

Article

Evolutionary Progress and Cultural Value: An Analysis of the Divergence Between Ernan McMullin and Michael Ruse

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Abstract

The relationship between science and values is a classic and important issue in the philosophy of science. Ernan McMullin, a philosopher of science, believes that as science matures, the pursuit of epistemic values leads to the gradual exclusion of non-epistemic values. Michael Ruse, a philosopher of biology, emphasizes the uniqueness of this issue in evolutionary biology: the expulsion of progressivist cultural values actually stems from the influence of another cultural value, rather than purely from the pursuit of epistemic values. Therefore, the concept of evolutionary progress cannot completely escape the entanglement of cultural values. Even today, biologists still use other concepts to discuss a metaphor sympathetic to progressivist cultural values. By sorting out the discussions on evolutionary progress among evolutionists in different periods, this paper aims to show that Ruse's view that "the concept of evolutionary progress is necessarily bound to cultural values" is wrong. Although Ruse correctly points out the uniqueness of this topic in evolutionary biology, his argument hinges on Thomas Huxley's distinction between professional science and popular science. Huxley confined evolutionary progress to the latter—an area with looser academic norms—which complicates the process of expelling cultural values. More importantly, this paper argues that Ruse's central mistake is his failure to distinguish between two fundamentally different kinds of value: the cultural values imported by human beings into the concept of evolutionary progress, and the survival values that arise from the functional performance of organisms themselves. The former can, in principle, be excluded from mature scientific discourse; the latter cannot, because they are constitutive of what evolutionary progress describes. By conflating these two categories, Ruse wrongly concludes that even today, the concept of evolutionary progress still cannot be separated from the influence of cultural values.

Keywords: evolutionary progress; cultural value; epistemic value; Ernan McMullin; Michael Ruse; popular science



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1. Introduction

The relationship between science and values is an important and difficult question in the philosophy of science, one that is particularly salient in evolutionary biology. Since Lamarck proposed that "evolution is progressive", many controversial focuses have emerged both within and outside the scientific community around this topic. Within the scientific community, opponents argue that "evolutionary progress" lacks empirical evidence, which reflects the human tendency to project the desire for social progress onto the history of life. Outside the scientific community, opponents are worried that this view may provide a "scientific basis" for racial discrimination and anthropocentrism. In the mid-20th century,

a professionalized evolutionary biology emerged at the cost of expelling the concept of evolutionary progress—a term deemed deeply value-laden. The philosopher of biology, Michael Ruse, believes that there are still normative terms in evolutionary biology that serve as alternatives to the concept of “evolutionary progress.” These normative terms, due to their metaphorical association with progressivist cultural values, prevent evolutionary biology from reaching the highest-standard disciplinary paradigm required of professional natural sciences ([1], pp. 14–18, 526–534). This leads to the core question of this article: Does Ruse’s judgment hold? Is the concept of evolutionary progress inevitably influenced by cultural values? While eugenics represents a prominent historical instance of cultural values being projected onto evolutionary theory, eugenic arguments exhibit precisely the logical leap (from descriptive claims about biological differences to prescriptive claims about social policy) that this paper identifies as the hallmark of cultural-value infiltration, and the scientific community’s mid-20th-century rejection of eugenics exemplifies the exclusionary trend traced in Section 5.3. The eugenics case therefore warrants separate treatment and is bracketed here as a deliberate limitation of scope.

To analyze these issues, let us first focus on McMullin’s 1982 paper “Values in Science” (originally delivered as an address to the Philosophy of Science Association, later reprinted in *Zygon* in 2012 [2], which is the version cited throughout this paper). McMullin argues that science is permeated with values. This not only refers to judging the merits of theories; values exist in the overall work of science. McMullin distinguishes between non-epistemic values and epistemic values. The predictive accuracy, internal coherence, external consistency, unifying power, and fertility of theories proposed by Kuhn, and sometimes simplicity, all fall into the category of epistemic values. In addition, McMullin also claims that philosophical and theological worldviews have an epistemic status in science. These factors are usually considered external to science and are therefore labeled as “values”. For example, Newton’s use of theological arguments in mechanics is generally considered unacceptable. However, McMullin points out that theology played a role as an epistemic factor for Newton. In short, epistemic values are presumed to promote the truth-like character of science, specifically its status as the most secure knowledge available to us about the world we seek to understand ([2], pp. 701–703).

The definition of non-epistemic values is broad. Some of them are pragmatic, such as the finiteness of the time or resources available to the experimenter. There are also some Weberian (ethical) values, such as the requirement that researchers should not engage in fraud and carelessness. The remaining and most important part consists of values used to narrow the gap between uncertain theories and their supporting evidence. These values come from politics, morality, society, and religion. McMullin specifically emphasizes the issue of ideology, which can distort human perception of the world and damage the truth-like characteristics of science. McMullin believes that although non-epistemic values and non-epistemic factors play a significant role in the initial theoretical decision-making, the influence of these factors on science will be gradually restricted and thus cannot be retained in the development process of science ([2], pp. 702–707).

Throughout this paper, we use “McMullin’s view” to refer primarily to the position as presented in his 1982 address and as interpreted by Ruse in his engagement with McMullin. Ruse’s interpretation of McMullin—particularly his claim that McMullin’s framework, derived from the history of modern physics, is inapplicable to evolutionary biology—is the specific target of this paper’s critical analysis. Whether Ruse’s reading faithfully captures McMullin’s own considered position is a separate question that we bracket for the purposes of this argument. Our concern is whether Ruse’s claims about evolutionary biology, made in explicit dialogue with what he takes to be McMullin’s framework, withstand scrutiny on their own terms¹.

Ruse accepted McMullin's distinction between epistemic and non-epistemic values, equating non-epistemic values with cultural values ([1], pp. 10). In Ruse's work of 1996 [1], he only provided a relatively rough definition of "progressivist cultural values" (denoted by the capitalized initial letter "Progress"). Drawing on Bury's definition, progressivism is the belief in the course of history, holding that humanity advances slowly in a certain direction and this advancement can continue indefinitely ([1], pp. 20). Ruse further pointed out that these directions of progress include knowledge (especially scientific knowledge), technological ability, moral and social behavior, economic success, religious sensitivity, and more ([1], pp. 38)². In Ruse's view, evolutionary progress is formed by the projection of progressivist cultural values onto the theory of evolution. However, in Ruse's articles in 1994 and 2012, he might have strengthened McMullin's stance of maintaining the objectivity of science:

"Here, I think one might usefully refer to McMullin's analysis. He argues that, although young immature science is laden both with epistemic and non-epistemic values, over the course of time, as scientists theorize and gather data and experiment, the epistemic values slowly but surely thrust the non-epistemic values out of the nest". ([3], pp. 60)

"Values in Science" is a typical McMullin production. . . McMullin draws the distinction between valuation (values in some absolute sense) and evaluation (values in a comparative sense) and makes it clear that it is the former that concerns him. He shows agreement with the logical positivists/empiricists in wanting no absolute values of the general cultural kind in science". ([4], pp. 672)

This paper sharpens Ruse's characterization by distinguishing, within what he calls 'progressivist cultural values,' three distinct elements. The first is directional optimism: the belief that evolution possesses an inherent tendency toward improvement, and that this trajectory aligns with moral or social betterment. The second is anthropological exceptionalism: the assumption that *Homo sapiens* represents the culmination, apex, or intended endpoint of the evolutionary process. The third is the confidence that descriptive evolutionary trends warrant prescriptive conclusions about social organization. These three elements constitute what this paper means by 'progressivist cultural values'—a projection of human social ideology onto the natural world. They are to be distinguished from a milder epistemic optimism (the defensible methodological assumption that scientific knowledge can accumulate and deepen over time) and from the survival values defined in Section 5.1, which are norms internal to biological systems rather than imports from human culture. This distinction is essential because much of the existing literature, Ruse's work included, moves between these different senses of 'progress' without marking the transitions, making the debate about whether evolutionary progress is 'value-laden' harder to resolve than it needs to be.

