged, articulated, and placed within a wider teleological context of primary and secondary causes.<sup>5</sup> Third, the goal of the universe of time and space is to approximate the realm of eternal and perfect patterns.

Timaeus introduces the Creator with a kind of cosmological argument: “Everything that comes to be must of necessity come to be by the agency of some cause, for it is impossible for anything to come to be without a cause” (2000b, 28a). Since the cosmos is perceptible, and since perceptible things come to be, there must be a cause of the genesis of the cosmos. The Creator is the Demiurge, the Craftsman, “the maker and father of all” (28c). He wants everything to be as much as possible like himself—to be good. Thus, our goal is to become like God. The Creator works on a preexistent chaos to impart order, and he looks to an eternal pattern, the Living Being, so that the created cosmos becomes a living whole.<sup>6</sup>

Creation is accomplished in two phases. The principal Creator performs the first phase, in the course of which subordinate divinities are created; they in turn are charged with completing the cosmos. To posit creators of different orders is part of Plato’s theodicy. The works of subordinate gods are less perfect, but imperfection cannot be attributed to the principal Creator. The Creator, moreover, retains a prime function in fashioning mortals: it is he who sends the spark of divinity into the soul. Intellect (*nous*), the most godlike aspect within each of us, is given directly by the principal Creator. The secondary divinities fashion the rest of the creature that we are. In order for divine intellect to be conjoined to matter, soul (*psyche*) must be fashioned to function as an intermediary.

The distinction between primary and secondary causes is advanced as Timaeus bewails the popular tendency to take material factors as true causes.

“Anyone who is a lover of understanding and knowledge 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” (46d–e). Note that primary causation is attributed not only to the Creator but also to every intelligent agent. Timaeus accords a great importance to necessary causes.

Although [the Craftsman] did make use of the relevant auxiliary causes, it was he himself who gave their fair design to all that comes to be. That is why we must distinguish two forms of cause, the divine and the necessary. First, the divine, for which we must search in all things if we are to gain a life of happiness to the extent that our nature allows, and second, the necessary, for which we must search for the sake of the divine. Our reason is that without the necessary, those other objects, about which we are serious, cannot on their own be discerned, and hence cannot be comprehended or partaken of in any other way. (68e–69a)

Timaeus goes to extraordinary lengths to show that a detailed mathematical reconstruction of, for example, the features of the human body shows the divine providence. It was crucial that Plato include some such account, because Democritus (fl. 420 B.C.E.) had already proposed a geometrical account of matter to explain everything deterministically. Plato shows that he could develop a geometric account more extensive than that of Democritus while continuing to display the wisdom of the Creator in fashioning our world and ourselves.

Timaeus presents the Creator as looking to eternal patterns (*paradeigmata*, paradigms, archetypes) as he launched the creative adventure into time and space. What is crucial in this vision is that there is a real and eternal heaven, distinct from the visible heavens, whose lovely lights and seeming everlasting perfection of circular movement inspired wonder in the ancients as they gazed into the night sky.<sup>7</sup> Though we mortals cannot observe the heavenly patterns, we can have essential knowledge of them, because their essences (forms) are the same ones that we discern in their imperfect approximations on earth.

Plato’s gift, in sum, is to offer a full cosmology with integrated accounts of the geometric structures of matter, the forms, the heavenly patterns, and the purposive creation of God. He shows the possibility of accepting mechanical accounts and placing them in a wider teleological perspective. His notion of form persists, with modification, in current notions of information (a basis of intelligibility) and species (a pattern conserved through reproduction).<sup>8</sup> His notion of heaven has analogues in nearly every world religion; his cosmology of creative purpose, assimilated to Jewish theology by Philo of Alexandria, becomes a classical model for Jewish, Christian, and Muslim cosmologies. Briefly, Plato’s teleology proposes that seeking to appreciate the purpose of the Creator is the philosophic key that leads beyond mathematical materialism to unlock a vision of what is eternal. Put in a more contemporary way, every structure that science discovers may be philosophically interpreted as serving the Creator’s purpose.

## ARISTOTLE'S PHILOSOPHICAL SCIENCE OF ENDS IN NATURE

The first big step away from Plato's Creator-centered teleology is Aristotle's concept of nature as inherently purposive. Aristotle's Prime Mover or First Cause is not a creator and has no purposes for the natural order.<sup>9</sup> Aristotle posits directedness toward ends as inherent in nature: "Nature is a cause that operates for a purpose" (Aristotle 1984, *Physics* II.8, 199b32). Aristotle distinguishes artifacts, which serve ends external to themselves, from natural things, whose ends are internal. "Those things are natural which, by a continuous movement originated from an internal principle [*arche*, beginning, foundation], arrive at some end: the same end is not reached from every principle; nor any chance end, but always the tendency in each is towards the same end, if there is no impediment" (Aristotle 1984, *Physics* II.8, 199b15–18).

