Article

CrossMark
click for updates

Special Issue: Author Meets Critic (AMC)

Evolution and Teleology: A Critical Response to Ted Peters

Francisco J. Ayala

University of California, Irvine

Abstract | In chapter 19 of Ted Peters' new book, *God in Cosmic History,* he addresses the knotty question of teleology in evolutionary biology. This requires further discussion. Scientifically speaking, we can perceive design in nature without a designer. On the one hand, there is purpose in nature. Human eyes have a purpose, namely, to see. Teleological explanations are required in biology for (1) goal oriented behavior; (2) self-regulating systems; and (3) the function of organs and limbs. On the other hand, the natural history of evolution does not require a Creator or a planning agent external to the organisms themselves. There is no scientific evidence of any vital force or immanent energy directing the evolutionary process toward the production of specified kinds of organisms. Even if a scientific account of natural history is open to the God question, it will take a theologian to propose an answer.

Introduction

"The Evolution of Controversy" is chapter 19 in Ted Peters' wonderful book, *God in Cosmic History. Where Science & History Meet Religion* (Anselm Academics, 2017). Peters dedicates a section of the chapter to Darwin's Theory of Evolution, but the chapter's dominant topic is an extended critique of authors who criticize or deny evolutionary knowledge on religious grounds and of those who deny or reject religion on scientific grounds. Central to Peters' discussion is the notion of teleology and whether teleological explanations are appropriate in evolutionary biology. Teleology is the topic that I want to explore in this commentary.

The staircase in my home has been designed for climbing between the first and second floors; the human eye has been designed for seeing. Most of us would be willing to accept these two statements, but would probably balk if somebody claimed that a mountain has been designed for climbing. We might note that mountain slopes are there whether or not

there is anybody to climb them, but staircases would never be produced if it were not for the purpose they serve. Mountain slopes and staircases have in common that they are used for certain purposes, but differ because staircases, but not mountain slopes, have been specially created for the purpose they serve. This is what we mean when we say that staircases are 'designed' for climbing; the reason staircases exist at all and exhibit certain features is that they have been designed for climbing between floors. This is not so with mountain slopes.

What about human eyes? Human eyes have something in common with staircases and something in common with mountain slopes. Human eyes, like steering wheels, have been 'designed,' because were it not for the function of seeing they serve, eyes would have never come to be; and the features exhibited by eyes specifically came to be in order to serve for seeing. But eyes share in common with mountain slopes that both came about by natural processes, the eyes by biological evolution (natural selection), the mountain slopes by

Links
Researchers

geological movements and erosion. Staircases, on the contrary, are designed and produced by human architects. *The issue at hand is, then, how to account for design, as in the design of the eye, without a designer; that is, if we want to accept that human eyes are the result of natural processes, rather than having been designed by a Designer, the Creator of the World.* This conundrum was solved by Charles Darwin with the theory of evolution by natural selection.

Darwin on Natural Selection without Advanced Design

In *The Origin of Species* Darwin accumulated an impressive number of observations supporting the evolutionary origin of living organisms. Moreover, and most importantly, he advanced a causal explanation of evolutionary change - the theory of natural selection, which provides a natural account of the design of organisms, or as we say in biology, their adaptation. Darwin accepted that organisms are adapted to live in their environments, and that their parts are adapted to the specific functions they serve. Penguins are adapted to live in the cold, the wings of birds are made to fly, and the eye is made to see. Darwin accepted the facts of adaptation, but advanced a scientific hypothesis to account for the facts. It may count as Darwin's greatest accomplishment that he brought the design aspects of nature into the realm of science. The wonderful designs of myriad plants and animals in their profusion and wondrous variations could now be explained as the result of natural laws manifested in natural processes, without recourse to an external Designer or Creator.[1]

The central argument of the theory of natural selection is summarized by Darwin in *The Origin of Species* as follows: "As more individuals are produced than can possibly survive, there must in every case be a struggle for existence, either one individual with another of the same species, or with the individuals of distinct species, or with the physical conditions of life. ... Can it, then, be thought improbable, seeing that variations useful to man have undoubtedly occurred, that other variations useful in some way to each being in the great and complex battle of life, should sometimes occur in the course of thousands of generations? If such do occur, can we doubt (remembering that more individuals are born than can possibly survive) that individuals having any advantage, however slight, over others, would have the best chance of surviving and of procreating their kind? On the other hand, we

may feel sure that any variation in the least degree injurious would be rigidly destroyed. This preservation of favourable variations and the rejection of injurious variations, I call Natural Selection."[2]