Ruse believes that McMullin's view, which is derived from the history of modern physics in Galileo's era, is not applicable to evolutionary biology ([4], pp. 667). The development of evolutionary biology has its own particularities, leading to different circumstances. Ruse believed that there were three reasons why evolutionary biology could not completely exclude cultural values: first, there was a natural tendency for the progress of science to be projected onto the field of evolutionary theory; second, evolutionary theory contained a cognitive paradigm similar to what physicists call the "anthropic principle", in that the way the world presents its current form is inseparable from the unique cognitive abilities of humans, and the fact that humans can pose the question "Is evolution progress?" itself implies that, in some sense, humans have already reached the peak; finally, groups seeking

modern religious alternatives often actively gather around evolutionary theory research ([3], pp. 66).

Subsequently, Ruse published the book *Monad to Man: The Concept of Progress in Evolutionary Biology* in 1996 [1], which was used to refute McMullin. Ruse found that there are similarities between the cultural values held by evolutionary biologists and their views on “evolutionary progress”. Based on this, he proposed that “there are gaps in both the theories and evidence of these biologists, and cultural values fill the evidence required for the argument.” In the United States around the middle of the 20th century, as a professional science, evolutionary biology excluded the concept of evolutionary progress, which was considered to be deeply influenced by cultural values. The driving force was not the pursuit of epistemic values, but the replacement of progressivist cultural values by other types of cultural values (Ruse did not specifically clarify what these alternative cultural values are). Today, although biologists barely use the concept of evolutionary progress, they still essentially discuss biological progress in a relative sense ([1], pp. 14–18).

This paper argues that there are significant problems in Ruse’s 1996 work [1]. Ruse divided science into pseudoscience, popular science, and professional science to distinguish the influence intensities of epistemic values and cultural values in different types of science. However, in the conclusion part, Ruse only emphasized that biologists gradually increased their pursuit of epistemic values, while avoiding the possibility of the diminishing influence of cultural values. He is more inclined to believe that the exclusion of the cultural value of progressivism is driven by another cultural value, rather than the pursuit of epistemic value. There is, however, a difference in scope between the focus of this paper and that of Ruse. Ruse believes that the evolutionary progress is necessarily bound to cultural values, and evolutionary biology has always been influenced by cultural values: in the past it was the cultural value of progressivism, which was later replaced by another cultural value. This paper only focuses on the cultural value inherent in the concept of evolutionary progress itself. In other words, even if current evolutionary biology is influenced by other cultural values (we do not agree with Ruse’s judgment that “current evolutionary biology is not mature enough”), it does not mean that the process of excluding the cultural value from the concept of evolutionary progress has stagnated or cannot be achieved.

Therefore, to refute Ruse’s view, based on Ruse’s work in 1996 [1], this paper selects some biologists or evolutionists from different periods in Ruse’s research. Due to limited space, only those who have the most comprehensive discussions on the concept of evolutionary progress are selected. Due to the wide range of cultural values, this paper only focuses on the beliefs in social and scientific progress and anthropocentrism. Drawing on Ruse’s analytical method, this paper only focuses on biologists’ arguments about evolutionary progress. By indirectly examining the influence of cultural values through aspects such as the logic of the arguments, the amount of evidence provided, the exclusion of non-empirical content, and whether mathematical methods are introduced, it shows that Ruse’s conclusion that “the concept of evolutionary progress must be bound to cultural values” on the grounds that “there is a gap between theory and evidence” is wrong. It should be noted that the historical material presented in Sections 2–4 serves the conceptual argument developed in Section 5, not the reverse: the paper’s primary aim is to articulate and defend a conceptual distinction (between cultural values and survival values), and the historical cases are selectively drawn upon to illustrate and test that distinction against Ruse’s empirical claims. A comprehensively historical treatment of evolutionary progress would require a separate study. When this paper refers to ‘progressivist cultural values’ without qualification, it means specifically directional optimism, anthropological exceptionalism, and the projection of social ideology onto nature, as defined above.

The impact of cultural values on arguments for evolutionary progress cannot be precisely quantified—not only because biologists may be unaware of cultural value influences on their views, but also because correlations between cultural values and scientific views do not establish causation. The four indirect indicators used in this paper (logical coherence of arguments, quantity of evidence, exclusion of non-empirical content, and integration of mathematical methods) nonetheless track features relevant to the question. Logical leaps in argumentation are where cultural values can enter to bridge evidential gaps; non-empirical mechanisms provide convenient vehicles for value-laden speculation; mathematical formalization constrains the range of permissible interpretations and makes assumptions explicit. These indicators yield no precise metric, but they capture dimensions along which the influence of cultural values varies systematically, and the resulting assessment, though approximate, is informative.

This paper argues that both McMullin's and Ruse's views have their merits. In the case of McMullin (as interpreted by Ruse and as the proponent of the gradual-exclusion view), although the particularity of the development of evolutionary theory seems to make his conclusion based on the history of physics inapplicable, the trend of pursuing epistemic values and thus weakening cultural values is indeed discernible: this can be confirmed by Ruse's own partial recognition of McMullin in his 2012 article [4]. As for Ruse, he correctly points out the particularity and complexity of the development of the idea of progress. Ruse's mistake lies in his failure to distinguish between cultural values and the survival values brought about by biological functions. The former can be separated from the concept of evolutionary progress, but the latter cannot. Survival value is a norm in nature. Selecting a specific perspective to study survival value may be guided by cultural values, but the description results do not necessarily contain cultural values, so the maturity of evolutionary biology will not be damaged. Ruse's failure to recognize this distinction has led to his self-contradictory attitude: on the one hand, he believes that evolutionary biology as a professional science needs to abandon value-laden terms such as evolutionary progress; on the other hand, he believes that evolutionary biology needs to discuss these contents, and that completely abandoning them would cause evolutionary theory to lose much. On the one hand, he believes that discussions about relative progress such as the "arms-race", "escalation", and the "Red Queen hypothesis" are only about success in one dimension and are only related to epistemic values; on the other hand, he claims that these contents are still metaphors sympathetic to the progressivist cultural values ([1], pp. 526–539). This paper contends that Ruse's contradiction dissolves once we recognize that what he takes to be residual cultural values in relative-progress discussions are in fact survival values—norms inherent in the biological phenomena themselves, not projections of human social ideology. Nevertheless, from Lamarck to Dawkins, in developing arguments about evolutionary progress, it has been possible to gradually exclude cultural values without abandoning the concept. Today, an objective standard of evolutionary progress—non-anthropocentric and free from cultural value influences—is achievable³.

2. Evolutionary Progress in Early Evolutionary Theory

This section provides a brief overview of the early discussions on evolutionary progress, focusing on the viewpoints of three evolutionists: Jean-Baptiste Lamarck, Herbert Spencer, and Charles Darwin. Additionally, it briefly outlines Thomas Henry Huxley's practice of dividing science into professional science and popular science. This paper argues that compared with the evolutionary progress views of Lamarck and Spencer, the influence of cultural values in Darwin's evolutionary progress is somewhat reduced. Huxley, for his part, promoted the division between professional and popular science and confined evolu-

tionary progress to the latter—an approach that illustrates the complexity and particularity of excluding cultural values in evolutionary theory.