Aristotle's teleology relies on a threefold classification of events: those that happen by chance, those that happen of necessity, and those that usually happen. His intuition is clear: If things always happen a certain way, it is not just by chance. If things usually happen a certain way, that is not by chance, either. For Aristotle, these last two classes are in and of themselves evidence of nature acting for the sake of something: "Our first presupposition must be that in nature nothing acts on, or is acted on by, any other thing at random" (Aristotle 1984, *Physics* I.5, 188a32).

Even things that happen by chance do not occur wildly, for no reason at all. Under some description, chance events occur in an orderly way. For example, the cycle of evaporation of water and then cooling, resulting in precipitation, is necessary. In southwest India, rain is usual during the monsoon season. But it is a matter of chance whether ash from a volcano accompanies the rain. It is neither necessary nor usual that the monsoon rains bring ash to the soil. Thus, a given cause has its proper effects and its accidental effects (due to atypical features). There is, of course, a causal account available to explain the presence of ash. That there is causal necessity behind what Aristotle identifies as chance will seem a concession to a mechanist such as Democritus, for whom "chance and necessity" are sufficient to explain all things, making teleology obsolete along with religion.<sup>10</sup> For Aristotle, however, necessity never comes about merely by chance; it indicates a process for, or toward, an end. Thus, *mechanical causation is not an alternative to teleological explanation but requires it*.

Aristotle's intuition is that what is necessary or usual is not by chance—it does not just happen. Like Plato, Aristotle holds that the perfect constancy of the circular motion of the heavens gives evidence of purpose far more than do the inconsistently ordered living beings here below.

Everything that nature makes is for the sake of something. For just as art is present in the products of art, so in the things themselves it is apparent that, just as craft is present in artifacts, so also in [natural] things there is another cause and

principle of this sort, derived . . . from the whole universe. Hence it is more plausible to suppose that the heaven has come to be by such a cause (if indeed it has come to be at all) and remains in being because of it, than to suppose this about mortal animals. For order and definiteness are much more plainly manifest in the celestial bodies than in our frame. (Aristotle 1984, *De Partibus Animalium* I.1 641b13–20)

We may wonder what regularities Aristotle would choose today as the most evident manifestations of order. Today, Aristotle's intuition that what is usual does not come about merely by chance would accommodate the fact of anomalous births resulting from a chance accident in the replicating of DNA strands. His view also accommodates the fact that we have only statistical laws at the quantum-mechanical level. He would find teleology confirmed in the fact that the whirling uncertainties of the microworld result in the dependable objects of our daily experience.

Aristotle sees all change as bringing potentials into actuality. In organic development from acorn to mature tree, the oak becomes fully *what it is* only at the completion of its growth. When we say what something is, we name it in terms of its *form*. Because the form is the goal toward which the growth was directed, the form is also the *telos*, or final cause. For these potentials to be actualized requires the right kind of *matter*. Moreover, the seed comes from something, from a mature tree, its *efficient cause*. Thus, when we inquire into something, we can raise four basic questions, and a full account mentions most or all of these factors. As factors, they are called *causes*: the material, formal, efficient, and final cause.

Aristotle clarifies his teleology by moving back and forth between talk of artifacts and talk of natural objects. He speaks of building a house: "Though the wall does not come to be *without* these [stones and foundations and earth], it is not *due* to these, except as its material cause: it comes to be for the sake of sheltering and guarding certain things" (Aristotle 1984, *Physics* II.9 201.5–8). Human beings, of course, act purposively. Led by desire shaped by deliberation, we act for ends that are conscious. In our natural surroundings Aristotle also finds goal-directed motion in the elements—earth, air, fire, and water. For example, the natural motion of fire is to rise toward its place above the earth, to the outermost sphere of the heavens. The natural place of earth, or earthy things as such, is the center of the earth. Because these elements have their tendencies in themselves, nature is a principle of change internal to things.

It is Aristotle's account of living things that has had the greatest influence on modern teleology. *Psyche* (soul) is what makes beings alive. Ensouled beings nourish themselves, grow and repair themselves, reproduce, and have awareness. More precisely, animals, not plants, have sensation, and human beings are distinguished by intellect. Performing such functions, living beings may be said to "move themselves." Their motions need not await the impact of an external force. The end of their activities

is, as it were, themselves. Their teleological character does not require that the “purpose” in question be conscious, an affair of deliberate intention.

Aristotle blazes the trail for later thinkers, including Monod and Dawkins, to speak of teleonomy and design without implying any higher conscious purpose or intention whatsoever behind the natural process. At the same time, Aristotle’s progress in articulating teleology gives theists a more adequate vocabulary in terms of which to acknowledge the differences between conscious teleology and the teleology implicit in organisms and ecosystems.

During the medieval period, Jewish, Christian, and Muslim philosophers, by reaffirming a Creator, reinstated what Aristotle had deleted and anchored teleology once again in divine purpose. At the time of Galileo a new cosmology began to emerge, positing the physical realm as autonomous, independent, and self-explanatory.<sup>11</sup>

Modern mechanism developed in two phases. Consistent with the intuition that purpose is implicit in whatever happens necessarily, seventeenth-century discoveries of mechanical principles and laws of nature were widely received as insights into the Creator’s dependable way of governance, his reliable habit of sustaining the universe. Then eighteenth-century minds began to interpret those very mechanisms as evidence that such laws are self-explanatory.<sup>12</sup> The revolt against theism, in association with the movement to establish science as independent from philosophy and theology, has in recent centuries tended to make teleology an unwelcome projection into the serious work of understanding nature.