Darwin formulated natural selection primarily as differential survival and reproduction. The modern understanding of the principle of natural selection is formulated through gene arrays and statistical terms. Natural selection implies that some genes and gene arrays are transmitted more frequently, on the average, to the following generations than their alternates. Such genetic units will become more common in subsequent generations and their alternates less common. Natural selection is simply a statistical bias in the relative rate of reproduction of alternative genetic units. But the reproductive bias, argued Darwin, will likely favor the variants that are useful to the organisms, precisely because it is this usefulness that increases the reproductive chances of their carriers. Gazelles that run swifter will better escape their predators and so gazelles come to have swift legs.

Biologists account for the functional features of organisms, their "design," in terms of the goals or purposes they serve, which is accomplished by means of teleological hypotheses or teleological explanations. Physical scientists do not face similar demands. A dictionary definition of "teleology" is "the use of design, purpose, or utility as an explanation of any natural phenomenon" (*Merriam Webster's Collegiate Dictionary*, Tenth Edition 1994). The same dictionary defines "teleological" as "exhibiting or relating to design or purpose esp. in nature." The *Oxford Dictionary* includes virtually identical definitions: "teleological," "dealing with design or purpose, esp. in natural phenomena"; "teleology," "such design as exhibited in natural objects or phenomena."

Inanimate objects and processes (other than those created by humans) are not teleological because they are not directed toward specific ends; they do not come into existence in order to serve certain purposes, even though they can so be used. The configuration of sodium chloride depends on the structure of sodium and chlorine, but it makes no sense to say that that structure is made up so that humans could use it as food to serve a certain end. Similarly, the slopes of a mountain are the result of certain geological processes and weather erosion, but did not come about so as to serve a certain end, such as skiing by humans,

even though humans use them for that purpose. The motion of the earth around the sun results from the laws of gravity, but it does not exist in order to satisfy certain ends or goals, such as producing the seasons. We may use sodium chloride as food, a mountain for skiing, and take advantage of the seasons, but the use that we make of these objects or phenomena is not the reason they came into existence or have certain configurations. The configuration of a molecule of sodium chloride contributes to its property of tasting salty and therefore to its use as food, not vice versa; the potential use of sodium chloride as food is not the reason why it has a particular molecular configuration. The motion of the earth around the sun is the reason seasons exist; the existence of the seasons is not the reason the earth moves about the sun.

Teleological Explanations are Still Required in Biology

We can identify three categories of biological phenomena where teleological explanations are pertinent. These three classes of teleological phenomena are established according to the mode of relationship between the structure or process and the property or end-state that accounts for its presence.[3]

(1) A behavior such that the end-state or goal is consciously anticipated by the agent. This is purposeful activity which, if it is understood in a strict sense, probably occurs only in humans. With a lesser degree of intentionality, behaviors initiated in order to reach a goal also occur in other animals. I am acting teleologically when I buy an airplane ticket to fly to Mexico City. A cheetah hunting a gazelle gives at least the appearance of purposeful behavior.

(2) Self-regulating systems, when there exists a mechanism that enables the system to reach or to maintain a specific property in spite of environmental fluctuations. The regulation of body temperature in mammals is a teleological mechanism of this kind. In general, the homeostatic reactions of organisms belong to this category of teleological phenomena. Biologists distinguish two types of homeostasis—physiological and developmental. Physiological homeostatic reactions enable the organism to maintain a certain physiological steady state in spite of environmental shocks. The regulation of the composition of the blood by the kidneys, or the hypertrophy of muscle in case of strenuous use, are examples of this type of

homeostasis. Developmental homeostasis refers to the regulation of the different paths that an organism may follow in its progression from zygote to adult. The development of a chicken from an egg is a typical example of developmental homeostasis. The process can be influenced by the environment in various ways, but the characteristics of the adult individual, at least within a certain range, are largely predetermined in the fertilized egg. Self-regulating systems built by humans, such as a thermostat, belong to this second category of teleological phenomena.