The French biologist Lamarck was the first to systematically propose evolutionary progress. However, when he initially engaged in botanical research, he opposed the idea of evolution and progress, believing that such views would undermine plant taxonomy. As his research shifted to zoology, particularly the study of marine invertebrates, Lamarck observed a slow, gradual trend of morphological changes in fossils. This observation led him to change his stance and support the ideas of evolution and progress. The core of his theory is that evolutionary progress involves a gradual improvement from simplicity to complexity in organisms, driven by an inherent drive for perfection. Stimulated by this drive, organisms undergo changes in their organs through the law of use and disuse: frequently used organs become more complex and larger due to nervous fluid accumulation, while unused organs lose fluid and degenerate ([5], pp. 88–92). After acquiring these modifications, they can be inherited by offspring, a concept known as acquired inheritance. Over many generations, this process leads to continuous evolution from simplicity to complexity.

Although Lamarck's theory aligned with the progressivist ideology prevalent in French society, it failed to gain widespread acceptance due to multiple factors. A key reason was Georges Cuvier's scholarly work, which strongly refuted Lamarck's theory of evolution: Cuvier's framework better aligned with the limited empirical evidence available at the time. Based on early 19th-century fossil records, scholars frequently observed abrupt transitions (saltation) and discontinuous evolutionary trajectories from ancestral to descendant species. Such fragmented evidence could scarcely support the concept of gradual evolution. Consequently, Cuvier's theoretical system perpetuated the academic dominance of species fixity across continental Europe, a paradigm that persisted until the mid-19th century.

In the mid-19th century, Herbert Spencer, a contemporary of Darwin, may have exerted an influence surpassing Darwin's. Spencer's work relevant to this paper appeared in articles published in the *Westminster Review* between 1852 and 1857 ([1], pp. 183–186). Although both were influenced by Thomas Robert Malthus, Spencer's interpretation diverged fundamentally from Darwin's. Unlike Darwin, Spencer did not derive natural selection from Malthus' theory; instead, he proposed that resource scarcity induced an inverse relationship between an organism's self-sustenance capacity and its reproductive ability. For instance, he noted an inverse correlation between brain development and reproductive capacity. Population pressure triggered intense survival competition, compelling individuals to continually exercise their abilities to cope with competitive challenges. In this context, intellectual development was paramount. Although brain development reduced reproductive capacity, this adaptation not only helped control population numbers—thus avoiding the Malthusian trap—but also achieved a balance between organismal development and reproduction ([1], pp. 183–184).

In his 1857 paper [6], Spencer argued that the essence of evolutionary progress lies in the shift from homogeneity to heterogeneity—a continuous evolutionary process from simplicity to complexity, spanning changes from the universe to human civilization ([6], pp. 314). In the biological domain, although evidence is limited, a clear trend emerges: organisms with greater complexity gradually evolved in later geological periods. Over time, life's overall heterogeneity becomes more pronounced ([6], pp. 321–322). This is most evident in humans, the latest and most complex species. This phenomenon is observable as human civilization advanced: societies grew more heterogeneous, and the human species diversified due to population increases and differentiation. Spencer believed causality itself drives complexity development. Due to causal asymmetry, effects often exceed causes

in complexity ([6], pp. 354–356). Thus, complexification and heterogenization become inevitable outcomes of all systemic evolution. Later, Spencer integrated the concept of entropy from the second law of thermodynamics and German idealism into his framework. He argued that opposing forces act on a system, driving it toward equilibrium. However, homogeneous equilibrium is unstable. To achieve stability, the system evolves toward heterogeneity. Ultimately, it reaches static equilibrium—equivalent to the universe’s final state of maximum entropy ([1], pp. 186).

The publication of Darwin’s *On the Origin of Species* in 1859 was a crucial milestone in the development of evolutionary theory. Darwin’s ideas were both broad and profound, yet also contained ambiguity and vagueness, which provided rich theoretical resources for later scholars. Whether scholars supported or opposed evolutionary progress, they could find evidence in Darwin’s theory to support their views. In research from China, Li and Zhao’s paper “Did Darwin Reject the Concept of Evolutionary Progress?”, published in 2023 [7], argues that although Darwin initially held negative views on progress, as natural selection theory matured, Darwin grew increasingly confident in evolutionary progress ([7], pp. 152). This paper takes the same position, summarizing Darwin’s arguments on evolutionary progress across different periods.

In his early years, Darwin was inspired by Malthus to propose the theory of natural selection. However, at that time, he was hesitant about the view of biological progress. Those who opposed the idea of evolutionary progress, represented by Gould, mostly cited Darwin’s early manuscripts when referring to his views. Darwin’s explicit support for evolutionary progress first appeared in the latter part of Chapter 4, “Natural Selection,” in the third edition of *On the Origin of Species*. Darwin believed that the best criterion for evolutionary progress was the degree of specialization and differentiation in a species’ adult organs. Natural selection drives this progressive trend, enabling organisms to better perform their functions. In the fifth edition, Darwin removed the term “best” ([8], pp. 222). Compared with Lamarck’s criterion of complexity, this criterion introduced by the German biologist Von Baer, which Darwin cited, was more practical. Additionally, the fifth edition adopted a more assertive tone. Although Darwin hinted at other progress criteria in the third edition, his removal of “best” in the fifth edition led him to conclude that specialization and differentiation constituted the only reasonable and acceptable criterion for evolutionary progress.

Additionally, two other passages in *On the Origin of Species* support evolutionary progress. At the end of the chapter “On the Geological Succession of Organic Beings,” Darwin noted in the first edition that later organisms surpassed their predecessors in the struggle for existence and occupied a higher position in the natural hierarchy. This observation explained the vague yet ill-defined sentiment among paleontologists that the overall organization of life forms had progressed. In the third edition, Darwin inserted the phrase “these organisms have become more specialized” to define a higher position. By the fifth edition, he deleted “vague yet ill-defined” and replaced “sentiment” with “common belief” ([8], pp. 561). At the end of this book, Darwin asserted that natural selection acts solely for each organism’s benefit, so all bodily and mental endowments tend to progress toward perfection ([8], pp. 758). This statement remained unchanged in subsequent editions.

In 1872, in *The Descent of Man*, Darwin praised Von Baer’s criterion of evolutionary progress as the best standard and believed it consistent with geological evidence ([9], pp. 211). However, when discussing humans, he exhibited a social Darwinist tendency. In Volume I, Chapter 5, he cited accounts of the Celts and Saxons, portraying the Celts as having lower innate abilities and inferior qualities ([9], pp. 174). In Volume II, he expanded on sexual selection, and in its concluding sections, he addressed human sexual selection,

noting that differences in aesthetic preferences among populations led to the diversification of physical features. Overall, from the first edition of *On the Origin of Species* to *The Descent of Man*, Darwin increasingly supported evolutionary progress. For him, it was both an assumed premise of natural selection and a fact supported by geological evidence ([7], pp. 148).