#### KANT’S DIPLOMATIC PLACEMENT OF TELEOLOGY BETWEEN SCIENCE AND THEOLOGY

Kant argues in *The Critique of Pure Reason* ([1781] 1963) that our understanding (*Verstand*) achieves knowledge of the phenomena of space and time by applying the mind’s categories to the data of sensation. However, when we try to use reason (*Vernunft*) to apply categories to objects beyond our experience—for example, when we try to gain metaphysical knowledge of God or the soul’s immortality or the cosmos as a whole—we fall into incoherence. Examining opposing propositions about the cosmos, Kant shows severe difficulties with both thesis and antithesis: the universe must have a beginning in space and time, and the universe can have no beginning in space and time. According to Kant, such problems force us to admit that reason cannot fulfill its drive for metaphysical knowledge, knowledge of things in themselves apart from our human conditions of knowing. Because the proofs for the existence of God fail, rational theology collapses, and along with it go rational psychology and rational cosmology. These failures, however, do not leave reason totally in the dark as regards the realm of the unprovable. There are rational motives to posit

Ideas that cannot be proven but that can nevertheless guide the progress of a discipline. We can work with an Idea of God as an unconditioned Cause of nature, for example, even though science and philosophy do not let us *know* God. Kant never wholly rejected the faith of his Pietist Christian upbringing, and he spoke of “limiting reason to make room for faith” ([1781] 1963, 29).

In the *Critique of Judgment* ([1790] 1987) Kant turns to explore purposiveness as we may judge it to be involved in aesthetic experience, in organisms, in nature as a whole, in history, and in the mind of God. Judgment is neither the power of understanding that gains theoretical knowledge of nature through mechanical analysis nor the power of reason that grasps the unconditioned principles of moral reason. Judgment claims neither scientific necessity nor metaphysical insight. Regarding organisms, Kant’s central thesis is that, while we are scientifically required to pursue mechanical explanations as far as possible, the human mind cannot grasp living things without using the concept of purpose.

Regarding organisms, Kant synthesizes three aspects of his heritage. As the centerpiece of his philosophical biology, he maintains key features of Aristotle’s account of living beings. With Plato, he recognizes a subordinate role for mechanism. And without claiming philosophical knowledge of God, Kant sustains a theistic concept of God as a possibility and a postulate. Kant’s modern diplomatic instinct and his tactic of drawing distinctions to elaborate a systematic philosophy enable him to weave these diverse commitments together.

What is it about the organism that strikes Kant as irreducibly teleological? There are things that seem to him as though they could not possibly have arisen by blind chance and necessity. It is conceivable that a higher mind might be able to explain everything in terms of mechanical laws, but we cannot. A tree produces itself. It grows and maintains itself, assimilating from the environment what it needs. The organism is both cause and effect, both as species and as individual. There is mutual dependence of the parts; if one part is injured, it is repaired, or else other parts take over its function ([1790] 1987, 249–50). Because the parts produce each other and are *self-organizing*, organisms are not like artifacts (watches, for example). In organized beings, everything is both end and means (p. 255). For example, a leaf is a means for bringing energy from the sun to the rest of the plant, but it is an end of the productive stem or branch that puts out buds (p. 257). Even if there are parts that could be interpreted in mechanical terms, one must posit a teleological cause “that procures the appropriate matter, that modifies it and forms it and deposits it in the pertinent location.” We cannot construct an organism out of dissected remains or out of the materials it uses as nourishment.

Do these reflections enable us to assert that we *know* that living beings *are* teleological systems? No. Kant says that even though we are prompted



to think teleologically about, say, “the structure of birds regarding how their bones are hollow, how their wings are positioned to produce motion and their tails to permit steering, and so on,” looking at nature simply as “the sum total of sense objects,” we cannot presume to explain these facts by appealing to a purposive cause. When we investigate the bird by asking about the purpose of this or that feature, we merely use an “analogy with such a causality . . . which we find in ourselves” (pp. 236–37). In other words, we find agent causality in ourselves and readily wonder whether some kind of agent causality might be responsible for striking features of organisms.

According to Kant, although a mechanist cannot ask what things are for, if we think teleologically it is impossible to stop short of the question of an ultimate purpose. Looking at ecosystems, we observe that some things are beneficial to others, but nothing in nature can be scientifically identified as a final end. The lack of a scientifically certifiable final end seems to be a problem, because to think of an original purposive Author of Nature is meaningless unless there is an ultimate purpose. To produce things merely for the sake of something else and so on, *ad infinitum*, makes no sense. However, once we realize the significance of moral reason, we find grounds to posit humanity as an end in itself. Thus we can portray free human beings as “the final purpose to which all of nature is teleologically subordinated” (p. 323).