(3) Organs, limbs, and other features anatomically and physiologically constituted to perform a certain function. The human hand is made for grasping, and the eye for vision. Tools and human-made machines are teleological in this third sense. A watch, for instance, is made to tell time, and a faucet to draw water.

The adaptations of organisms—whether organs, homeostatic mechanisms, or patterns of behavior—are explained teleologically as a consequence of natural selection, because their existence is ultimately accounted for in terms of their contribution to the reproductive fitness of the organisms. A feature of an organism that increases its reproductive fitness will be selectively favored. Given enough generations it will extend to the whole species.

In "Darwin and the Teleology of Nature"[4] I argued that "teleological explanations are necessary in order to give a full account of the attributes of living organisms."[5] According to the proponents of Scientific Creationism or Intelligent Design, "teleological explanations are understood to imply the belief that there is a planning agent external to the world, or a force immanent to the organisms, directing the evolutionary process toward the production of specified kinds of organisms. The nature and diversity of organisms are, then, explained teleologically in such view as the goals or ends-in-view intended from the beginning by the Creator, or as a necessary development of specific potentialities implicit in the nature of the first organisms. Biological evolution can however be explained without recourse to a Creator or a planning agent external to the organisms themselves. There is no evidence either of any vital force or immanent energy directing the evolutionary process toward the production of specified kinds of organisms.[6]

The ensuing sentence emphasizes the same point by reference to the fossil record: "The evidence of the fossil record is against any directing force, external or immanent, leading the evolutionary process towards specific goals. Teleology, *understood in the stated sense* is, then, appropriately rejected in biology as a category of explanation."[7] These last two sentences are quoted by Peters on p. 285 of *God in Cosmic History*. But Peters has removed from the quotation the phrase I have written here in italics. The teleology that I am rejecting is the teleology of creationists and intelligent designers who are attributing the design of organisms "to a Creator or a planning agent."

Conclusion

The point emphatically made in the present article is that teleological explanations are appropriate in evolutionary biology, because they are needed to account for the design of organisms, their adaptations to the environment and for performing their living functions. I may have been the first author in recent times to elaborate that point, with my 1970 article, "Teleological Explanations in Evolutionary Biology,"[8] which I have repeated again recently in Chapter 7 of my 2016 book, *Evolution, Explanation, Ethics and Aesthetics. Towards A Philosophy of Biology*,[9] as well as in the article cited in footnote 4 and elsewhere. The distinction between an appropriate use of teleological explanations and the notion of teleology advanced by creationists and intelligent designers is one of the points of my 1998 article, "Teleological Explanations *versus* Teleology,"[10] as well as elsewhere.

Endnotes

[1] Ayala, F.J. 1970. Teleological explanations in evolutionary biology. *Philosophy of Science* 37:1-15.

[2] Darwin, C., 1967. *On The Origin of Species*. Facsimile of the first edition (1859), Atheneum, New York. Chapter 3, p. 63 and Chapter 4, pp. 80-81.

[3] Ayala, F.J. 2016. "Adaptation and Novelty: Teleological Explanations in Evolutionary Biology," Chapter 7. In: Ayala, F.J., *Evolution, Explanation, Ethics, and Aesthetics. Towards a Philosophy of Biology*. Academic Press (Elsevier), San Diego, CA.

[4] Haught, J.F., ed. 2000. *Science and Religion in Search of Cosmic Purpose*. Georgetown University Press, Washington, DC, pp. 18-41.

[5] Ibid, p. 18

[6] Ibid, p. 19

[7] Ibid, p.19

[8] Ayala, F.J. 1970. Teleological explanations in evolutionary biology. *Philosophy of Science* 37:1-15.

[9] Ayala, F.J. 2016. "Adaptation and Novelty: Teleological Explanations in Evolutionary Biology," Chapter 7. In: Ayala, F.J., *Evolution, Explanation, Ethics, and Aesthetics. Towards a Philosophy of Biology*. Academic Press (Elsevier), San Diego, CA.

[10] Ayala, F.J. 1998. Teleological Explanations *versus* Teleology. *Hist. Phil. Life Sci*. 20:41-50.