Finally, a brief review of Thomas Henry Huxley's contributions to biological education is necessary, as his approach profoundly influenced his era and later generations. Although known for defending Darwin's theory, Huxley did not immediately accept natural selection, instead centering his own theory on Lamarckism. In public lectures, he often identified as an evolutionist but excluded evolution from professional science curricula. In 1900, a student questioned this inconsistency between his lectures and courses. Ruse argued that Huxley's evolutionary theory was essentially Spencerian—a blend of science and philosophy. However, Huxley himself opposed combining science and philosophy, viewing it as harmful to scientific progress. Moreover, evolutionary theory conflicted with his advocacy for scientific education that excluded cultural values, leading him to exclude it from professional science ([1], pp. 218–221). Huxley's approach fostered a binary model in the 20th century: in professional science, evolutionists avoided the concept of evolutionary progress; in popular science, vague terms and cultural values filled gaps between theory and evidence. Evolutionists did not have enough motivation to exclude cultural values, resulting in cultural values remaining dominant in popular science for a long time⁴.

3. Evolutionary Progress in the Modern Evolutionary Synthesis

About 60 years after Darwin's *The Descent of Man*, evolutionary theory was dominated by neo-Lamarckism and orthogenesis, largely because the mechanism of natural selection had not yet been widely accepted. Julian Huxley vividly referred to this period as "The Eclipse of Darwinism" ([10], pp. 22). In the 1930s, the development of population genetics promoted the resurgence of Darwinism. Subsequently, the combination of population genetics and evolutionary theory gave birth to the Modern Synthesis in the 1940s, a term derived from Huxley's 1942 seminal work *Evolution: The Modern Synthesis*. This section briefly outlines the discussions on evolutionary progress by population geneticist Sewall Wright, evolutionist Julian Huxley, and paleontologist George Gaylord Simpson during this period, as well as the establishment of the status of evolutionary biology as a professional science in the United States.

Wright's most important contribution to the exclusion of cultural values in evolutionary progress was the introduction of the concept of the "adaptive landscape" in 1932. By incorporating mathematics, he made the "adaptive landscape" concept operable, which means that the influence from cultural values would decline. Ruse pointed out that the "adaptive landscape" can be regarded as an alternative concept for discussing evolutionary progress in only one dimension. This concept later legitimately appeared in professional evolutionary theory. Wright's argument for evolutionary progress can be summarized as follows: Suppose a small population splits off from a large one, while occasional gene flow exists between them, so that the small population would not go extinct due to extreme inbreeding. Natural selection drives the large population to cluster around a peak, but if there is another higher peak, natural selection cannot directly move the large population to the new peak. This requires the rapid passage of the small population through the valley to reach a new adaptive peak through the action of genetic drift. Then, through gene flow, the new advantageous genes appear in the original large population, altering the topography of the adaptive landscape, ultimately leading the entire population to a new peak under the impetus of natural selection ([1], pp. 371–373).

As one of the representatives of the Modern Synthesis, Julian Huxley was the grandson of Thomas Huxley. He did not accept the division between professional and popular science proposed by his grandfather. His most systematic argument for evolutionary progress can be found in the last chapter of *Evolution: The Modern Synthesis* in 1942 [10].

Huxley believed that to derive an objective definition of evolutionary progress, it was necessary to base it on the conclusions of paleontologists. The paleontologists reached a consensus on what constituted the dominant species, and Huxley then listed the dominant species of various geological periods. Based on this, Huxley believed that the standard of progress was either a stronger control over the environment or a greater independence from the environment. Subsequently, Huxley believed that it was necessary to distinguish specialization from evolutionary progress. Specialization, although it also met the definition of progress, was limited and would ultimately reach a dead end, whereas truly sustained progress was rare. Huxley continued to cite paleontological evidence, pointing out that the fossil record of the most recent geological periods showed that most species had not changed. This, combined with Edward Drinker Cope's law of the unspecialized, led Huxley to conclude that existing organisms had exhausted the potential for evolution, and thus he concluded that evolution had largely come to an end. Only humans could continue to evolve through conceptual thinking. Huxley also envisioned that in the near future, humans would migrate to other planets, representing a new step in evolutionary progress. Relying on conceptual thinking, humans had become an independent line of radiation—a phenomenon appearing for the first time in a single species. Therefore, although Huxley believed that the history of life evolution has no purpose, he thought that one could look for a suitable purpose for humanity in the purposeless universe based on the past evolutionary history. That is, humans are the only trustee of evolution. In order to maintain our status as trustee of evolution, humans need to ensure that we are not falling behind other species in the mainstream of evolution, based on the six universal trends manifested in past evolution ([10], pp. 556–578).

Another representative who discussed evolutionary progress more deeply in the synthetic theory of evolution is Simpson, who was about 15 years younger than Huxley. They were both friends and rivals. In the 1950s, Simpson and Huxley had a debate about evolutionary progress. Although both supported evolutionary progress, they held significantly different views, particularly regarding the details of their arguments, especially concerning the evolution of equine animals. Huxley believed that evolution had largely come to an end and that future evolution would be linear. Simpson, on the other hand, thought it premature to assert whether the potential for biological evolution had been exhausted, and he refuted Huxley's linear evolutionary vision ([11], pp. 67–68).

The discussion of evolutionary progress by Simpson adhered to the division between professional and popular science, which was also endorsed by most evolutionists of the time. In his 1949 popular science book *The Meaning of Evolution* [12], Simpson argued that the standards of evolutionary progress are diverse. While humans are the highest in many standards and overall, it is necessary to acknowledge that other forms of life may excel humans in certain aspects of progress. Simpson examined 16 previous standards and categorized them into three types: invalid, subjective, and objective. Invalid standards refer to those that are fictional, poorly defined, or lack operationality, including six standards such as replacement within the adaptive zone, improvement in adaptation, the possibility of further progress, independence from the environment, structural complexity, and relative degrees of difference from a common ancestor. Subjective standards are anthropocentric standards that only apply to humans, including the ability to cope with a greater variety of environments and control the environment. Simpson pointed out that subjective standards are not fictional; they represent a part of the reality of evolutionary history. The fallacy

of anthropocentrism lies in applying subjective standards to other organisms. Objective standards are universal standards that can be applied to multiple species or lineages. The most ideal objective standard is one that applies to all species, but most objective standards do not meet this requirement. Objective standards include expansion of life, dominance, invasion of new adaptive zones, specialization, increase in general energy, prenatal and postnatal care, awareness and perception of the environment, and individual versatility, totaling eight standards. The ranking of humans in these objective standards is as follows: dominance is one of the highest, specialization is lower but humans have unique features, increase in general energy is very high but not the highest, and in addition to these, humans rank the highest in the remaining five standards ([12], pp. 107–122). For Simpson, an objective standard of progress requires rejecting the supernal perfecting principle, the concept of a goal in evolution, and the idea of control of evolution by autonomous factors. Although progress exists in evolution, evolution is not always accompanied by progress. The types of progress are diverse, and humans do not occupy the highest point in all standards of progress. However, overall, there is no doubt that humans represent the pinnacle of evolutionary progress.

The development of evolutionary biology experienced another significant turning point in the 1950s, as it gained professional scientific status. In the United States, for example, Theodosius Dobzhansky, Simpson, and Ernst Mayr made significant contributions to the professionalization of evolutionary biology. They advocated for the establishment of evolutionary biology faculty positions at universities, the offering of specialized courses, and the founding of academic journals. After evolutionary biology became a professional science, the use of the concept of evolutionary progress significantly decreased, as scholars from Thomas Huxley to Simpson believed that this concept was deeply influenced by cultural values. For instance, the journal *Evolution*, founded in 1947, explicitly stipulated that research must be on experimentation, or epistemic activities with the virtues of experimentation: hard evidence, the exercise of control, and the use of measurement. Content related to philosophy, including teleology, orthogenesis, and phylogenetic speculation, was explicitly prohibited ([1], pp. 445–448). Although Julian Huxley, Simpson, Mayr, and others have all contributed to decoupling the concept of evolutionary progress from its teleological connotations, the concept of evolutionary progress is still rejected. However, the value-laden term “adaptive landscape” could legitimately exist within professional evolutionary biology. This demonstrates that professional evolutionary biology does not exclude value-laden terms as such, but rather opposes the concept of evolutionary progress specifically—a fact that, as we argue below, reflects not only the legacy of cultural-value entanglement but also a confusion between cultural values and survival values.