For Kant, teleological interpretation of nature stimulates the mind to think of God. In an observation about organisms more evident for his time than for ours, Kant confesses, “We cannot even think of them as organized things without also thinking that they were produced intentionally” (p. 281). Moreover, once we find that we must posit purpose on the level of the individual organism, it becomes legitimate to inquire about the possibility of purposiveness regarding the world as a whole (pp. 257–61). “The purposiveness we must presuppose . . . in many natural things is quite unthinkable . . . unless we think of it, and of the world as such, as a product of an intelligent cause (a God)” (p. 282).

Why does teleology lead us to think of God? Generally, Ideas are not presented in nature, but human beings—products of nature conceived as purposive agents—are given. However, the Idea of the organism as naturally purposive is for use not by (scientific) understanding but only by reflective judgment. *To be aware of our limits* (that we cannot claim to know the natural object through this idea of natural purpose) *is to presuppose the possibility of a greater understanding*. To contrast the human mind with a possible greater mind leads one to the idea of an original, divine mind (pp. 288–94).

We can think of an original, purposive agent only as a unitary, rational being, but what are the conceivable alternatives? Kant entertains a surprising array of possibilities. His basic position is that, in judging beings to be

organized, we must presuppose some original organized being that itself uses mechanism to produce other organized forms or new shapes. He notes that comparative anatomy gives hope for a scientific discovery showing kinship deriving from a common original mother, but it would still be necessary to attribute purpose to this original mother Earth (or other origin), because otherwise it is inconceivable how we find living, organic products. No organized being is generated from a radically different kind of being (pp. 303–7). Moreover, it would destroy natural intelligibility to posit organisms as given afresh each time a new (animal) being arises. Thus, of different hypotheses to explain the propagation of purposive form, it is best to minimize the need for supernatural intervention: after the first beginning, leave everything else to nature (pp. 308–11).

How mechanism and teleology are possible together is beyond us, because the two kinds of explanation exclude each other if they are placed on the same level. But philosophy offers harmony for thinkers willing to distinguish a mechanical account of *appearances* from a teleological account of the whole of nature *in itself*. Neither account should presume to exclude the possibility of the other. The two principles can be reconciled only by subordinating mechanism to teleology. Our concept of mechanism must assume a causal law heedless of purpose; it may also posit matter's being inherently prepared for receiving a form that is unpredictable from a mechanical standpoint (pp. 295–300, 308).

How shall we understand the relevant three disciplines—mechanical science, theology, and teleology—in the light of a critical philosophy of reflective judgment? First, the disciplines must be separated. Appealing to God does not advance the knowledge of nature. Moreover, because teleology deals with nature, it is not, strictly speaking, part of theology. Because it does not give determinate knowledge, neither is teleology part of natural science. Teleology belongs only to reflective judgment (p. 302).

Next, we should recall the interrelations between the disciplines. Our inability to complete a totally mechanical interpretation of the organism supports teleology. Teleological interpretation of nature leads the mind to think of God. And, finally, we may use teleology heuristically to interpret nature as a whole and thereby perhaps discover additional laws of nature (p. 280).

The claims remain moderate, for there is no question of proving any of them. Nevertheless, Kant shows the grounds that lead seekers of wisdom to achieve what they could not attain if they demanded a scientific-logical demonstration. Reflective judgment leads to a concept of nature whose Author created organic life with a purpose culminating in human beings, creatures with reason who can, through reflective judgment, affirm what cannot be proven.

## HEGEL'S RATIONALIST TELEOLOGICAL FUNCTIONALISM

Hegel's philosophy of nature continues the tradition of Plato, Aristotle, and Kant, but Hegel subtracts a transcendent Creator from his picture and adds a sturdy antireductionist plank to his teleology. For Hegel, modern physics shows us that we can understand the truth of nature as a system of laws in which nature is not something foreign to the scientific spirit of the community of modern, rational thinkers and agents. Rather, the truth of mechanical nature is just what the understanding grasps. Like Kant, Hegel distinguishes understanding from reason, but, unlike Kant, Hegel affirms the use of reason in any field whatsoever, including religion and biology. Hegel's philosophy traces a conceptual narrative linking the key concepts at work in the domains of nature and mind.

Portraying nature as a living whole, Hegel assails the superficial thinking of those who appeal to analogy or mystical intuition as a substitute for the labor of reason. Philosophic reason must base itself on the best science of the day, and reason's work is to trace more deeply the conceptual story implicit in the categories used by the empirical sciences. In his *Philosophy of Nature* ([1830] 1970) Hegel works out a detailed philosophical analysis of the life of the earth and of plants and animals. (Yes, Hegel holds a version of the "Gaia hypothesis.") The concepts required to describe mechanical and chemical systems are fundamentally different from those required to describe organisms. Following Kant's revival of Aristotle's internal teleology, Hegel affirms that life must be grasped as self-maintaining and that self-maintenance is implicitly teleological. Mechanical interactions do not sustain themselves; chemical reactions result in neutral products that cease to interact. But the living system sustains its own process, and each organ is part of a self-sustaining and self-differentiating whole.