4. Evolutionary Progress in the Post-Synthesis Period

Ruse used the terms “Synthesis” and “Post-synthesis” to distinguish between the biologists who established the modern evolutionary synthesis and promoted the professionalization of evolutionary biology, and those who followed. Among the post-synthesis figures, Richard Dawkins’ argument for evolutionary progress—comprising the arms race model and an objective criterion for progress—deserves particular attention.

In *The Blind Watchmaker* [13], Dawkins compares the competition for survival caused by natural selection to an arms race. He distinguishes between two types of arms races: symmetric arms races within a species and asymmetric arms races between species. The former involves competition with similar selection pressures—for example, trees competing for sunlight, leading to increased height over time. The latter involves competition with different selection pressures due to the varying needs of the parties involved—for instance, cheetahs and gazelles, where cheetahs improve hunting techniques such as faster running,

increased strength, and sharper teeth, while gazelles enhance escape abilities including greater speed, improved agility, and higher reproductive capacity. Dawkins argues that although evolution is not inherently progressive, the progress in evolution mainly arises from arms races. These races generate cumulative selection pressures, driving participating species to progress continuously, ultimately resulting in complex designs ([13], pp. 178–193).

Dawkins further explains four points regarding the metaphor of an arms race. First, if the environment remains stable, the arms race may stagnate after a period because improvements come with costs. For instance, if cheetahs and gazelles evolve to run faster, the required costs increase until they become unaffordable, leading to the end of the arms race. This also explains degeneration: species may fail to maintain past improvements in new environments, making it beneficial to lose or suppress those improvements. Therefore, the arms race metaphor does not represent a Victorian era inevitable upward progression; it allows improvement to be non-continuous, with stagnation and regression possible at any time. The end of an arms race can cause a species' sudden extinction, followed by the start of a new arms race. Second, species may face multiple arms races simultaneously due to multiple competitors, resulting in diverse natural selection pressures. Third, both sides constantly progress, maintaining a balance, such that the cheetah's hunting success rate does not increase. However, if hunters and prey from different eras met via a time machine, the earlier species would be eliminated. Fourth, the arms race does not benefit the population; it imposes a significant economic burden that is wasteful overall. For example, competition among trees encourages each to grow taller than its neighbors. If all trees reduced height simultaneously, it would save substantial costs for the population, but natural selection ignores population interests ([13], pp. 178–193).

To refute Stephen Jay Gould's view that random forces dominate evolution, Dawkins metaphorically likened the process of achieving complex design to "Climbing Mount Improbable," the title of his 1996 book [14]. The term "improbable" signifies the near-zero probability of achieving complex design through pure chance alone. Creationists have challenged Darwinism with analogies such as the chance of nature forming a functional enzyme being akin to a tornado assembling a Boeing 747 in a junkyard. Although this probability is not zero, it is implausible for multiple such events to occur within Earth's limited evolutionary history. Therefore, complex design is more likely achieved gradually through cumulative selection. Dawkins further noted that evolution is often misunderstood as a purely random process. This misconception stems from the randomness of mutations, which provide the raw material for natural selection. While some argue that mutations may not be purely random, the crucial factor is natural selection's non-random process acting on variations ([14], pp. 75–82). Thus, complex structures like functional enzymes and well-adapted eyes accumulate through the directional force of natural selection. This reveals how organisms can scale Mount Improbable.

In 1997, Dawkins [15], in his review of Stephen Jay Gould's *Full House*, refuted Gould's arguments and proposed an objective standard of evolutionary progress. Dawkins argued that although Gould's critique of anthropocentric standards (e.g., complexity) effectively challenged only one aspect of the evolutionary progress view, progress standards can still be identified from a non-anthropocentric perspective. In most lineages, evolutionary progress occurs toward a specific direction, but the adaptive advantage traits unique to humans (e.g., intelligence and complexity) are not the typical evolutionary path for most lineages. Therefore, Dawkins defined evolutionary progress as the accumulation of adaptive advantageous features across various lineages. In the short to medium term, the trend of progress can be predicted until a major extinction event occurs, and then a new phase of evolutionary progress begins [15].

Dawkins' arms race model and progress standard offer a reasonable account of short-term progress, as the responses of his opponents confirm. In 2002, Gould accepted that Darwin's reasoning and developmental ideas were sound, which amounted to recognizing the objective progress driven by arms races at the micro level, while maintaining his original stance at the macro level ([16], pp. 1320–1321). Ruse, sharing a similar viewpoint, contends that in contemporary evolutionary biology, the relative progress embodied in the arms race model is successful: these issues relate to defining success criteria in specific dimensions, and are epistemically trouble-free. However, regarding absolute progress, Ruse asserts that no satisfactory standard exists in academia ([1], pp. 534–536).

5. How the Development of Evolutionary Progress Reflects the Gradual Exclusion of Cultural Values

5.1. Clarifying the Distinction: Cultural Values, Epistemic Values, and Survival Values

Before presenting the historical argument, we must first clarify the specific meaning of the statement in this paper: "The pursuit of epistemic value gradually excludes cultural values, and the concept of evolutionary progress is ultimately free from the influence of cultural values." This paper acknowledges the importance of cultural values and subjective factors in science, but this does not mean they can legitimately permeate every detail of scientific research.

We distinguish among three categories of value that are relevant to the concept of evolutionary progress but are often conflated in the existing literature. The first category is epistemic values: values such as predictive accuracy, internal coherence, and explanatory power that are presumed to promote the truth-like character of science. These are not at issue in the present debate: both McMullin and Ruse accept their legitimate role in science. The second category is cultural values (non-epistemic values in McMullin's terminology): values originating from the social, political, religious, and ideological contexts in which scientists operate, such as beliefs in social progress, anthropocentrism, providentialism, and Marxism. These are the values that McMullin argues are gradually excluded as science matures, and that Ruse argues cannot be excluded from evolutionary biology. The third category—and the one that we argue Ruse systematically conflates with the second—is what we call survival values: the norms in nature that reflect differential survival and reproductive success arising from differences in the functional performance abilities of organisms. A cheetah that runs faster has a survival advantage over one that runs slower not because of any human cultural projection, but because of the causal relationship between running speed and prey capture in the cheetah's ecological context. This norm is a "value-laden fact"—a fact about the world that carries normative implications for the organisms in question, independent of human evaluation⁵.

The crucial question is: when evolutionary biologists discuss "progress" in terms of improved functional performance along a specific dimension (e.g., running speed in a predator–prey arms race, or the accumulation of adaptive features in a lineage), are they importing cultural values into their scientific discourse, or are they describing survival values that are constitutive features of the biological phenomena themselves? Ruse's answer is the former; this paper argues for the latter.