In Hegel's dialectic, a mechanical object is only an aggregate, with merely external relations between its parts, like rocks in a pile.<sup>13</sup> The object's very independence, however, renders it vulnerable to shocks from outside. It therefore comes into relation with other things as agent and patient. Originally the mechanical object was defined as independent, as a self-contained totality, but it interacts as active and passive. As passive, its independence is a sham; as active, it is defined in relation to another and so again is not thoroughly independent. Its relation to an opposite is characteristic of the next stage, which Hegel calls the chemical process.

In the chemical system, the object is defined in terms of its relation (affinity) to its opposite. Once process is invoked, mechanism alone is no longer adequate to describe the object. *Chemism* is the term describing the next higher stage after mechanism. The chemical object is given as the counterpart of its opposite, which in the presence of the appropriate catalytic agent reacts with it to produce a neutral product. The chemical process has two opposing moments: first, the combining of the extremes to

form the neutral product, and, second, the breaking up of the neutral product into the chemical opposites of which it is formed. The two processes cancel each other in the sense of proceeding in opposite directions from the start to the end. However, the end is not yet present in the fullest sense, because the processes that move toward chemical “ends” are contingently motivated; they depend on the presence of the catalytic agent and do not renew their interaction spontaneously. Nevertheless, chemism presents the concept of end (*Zweck*) and thus touches on teleology, the category required to comprehend organisms.

While affirming the normally clear and radical difference between living and nonliving systems, Hegel recognizes the existence of transitional forms that blur the conceptual boundaries. Because of the organism’s self-determining nature, teleology is explicit in the organism, whereas in mechanical and chemical systems determination of the object is always due to another, external object. Teleology shows freedom insofar as the only necessity governing it is internal, from itself. In other words, the organism sustains itself in relation to the inorganic. It is “for itself” on account of its subjectivity, since there is at least a basic level of sensitivity in the animal organism.

According to Hegel, recognizing the internal teleology of the organism enables us to regain Aristotle’s concept and to move past the “external” teleology so common in his day among religious writers. There are two phases of external teleology: first, the appeal to an Author of Nature, a Designer who orders things according to his purposes, and, second, the celebration of the usefulness of organisms to humankind. Hegel notes the extremes to which teleological praise has gone: “This often results in trivial reflections, as in the *Xenia* [of Goethe-Schiller], where God’s wisdom is admired in that He has provided cork-trees for bottle-stoppers, or herbs for curing disordered stomachs, and cinnabar for cosmetics” ([1830] 1970, 5, addition to section 245). In Hegel’s conceptual narrative, external teleology is a necessary moment in the development of the teleological concept; without the idea of an agent acting for a purpose, teleological thinking could not have been launched.

Nevertheless, external teleology does not represent the highest form of teleology in our understanding of the organism. Hegel’s teleology enables him to comprehend the organism as more than merely mechanical without embracing what he saw as the opposite extreme of vitalism. Toward the end of the eighteenth century in France, the idea appeared of an invisible, vital principle by virtue of which the organism lives, moves, and has its being. For Hegel, vitalism is a vague substitute for a thorough system of categories. Hegel’s concept of *life* nevertheless preserves the throb of his youthful romanticism when he revolts against the Lutheran theology dispensed in seminary and sympathizes with the ideals of the French revolution. Following Hölderlin’s vision of ancient Greece, Hegel’s concept of

life includes connotations of an idealized harmony of art, religion, and public life. For Hegel, the river of life is the dynamic universal, the process of the genus sustaining itself by generating individuals who reproduce and perish. Free and self-sustaining, life comes to its own self-realization in human consciousness.

For Hegel, then, biology errs insofar as it limits itself to mechanical and chemical analysis and should relent and accept the philosophic concept of organism. Biology properly studies *functional* relations within the living *system*. The organism nourishes itself, repairs itself, reproduces itself, and reacts sensitively to stimuli. Hegel would praise biologists for studying biological functions in practice while criticizing as naive the associated mechanistic philosophy that some biologists adopt. He would greatly welcome present-day ecology. In sum, teleology is not an affair of intelligent design; rather, living systems themselves show an internal teleology all their own, which comes to self-realization in human beings.

#### TELEOLOGY TODAY

Many contemporary analytic philosophers of biology discuss the concept of teleology in terms of the notion of function. Analyses of function proliferate and may be grouped in four types.

1. Functions may be interpreted reductionistically in terms of past causes or future effects. In some versions, the reductionistic character of the analysis is overt, attempting to supplant the recognition of the inherently purposive character of organismic structures and activities by causal accounts that empty organisms of their evident meaning. Many analyses of functions appeal to natural selection as the prime factor in the explanation. One difficulty with this approach is mentioned by Valerie Hardcastle: "Evolution is too complicated and messy and we know too little about how it has actually unfolded to use it to ground our analysis of functions" (1999, 38).

2. Functions may be interpreted as metaphor; that is, organisms are to be understood *as if* they were designed. This approach leaves open the question of a possible religious affirmation of primary causation.

3. Functions may be interpreted pragmatically as being relative to the questions that a particular discipline's inquiry seeks to answer. "The function of [trait] T is to do [effect] E in [organism] O because E is necessary for answering the question of what O is doing" (Hardcastle 2002, 153). To the critical realist, this response leaves a worry about its seeming relativism—it leaves the impression that anything might qualify as a function if some discipline decided to investigate it as such. But because scientists generally practice such critical realism, this problem is solved, though it leaves open the question of a possible synthesis of diverse disciplinary perspectives.

4. Functions may be interpreted in terms of an intrinsic teleology. Some accounts refer to design or goals, for example, "The function of S is what S is designed to do" (Kitcher 1998, 488). Christopher Boorse analyses function statements in terms of "general goal contribution." Goal directedness, implied in "most of our standard vocabulary for describing organisms' behavior," is, he claims, "an objective, non-mental property of all living organisms." This move "lets function statements be literally true throughout the biological domain, not merely metaphorically true, heuristically useful, or the like" (Boorse 2002, 68, 63–64).

To bolster the phenomenological intuition and philosophic concept of intrinsic teleology, it is well to complement analytic philosophy with European continental philosophy of biology. There is a surprising lesson to be drawn in this connection from the writing of Marjorie Grene, whose *Approaches to a Philosophical Biology* (1968) continues to be a helpful source for continental philosophical biology with chapters on Adolf Portmann, Helmuth Plessner, F. J. J. Buytendijk, Erwin Strauss, and Kurt Goldstein. She rejects teleology on the basis of a one-sided grasp of Kant: neglecting the marvelous, reciprocal teleological relation between the organs of the organism, she focuses on goal-directedness as merely instrumental.<sup>14</sup> The lesson is that one need not embrace teleology as such in order to support many of the concepts that the tradition of teleology means to sustain. Teleological concepts—purpose, goal, design, function—cluster with others, such as (organic) form, behavioral interaction, relation to environment, inwardness, soul, and others. Nor does Grene embrace a religious interpretation; she promotes a nonreductionistic biology independent of religion—suitable scientific common ground for further interpretation by philosophers and theologians. Michael Polanyi classically articulates a continuity between human and animal activity; he acknowledges mechanical aspects of the animal and proposes that understanding the behavior of an animal requires us to identify with the animal's rational center of action, expressed in its striving.

Partly illustrating phenomenological and conceptual teleology is Holmes Rolston, III. In his *Genes, Genesis and God* he argues that reductionist interpretations of biological evolution, culture, ethics, and religion are implausible because of the narrow range of evidence selected to build their case. His leading teleological theme is value. To speak of a *telos* or goal implies seeking or striving of some kind, which in turn implies a value in some sense. Hence the *teloi* are the values sought—and realized—in the diverse stages of life.

A plant, like any other organism, sentient or not, is a spontaneous, self-maintaining system, sustaining and reproducing itself, executing its program, making a way through the world, checking against performance by means of responsive capacities with which to measure success. Something more than merely physical causes, even when less than sentience, is operating within every organism. In its

genetic set, there is information superintending the causes; without it the organism would collapse into a sand heap. . . .

Botanists say that the tree is irritable in the biological sense; it responds with the repair of injury. The bee is making use of the nectar in the flower, but is the honey valuable to the bee? . . . These are observations of value in nature with just as much certainty as they are biological facts; that is what they are: facts about value relationships in nature. We are really quite certain that organisms use their resources, and one is overinstructed in philosophy who denies that such resources are of value to organisms instrumentally. (Rolston 1999, 39, 41–42)

As Rolston explains it, in the genetic set “is coded the *telos*,” ultimately, thanks to the creative Source of information. After commenting in a nuanced way on the striking gap between physical and chemical structures on the one hand and biological systems bearing information on the other, Rolston characterizes his story of evolutionary development as portraying “a loose teleology” (p. 367): in other words, the purposes of the Creator are realized in creatures characterized by relative autonomy and integrity.

The culmination of Rolston’s argument is worth quoting at length, because it argues that the teleological phenomena described throughout the book invite us to accept a concept of God.

The philosophical, metaphysical, and theological challenge, left over after the current scientific accounts, is the query what is the most adequate account of the origin of these information channels and the genetic information thereby discovered. In the course of evolutionary history, one would be disturbed to find matter or energy spontaneously created, but here is information floating in from nowhere. For the lack of better explanations, the usual turn here is simply to conclude that nature is self-organizing (autopoiesis) though, since no “self” is present, this is better termed spontaneously organizing. An autopoietic process can be just a name, like “soporific” tendencies, used to label the mysterious genesis of more out of less, a seemingly scientific name that is really a sort of mystic chant over a miraculously fertile universe. . . .