This distinction helps explain a puzzling feature of the historical trajectory. Why was the term "adaptive landscape" accepted by professional evolutionary biology while "evolutionary progress" was rejected, even though both carry normative implications? The answer is that the adaptive landscape, when used in a relative sense to compare fitness within a population in a stable environment, tracks survival values—the differential reproductive success that is a measurable biological fact. In contrast, the concept of "evolutionary progress" in its traditional formulations carried the unmistakable imprint of cultural val-

ues: the idea that evolution has a direction, that humans represent its culmination, and that this direction aligns with moral or social improvement. The professional rejection of “evolutionary progress” was thus a rejection not of all normative content in biology, but specifically of cultural-value-laden normative content. The confusion arose because Ruse and others did not distinguish between these two sources of normativity.

This distinction is what allows us to evaluate the history of arguments for evolutionary progress and to determine whether the gradual exclusion of cultural values is a real trend or, as Ruse contends, an illusion masking the substitution of one cultural value for another.

5.2. *A Preliminary Distinction: Two Types of Argument for Evolutionary Progress*

We now distinguish between two patterns of argument that are often conflated in discussions of evolutionary progress.

Argument 1: Major premise—“Homo sapiens possess the highest level of intelligence”; minor premise—“Intelligence is selected as the criterion for progress”; conclusion—“Under this criterion, Homo sapiens are the most advanced organisms.” If the major premise holds, the conclusion should not be questioned: it merely indicates that Homo sapiens are the most advanced when intelligence is taken as the criterion for progress. This paper argues that this conclusion embodies epistemic value, and the reasoning process is free from the influence of cultural values, with no logical leaps.

Argument 2: The major and minor premises are the same as in Argument 1, but the conclusion is “Homo sapiens are the most advanced organisms” (without qualification). This paper argues that this conclusion contains an obvious logical leap, which can only hold if other criteria for progress are ignored. A certain cultural value of the researcher permeates the conclusion through the vaguely defined concept of “most advanced,” making the conclusion reflect human subjective desires and undermining the truth-like character of science. Thus, the reasoning process of Argument 2 is influenced by cultural values. Based on the above distinction, this paper examines the topic of “the concept of progress avoiding the influence of cultural values” from a relatively narrow perspective in the relationship between science and values. From a broader perspective, Argument 1 may also implicitly contain cultural values: for example, the reason that prompts researchers to choose intelligence as a criterion may be anthropocentric cultural value (a non-epistemic value), but this does not lead to logical leaps in the argument. Borrowing McMullin’s view that “Newton’s use of theological arguments in mechanics is acceptable” ([2], pp. 703), the non-epistemic value in Argument 1 functions as an epistemic factor.

5.3. *Three Stages in the Exclusion of Cultural Values*

The development of evolutionary progress can be divided into three stages, distinct from previous divisions of evolutionary biology. The first stage involves the non-Darwinian paradigm of evolutionary progress, represented by Lamarck and Spencer; Darwin, as a pivotal figure of this era, requires distinct analysis. The second stage features anthropocentric evolutionary progress under the Darwinian paradigm, exemplified by Julian Huxley. The third stage encompasses non-anthropocentric evolutionary progress under the Darwinian paradigm, represented by Simpson and Dawkins. Across these stages, the influence of cultural values on evolutionary progress gradually diminishes.

In the first stage, the influence of cultural values on evolutionary progress was highly significant, mainly due to the lack of evidence and the abundance of non-empirical content. This is first manifested in Lamarck and Spencer’s agreement on integrating science and philosophy, which permitted social progress and anthropocentric cultural values to permeate deeply into arguments for evolutionary progress. Secondly, Lamarckism’s primary issue is its non-empirical evolutionary mechanism: organisms exhibit an inherent drive

toward perfection, yet apart from humans, we cannot determine whether other organisms share this purpose. Even with experimental methods introduced in early 20th-century neo-Lamarckism, it remains impossible to distinguish experimentally whether advantageous trait improvements arise from current generation use/disuse or inheritance from prior generations. Such a non-empirical mechanism facilitates the convenient intrusion of cultural values. Moreover, the neural fluid and its mechanism in Lamarckian evolution are entirely fictional. Furthermore, Spencer's evolutionary theory is primarily based on philosophical construction rather than science, and its supporting evidence is limited.

In contrast, Darwin's evolutionary progress based on natural selection leaves far less space for cultural values. This is because the mechanism of natural selection itself is empirically verifiable, and Darwin provided a richer variety of evidence. Although the theory was not widely accepted for decades after its proposal, this was not because it failed to satisfy scientific criteria, but rather because, compared with Lamarckism, its social metaphor was not popular among the middle-class in the 19th century. This confirms McMullin's view that non-epistemic values were indeed the dominant factor in the early development of evolutionary theory. However, as evolutionary theory gradually matured, non-empirical elements such as "use and disuse", "nervous fluid", and "the internal effort of organisms towards perfection" could not persist. Therefore, it was only a matter of time before natural selection replaced these theories. Today, few biologists regard natural selection as a dubious theory of subjective construction; instead, they recognize it as a real mechanism. Therefore, Darwin's argument for evolutionary progress through natural selection has far less influence on cultural values than Lamarckism. Moreover, while Lamarckians relied only on limited fossil evidence, Darwin provided new evidence from biogeography, comparative anatomy, and artificial selection analogies. Although the gap between theory and evidence was not completely bridged by the new evidence, it narrowed significantly compared to Lamarckism.

Although Darwin narrowed the gap between theory and evidence, he was still influenced by cultural values, and this influence became more evident in the later stage. Gould pointed out that Darwin showed a compromise with the progressivist ideology at the end of *On the Origin of Species* ([19], pp. 141–145). This compromise may have led him to confuse relative progress with absolute progress, because in his argument, natural selection can only ensure local and relative progress. This paper analyzes from the logical argument: Darwin believed that sexual selection is independent of natural selection and is mainly determined by the subjective will of females. Therefore, different from natural selection, sexual selection does not necessarily bring progress. However, when he emphasized the importance of sexual selection in the differentiation of human races, he strengthened his confidence in evolutionary progress. According to the theoretical logic, the increase in the importance of sexual selection should weaken rather than strengthen the confidence in progress. Obviously, Darwin's enhanced confidence in evolutionary progress in the later stage was not driven by objective evidence but by cultural values. Even so, compared with the degree of cultural value penetration in Lamarckism, Darwin was still significantly less influenced by it.

Based on this, perhaps it is more appropriate to place Darwin in the second stage, because it is difficult to judge whether Darwin or Julian Huxley was more influenced by cultural values. Huxley's error lies in overlooking anthropocentric biases in paleontology and logical leaps in argumentation that create ambiguity in the progress standard. On the surface, Huxley's standard emphasizes control and independence from the environment, but he believed true progress required this process to continue indefinitely ([11], pp. 70). For those situations where continuous progress cannot be achieved, Huxley prefers to call it specialization. Therefore, by bridging the gap between evidence and the real progress with

anthropocentric cultural values, Huxley mistakenly assumed the standard was universally objective. Additionally, as Simpson noted, the problem with anthropocentric progress views lies not in fiction but in extending standards applicable only to humans to other lineages.

In the third stage, the influence of cultural values further diminished, which was largely due to the combined application of Wright's concept of the adaptive landscape and mathematical tools. When analyzing Wright's discussion of relative progress, Ruse himself failed to find any evidence related to Wright's cultural values. Only when Wright addressed absolute progress did cultural values emerge, and this was evident solely in his 1931 correspondence with Fisher and 1978 interviews with Ruse ([1], pp. 373–380). Moreover, using fitness as a progress standard makes comparing fitness across populations in short-term stable environments solely a technical matter, devoid of cultural value infiltration. This also explains why the adaptive landscape, as a normative term, can be accepted by professional evolutionary biology: science needs to exclude cultural values rather than all values. The normativity of the adaptive landscape is a survival value, not a cultural value.