What is inadequately recognized in the “self-organizing” accounts is that, though no new matter or energy is needed for such spontaneous organization, new information is needed in enormous amounts and that one cannot just let this information float in from nowhere. Over evolutionary history, something is going on “over the heads” of any and all of the local, individual organisms. More comes from less, again and again. A more plausible explanation is that, complementing the self-organizing, there is a Ground of Information, or an Ambience of Information, otherwise known as God. . . .

We know what is in the seeds [of natural potentials] as the secret of their possibilities—information—and there is no such information inside amino acids, much less hydrogen and carbon atoms, much less electrons and protons. The creation of matter, energy, law, history, stories, of all the information that generates nature, to say nothing of culture, does need an adequate explanation: some sources, source, or Source competent for such creativity. Seeds need a source. . . . This portrays a loose teleology, a soft concept of creation, one that permits genuine, though not ultimate, integrity and autonomy in the creatures. We have in the life adventure an interaction phenomenon, where a prolife principle is overseeing the affairs of matter. The divine spirit is the giver of life, pervasively present over the millennia. God is the atmosphere of possibilities, the metaphysical environment in,

with, and under first the natural and later also the cultural environment, luring the Earthen histories upslope. God orchestrates such self-organizing, steadily elevating the possibilities, making for storied achievements, enriching the values generated. (Rolston 1999, 359, 367)<sup>15</sup>

Rolston's concluding concept of an overseeing Creator generating an attractive and negentropic possibility space that promotes the evolution of information is a concept that makes possible a theological reworking of the content of the early chapters, written in close dialogue with reductionists, where to introduce the concept of the Creator might have seemed to betray the dialogue. Rolston's ability to argue on the empirical terrain without invoking a religious premise adds power to his concluding proposal.

The need for further theological work in teleology is indicated by Gregory Peterson's comments on the rejections of theism by Dawkins and Gould:

For Dawkins, the process of evolution is a rationally understandable, largely goal-directed (in an adaptationist sense) phenomenon. Evolution is primarily about design and natural selection, and to understand evolution is to understand the lawlike character of evolutionary processes that predictably produce adaptations that are functionally advantageous to the organism that possesses them. To speak scientifically about evolution is precisely to speak of laws, fit, design, and even progress. In Dawkins's view, neo-Darwinism is incompatible with the idea of God because it provides a competing and superior explanation of design. . . .

For Gould, by contrast, the process of evolution is predominantly characterized by contingency, history, and accident. . . . Evolution has neither purpose nor progress. . . . For Gould, the lack of straightforward design counts as evidence against a designer. (Peterson 2000, 228)

Peterson goes on to sketch theological options that resonate with the two philosophies of nature implicit in the critiques.

There are those . . . who emphasize contingency as the significant entry point for theology, because the potential gaps implied by contingency and chance allow room for specific, divine intervention. Creationists and proponents of intelligent design look for precisely such areas of evolutionary theory as the origin of life or so-called irreducibly complex structures for which the improbabilities seem so great that they require direct divine action to explain them. In this light, there is a strong thematic continuity between Gould's approach and the approaches of those he regards as his opponents. Both attack classical neo-Darwinism in order to make room for contingent history, albeit quite different contingent histories. (Peterson 2000, 229)

Peterson's observations point to the need to synthesize a robust theism with the emerging insights of process theology.<sup>16</sup> I can barely indicate the work to be done, but a more complex ontology, sustaining a more complex theodicy, with a freshly motivated process theology will help faith anticipate a future cosmic integration of energy, mind, and spirit coming forth from the eternal God (Trinity). The weakness of process theology has



been its concessions to critiques of theodicy and its straw-man portrayal of the “eternal pole” of Deity as a mere nexus of abstractions. The weakness of traditional theism has been its deficient embrace of adventure, uncertainty, and the significance of choice. This synthesis should also show how an adequate philosophy of biology can integrate both the law-governed character of the role of physical law in evolution emphasized by Dawkins with the adventuresome character of evolution emphasized by Gould. The resulting concept of organismic design would be more complex and more satisfying.

#### CONCLUSION

Teleological language is the disputed *lingua franca* of biological description. For reductionists such as Dawkins, it is a convenient shorthand. For theists, it conveys how purposes implicit in the primary causation of the Creator may be expressed in the secondary causation of the creature. For nearly all, it is an intuitively appealing way to describe the phenomena.

The inability of philosophers to converge on a reductive analysis of teleology suggests that the concept of purpose, function, or goal may involve one of those insights that are so basic that they cannot be proven, since proof appeals to something more basic. Any attempted proof (or disproof) assumes too much or proves too little. To affirm such an insight, then, is to set forth an axiom. To the properly attuned mind, the insight is self-evident. Lucid philosophers do not claim to refute skeptics; rather, they evoke the relevant intuition, clarify it, show its interconnections with other concepts, defend it from misinterpretations, and show how to respond to objections. That living organisms differ ontologically from the material structures described in physics and chemistry is one such insight. Another basic insight affirms the meaningfulness of the concept of morality, or duty. Yet another affirms the reality of the spiritual. Teleology is a theme linking all of these basic realms of human inquiry.

The question remains of how meaningful teleology is without intelligent, divine purpose. Does it make sense, ultimately, to speak of unconscious goal-directedness in nature? Is it really intelligible to speak of an end without design consciously operative at some level? For theists, the wisdom of Plato’s cosmology was to combine themes from diverse perspectives. By contrast, Aristotle established biology as an autonomous discipline, independent of theology. However, with autonomy comes the possibility of fragmentation and loss of meaning. If Aristotle emancipated biology from a theology of the purposes of a Creator, did he not also remove the background of meaning without which we cannot sustain teleology? Does it make sense to speak of organisms both as goal-directed and as products of purely natural causes, or does such discourse compromise one of our deepest intuitions about life?

Philosophy is a workshop where thinkers elaborate harmony among their commitments (positive or negative) regarding religion and science. To set forth a religious philosophy of nature is an act of reason illumined by faith. Theistic teleology expanded by process theology will one day interpret both regularities and unpredictable events in nature as manifesting the wisdom and goodness of God.

## NOTES

I am indebted to Philip A. Rolnick for his many helpful comments on this essay and to a *Zygon* reviewer for advice in revising an earlier draft.

1. Holmes Rolston, III, in *Genes, Genesis and God* (1999), appeals to the classical ideal that science must “save the phenomena”—in other words, give an account that explains the phenomena, not explains them away. If we accept an account that renders meaningless Socrates’ heroic decision to remain in prison and face execution, something has gone wrong. In Rolston’s example, if a physicist proposes an account that implies that I cannot wave to my friend, so much the worse for the physics account.

2. See references to the *Timaeus* in Whitehead [1933] 1967, 147–50, 187–88, and 275–77, and the treatment by Luc Brisson and F. Walter Meyerstein (1995) axiomatizing the philosophy of science in the *Timaeus* and contrasting it with the new physics. See also Miller [1986] 1991; 2002.

3. Time comes to be with the origin of the cosmos (Plato 2000b, 38b).

4. Alister E. McGrath (1999) highlights these features in his contemporary text.

5. Note that the persisting appeal to the distinction between primary and secondary causes, preserves a place for teleological explanation at the level of primary causes—the acts of God.

6. In many religions the goal of human attainment is to become like God. In Christianity, Jesus shows the model of how God loves us. In Hinduism, the imitation of God is often a theme. In Taoism, the sage incorporates the Way into his own (non)action.

7. The hope for eternal life is arguably an essential implication of the religiously enlivened relationship between the Creator and the creature. That hope is called into question by the extrapolations of contemporary scientific cosmology peering into the physically remote destiny of the universe (Davies 1994); but the calling into question is always, by implication, mutual, and there is no a priori reason why religion must abandon its beliefs whenever they conflict with science-based speculation.

8. I wish to acknowledge the excellence of a relevant article by James G. Hart (2005), bridging classical and contemporary themes, which I found too late to incorporate into this study. In a similar vein, I am grateful for Robert Reno’s sharing with me his knowledge of the books on purpose in the universe written by John F. Haught (1995, for example).

9. Aristotle’s God was self-thinking thought, which we attain or approximate in our own highest experiences of contemplating eternal truth. The First Cause thus is more akin to a philosopher than to a man of action. The ideal of individual self-sufficiency haunting ancient Greek philosophers leads Aristotle to portray a God outside any essential relation, a God who does not know us. Richard Bodéüs (2000) points out that, in addition to the First Cause, Aristotle posits gods who know and bless human beings (see Aristotle 1984, *Nicomachean Ethics* X.8 1179a24–33).

10. This language and the associated philosophic issues persist in current discussion, from Jacques Monod to Michael Behe. Despite protests that the terminology is too crude for state-of-the-art discussion, the terms continue to be used because they continue vividly to symbolize major philosophic issues.

11. For Galileo’s role in this change, see Husserl [1954] 1970, 23–59.

12. This story is well told in Brooke 1991.

13. The ensuing account derives from Hegel’s *The Encyclopedia Logic* [1830] 1991, 272–86, and *The Science of Logic* [1812, 1816], 1969, and draws on the exposition in Wattles 1973, 43–71.

14. Heidegger, too, has criticized the merely instrumental concept of sense “organs” (McNeill 1999). True, even “mechanism” bears teleological implications, and Michael Polanyi (1962)

has criticized the notion that a machine can be adequately comprehended in physics and chemistry. Buytendijk, however, anticipated the postmodernist critique of mechanical interpretation as an expression of human will-to-power (Grene 1968).

15. Note this parallel argument: "Evolutionary development is 'attracted to' (in the current 'chaos' metaphor) culminating achievements in both diversity and complexity, and this attraction needs explanation. Attractors, or, at a more metaphysical level, even an Attractor, seem quite rational explanations" (Rolston 1999, 366).

16. The God of process theology is dipolar: one pole is the set of eternal ideas that can be exemplified by entity-events or occasions in the world; the other pole is in process, a less-than-omnipotent, creative response to all the evolving occasions that make up the world. See Whitehead [1927–28] 1978; Barbour 1990, chap. 8.

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