In strictly understood scientific research practice, we need to exclude the influence of cultural values and only retain epistemic values. However, on a broader level, non-epistemic values can sometimes exist as epistemic factors. Nevertheless, these factors cannot penetrate the argumentation process or replace the objective evidence required by theories, otherwise, they will distort our understanding of the world. In evolutionary biology, the third kind of value—survival value—reflects the differences in survival and reproductive success rates caused by differences in the functional performance abilities of individuals. In essence, it is a “value-laden fact” [17]. This term is inspired by Stephen C. Pepper's “the fact of value” ([20], pp. 286). The above three types of values are necessary components for discussing the concept of evolutionary progress, which reflects the entanglement of factual and value judgments in biology [18].

Returning to the biologists' discussion of evolutionary progress, Simpson divided the standard of progress into three categories. In his analysis of objective standards, he found that humans did not occupy all the peaks, which marked a crucial step towards non-anthropocentrism; this was achieved by examining different standards of progress from a broader perspective and acknowledging the limitations of humans themselves. Yet a contradiction runs through Simpson's work: although he believed that there are eight objective standards (there is not enough space in this article to analyze whether the eight criteria found by Simpson are really as objective as he claims), he did not incorporate these standards into the framework of professional evolutionary biology for discussion. As an important figure in the professionalization of evolutionary biology in the United States, his avoidance of incorporating these standards may stem from a compromise on the view that the concept of “evolutionary progress” carries cultural values. In the academic context at the time, the concept of “evolutionary progress” was always theoretically associated with teleology, Lamarckism, and orthogenesis. The historical stigma of this concept compelled Simpson to refrain from directly using the term “evolutionary progress” in professional evolutionary biology, even though he argued for the non-teleological characteristics of objective standards of progress. Instead, he used the concept of the adaptive landscape as a substitute. Therefore, Simpson's limitation of the concept of evolutionary progress to popular science reflects the influence of the cultural values of the academic community—not the cultural values purportedly embedded in the concept of progress itself, but the institutional norms and disciplinary anxieties of mid-20th-century evolutionary biology.

As a scholar of the post-synthesis era, Dawkins did not adhere to the academic norms and constraints of professional evolutionary biology. Dawkins has made significant contributions in the field of popular science. His major contributions in popular science blurred,

for him, the line between professional and popular science ([1], pp. 469–470). This blurring had positive implications, because discussions about evolutionary progress demand scientific rigor rather than the evasion of difficult issues or the infiltration of cultural values into popular science. Dawkins' proposed arms race model gained widespread acceptance, including among opponents. The standard of progress he established—accumulating adaptive advantageous features across various lineages—applies to any lineage and is practically applicable.

Does Dawkins' argument of the arms race model and the criteria for progress completely avoid the interference of cultural values? In Bernd Rosslenbroich's work in 2006 [21], he analyzed that as a scientific term, "evolutionary progress" needs to include four levels, change, order, direction, and general patterns, and rejects the fifth level, the normative content represented by anthropocentrism (which corresponds to cultural values). In addition, the previous use of the concept of evolutionary progress involves a combination of five elements: (1) Modifications in the living world generate increasingly higher organisms (however they are characterized). (2) These higher organisms are in certain ways better than lower ones ("improvement"). (3) This progression is more or less linear. (4) Evolution has an inbuilt force that drives this progress. (5) Progressive evolution leads eventually to some sort of perfection (end stage, culmination point, goal). Rosslenbroich pointed out that the Darwinian concept of evolutionary progress rejects the latter three elements and also believes that the second element is unnecessary because Darwinism does not necessarily lead to improvement. Therefore, only the first element is necessary for evolutionary progress [21]. Dawkins' use of the concept of evolutionary progress meets Rosslenbroich's requirements: his criteria for progress describe the content of the four levels. For example, identifying the adaptive characteristics of bacterial lineages, bacteria with more such characteristics perform better in the relevant functional dimensions. This does not include anthropocentrism. And Dawkins does not insist on the inevitability of progress: he only predicts the gradual accumulation of improvement when the environment is stable, thus excluding the second element and only retaining the first element.

After Dawkins, subsequent scholars have attempted to explore evolutionary progress on a long-term scale. Due to the randomness of environmental changes and the uncertainty of mass extinctions, such research only relies on retrospective analysis. Howard developed a new Selective Effect theory from a naturalistic perspective in 2020 [22]. This theory holds that the comparison of the functional advantages and disadvantages of organisms needs to be based on a shared history of natural selection. Such comparison requires biologists to first determine the research topic, then select samples that fit the topic through a retrospective of the life history, and then establish a lineage for certain traits or functions. Some lineages can span long time-scales, such as the eye lineage. In short, within a specified lineage, later samples perform better functionally than earlier ones [22]. Howard's framework requires no appeal to anthropocentric standards, no teleological assumptions, and no value judgments that originate outside the biological phenomena themselves. The standard of "better functional performance" is internal to the lineage under study: it is defined by the selective history of the traits in question, not by the cultural preferences of the investigator. This paper argues that Howard's argument for long-term progress also conforms to the four levels of content that Rosslenbroich believes the concept of evolutionary progress should describe, and it only includes the first element. In Howard's framework, "better" means better at performing the function that the trait was selected for, given the specific selective history—a survival value, not a cultural value.

To summarize the trajectory traced in this section, Wright's "adaptive landscape" (not used in an absolute sense), Dawkins' arms-race model and the short-term progress standard, and Howard's "functional improvement" standard can all yield genuine insight

into the history of life. In a strict sense, these contents have nothing to do with cultural values. McMullin's gradual-exclusion thesis is fundamentally correct, while Ruse's view that the concept of evolutionary progress is necessarily bound to cultural values is wrong. In a broader sense, even if biologists choose a certain standard to study a certain natural norm out of some cultural value motivation, as long as this does not distort our perception of natural phenomena, the "truth-like" characteristic of science can still be maintained. Today, few would think that the better performance of function in species A than in species B is merely a subjective construction of cultural values.

6. Conclusions

This paper aims to refute the conclusions of Ruse's 1996 study. By briefly reviewing the development history of the idea of evolutionary progress in evolutionary biology, it roughly determines through indirect means that the influence of cultural values is gradually decreasing. In strictly defined scientific research practices, the influence of cultural values will eventually disappear. Although cultural values such as social progress, scientific progress, and anthropocentrism initially inspired biologists to understand the history of life from the perspective of biological progress, these cultural values (non-epistemic values) cannot replace evidence or serve as a theoretical basis, and thus cannot legitimately persist in evolutionary biology as a mature science. Several developments bear this out: the eliminating of non-empirical content in Lamarckian views on evolutionary progress; the clarification of the definition of progress; the introduction of mathematics to make it operable; the rejection of the illegitimate extension of the anthropocentric standard in Darwinian views to other organisms or lineages; and the recognition that biological progress is not inevitable. Together these show that cultural values are gradually being excluded. When the concept of evolutionary progress only contains epistemic values and epistemic factors, it is actually a description of a certain norm in nature—a survival value—rather than a projection of subjective impressions onto biology.

Ruse's view is, nonetheless, partially correct. He reveals the tortuousness and particularity of the process of excluding cultural values from the concept of evolutionary progress. This insight has two sources: First, Thomas Huxley's practice of limiting evolutionary progress to the field of popular science—a field that does not require strict academic norms—slowed the exclusion of cultural values. From the time when Lamarck first proposed complexity as the standard of evolutionary progress in the early 19th century to the time when Dawkins established the arms-race model in 1986 and the universal objective criteria of progress in 1997, nearly two centuries had passed. Second, the exclusion of the concept of evolutionary progress during the professionalization of evolutionary theory also came from the influence of other cultural values. This might have been far more important than the pursuit of epistemic values in the United States in the mid-20th century. This may lead to Simpson being reluctant to use this concept in the theory of evolution as a mature science, even though he proposes that the objective criteria for progress are non-teleological.

However, Ruse believes that today's evolutionary biology has not reached the highest standard disciplinary paradigm of a mature natural science because it has not completely excluded cultural values. This paper argues that Ruse's view is wrong. It confuses the human cultural values in the concept of evolutionary progress with the survival values of organisms themselves. The former comes from the ideas in biologists' minds and is unnecessary; the latter comes from natural phenomena and cannot be separated from the concept of evolutionary progress. Since Ruse did not make a further distinction between values, he thought that the values that could not be removed from the evolutionary

progress were cultural values, ignoring the survival values. Eventually, he reached two self-contradictory views in the conclusion of Monad to Man.

In an article published in 2012 [4], Ruse may have partially recognized the problems in his previous conclusions and changed some of his views. First, he admitted the existence of survival value; second, he admitted that the pursuit of epistemic value had partly displaced cultural value. However, he still adhered to the view that evolutionary progress was necessarily linked to cultural value, believing that biologists who believed in progress tended to seek epistemically reasonable mechanisms ([4], pp. 675–680). This paper argues that Ruse has always had some misunderstandings about McMullin's views. While defending the objectivity of science, McMullin admitted that subjective factors and non-epistemic values within science might still persist. In particular, he recognized that non-epistemic values might function only as epistemic factors. Therefore, even if biologists conduct research on progress motivated by certain cultural values, their conclusions may not necessarily distort our understanding of the world.

Two questions remain open. The distinction between cultural values and survival values rests on the notion of a “norm in nature,” which requires more systematic philosophical analysis than could be provided here, particularly in its relationship to debates about naturalism, teleology, and the fact–value distinction in biology. The McMullin–Ruse debate, moreover, is not the only framework for understanding how normative concepts persist in evolutionary biology; Hilary Putnam's argument for the collapse of the fact–value dichotomy offers an alternative worth contrasting with the position defended here.

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Notes

- ¹ At a deeper level, the debate between McMullin and Ruse is a debate about the nature of scientific rationality. For McMullin, epistemic values are manifestations of scientific rationality: they are the operative principles that make science a rational enterprise capable of producing truth-like knowledge about the world. This understanding of epistemic values as constitutive of rationality is developed across McMullin's broader corpus, including his work on the relationship between the rational and the social in the history of science, his analysis of how scientific rationality is shaped by both construction and constraint, and his engagement with Kuhn on rationality and paradigm change. Ruse, by contrast, adopts a methodological pragmatist stance that tends to avoid the concept of rationality in favor of a more constructivist interpretation of scientific values—treating epistemic values less as manifestations of rationality and more as conventions adopted by scientific communities for practical reasons. These divergent philosophical presuppositions about rationality shape their different historical interpretations of evolutionary biology. A full exploration of this disagreement lies beyond the scope of this paper, and the present argument does not depend on adjudicating between these meta-level positions. Even if one grants Ruse's pragmatist framework, the historical evidence shows that the

exclusion of cultural values follows a trajectory consistent with McMullin's model, and Ruse's counter-argument fails on its own terms due to the confusion between cultural and survival values identified below. For McMullin's treatment of scientific rationality, see: Ernan McMullin, "The Rational and the Social in the History of Science," in J. R. Brown (ed.), *Scientific Rationality: The Sociological Turn* (Dordrecht: Reidel, 1984), pp. 127–163; "The Shaping of Scientific Rationality: Construction and Constraint," in Ernan McMullin (ed.), *Construction and Constraint: The Shaping of Scientific Rationality* (Notre Dame, IN: University of Notre Dame Press, 1988), pp. 1–47; "Rationality and Paradigm Change in Science," in P. Horwich (ed.), *World Changes: Thomas Kuhn and the Nature of Science* (Cambridge, MA: MIT Press, 1993), pp. 55–78.

- 2 The connotation of progressivist cultural values is extremely broad, making it difficult to formulate a standard and comprehensive definition. Since this paper focuses on the influence of progressivist cultural values on the concept of evolutionary progress, with a time span ranging from Lamarck to Dawkins, the concept adopted here is not completely identical to the connotation of progressivism prevalent in Western countries today. Therefore, this paper will not impose a strict definition on "what progressivism essentially is", but instead sort out Ruse's 1996 work [1] to examine how he employed this concept in his own texts. The connotation of progressivism varies across different periods, countries, and the contexts of different biologists. Before the modern era, only the two metaphors of The Great Chain of Being and The Tree of Life in Christianity can be regarded as the embryonic forms of progressivism. By the Age of Enlightenment, progressivism had taken three forms: French radicalism, British pragmatism, and German idealism. Progress in the French context mainly referred to the political and social dimensions, while also covering fields such as morality, ideology, and science; progress in Britain focused more on the economic dimension, extending to technology and social spheres; the German idea of Progress was rooted in Christian idealism, with strong teleological and deterministic traits, interpreting human history as a continuously upward climbing process. In the 19th century, the prevalent progressivism in the United States had been tightly intertwined with providentialism, making it nearly impossible to separate the two. From Ruse's perspective, biologists committed to the idea of biological progress do not uniformly subscribe to a single fixed doctrine, but instead typically hold positions that draw from one of the aforementioned ideologies and its subsequent variants, or a composite of two or more ideologies and their corresponding variants.
- 3 As noted in the Introduction, the omission of a full treatment of eugenics is a deliberate limitation of scope. The eugenics case is compatible with this claim: eugenic arguments typically involved precisely the kind of logical leap identified in Section 5.2, in "Argument 2" (from descriptive claims about differential reproduction to normative claims about social policy), and the rejection of eugenics by the mid-20th-century scientific community can itself be seen as an instance of the exclusion of cultural values from evolutionary biology. A full treatment of this topic would require a separate study.
- 4 Thomas Huxley's fact–value distinction has itself been subject to significant scholarly criticism. Christopher Cosans, in his study of Huxley's ethical thought, has argued that Huxley's separation of facts from values was poorly grounded and had dangerous consequences for race theory in the late 19th and early 20th centuries (see Christopher Cosans, *Owen's Ape & Darwin's Bulldog: Beyond Darwinism and Creationism*, Indiana University Press, 2009, Chapter 10). While this historical critique raises important questions about the foundations of Huxley's framework, the present paper's argument does not depend on accepting Huxley's distinction as correct. Rather, the point is that Huxley's institutional practice—whatever its philosophical merits—created a lasting structural division in how evolutionary biology was practiced and communicated, and that Ruse's reliance on this division as part of his argument against McMullin inherits the complications that this division introduced.
- 5 The term "survival value" is inspired by Stephen C. Pepper's concept of "the fact of value" in his work on value theory, as well as by more recent discussions in the philosophy of biology concerning the normativity of biological functions. The key idea is that biological functions ground a kind of normativity that is internal to the living world: organisms can perform their functions better or worse, and this difference has real causal consequences for survival and reproduction. This normativity is not projected onto nature by human evaluators; it is discovered by them. For a related discussion, see [17,18] in the References.

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