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THE VARIETIES OF DARWINISM: EXPLANATION, LOGIC, AND WORLDVIEW

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ABSTRACT

Ever since its inception, the theory of evolution has been reified into an “-ism”: Darwinism. Although biologists today, by and large, do not use the term “Darwinism” in their research, it still enjoys currency in broader academic and societal contexts. “Darwinian approaches” proliferate across the sciences and humanities and, in public discourse, various so-called “Darwinian views on life” are perceived to have ethically and politically laden consequences. What exactly is Darwinism, and how precisely are its non-scientific uses related to the scientific theory of evolution? Some claim the term’s meaning should be limited to scientific content, yet others call for its abolition altogether. In this paper, we propose a unified account of these varieties of Darwinism. We show how the theories introduced by Darwin have grounded a “logic” or style of reasoning about phenomena, as well as various ethically and politically charged “worldviews.” The full meaning of Darwinism, as well as how this meaning has changed over time, can only be understood through the complex interaction between these dimensions.

“**W**HAT is Darwinism? This is a question which needs an answer. Great confusion and diversity of opinion prevail as to the real views of the man whose writings have agitated the whole world, scientific and religious”—Charles Hodge (1874:1).

INTRODUCTION

DARWIN’S *On the Origin of Species* was, in the first place, a work in biology. By introducing the theory of natural selection, it explained how adaptive complexity arose over long periods of time. It also introduced the Tree of Life hypothesis, which holds that extant species evolved from a common ancestor (e.g., Darwin [1859] 2008:99–100). However, in the past century and a half, *On the Origin of Species* has often proved to be much more than a work in biology. Darwin’s ideas have stimulated scientists and scholars to advance “evolutionary approaches” in domains as diverse as economics, engineering, psychology, and history. The ideas have been used (and abused) for widely varying ethical and political ends: to undermine religiously inspired ideas about the origin of humans and their status in relation to other species, to support state-sponsored eugenicist policies, or to support laissez-faire (and, more recently, neoliberal) economic policies. In the form of an “-ism,” “Darwinism,” Darwin’s ideas have impacted a broad range of domains, inside as well as outside the life sciences.

It is not novel to ask the question “What is Darwinism?” In fact, in 1874, Charles Hodge deemed that Darwin’s ideas had produced such “confusion and diversity of opinion” (Hodge 1874:1) that he embarked on the first book-length analysis of Darwinism. However, there are novel sources of confusion that warrant revisiting the question. Unlike in the 19th century, the term “Darwinism” today has long ceased to be sufficiently precise for the explanatory goals of biologists. It would be passed over in favor of referring to a specific mechanism of evolution or evolutionary pattern. Instead, the sources of confusion originate in how the term “Darwinism” continues to enjoy currency in nonbiological contexts. So-called “Darwinian” approaches continue to proliferate in the biomedical sciences, social sciences, and humanities (e.g., in medicine, sociology, economics, psychology, anthropology, history, linguistics, and other fields), and even in the engineering sciences, computation, robotics, or electronics. These developments, which we will document in more detail, already raise the question of what, if anything, they have to do with Darwinian ideas as applied to biological phenomena.

What is perhaps even more puzzling is how Darwinism continues to seep into a broad range of policy discussions and public discourse (see also Alexander and Numbers 2010). Darwinism may have originally referred to a scientific theory, but the fact of

the matter is that some use it in a variety of ways for a variety of ends. Some highlight the “survival of the fittest,” and push for competition in economic policy (Bannister 1979), managerial approaches (e.g., McLean and Elkind 2013), or even science policy. Others of different political persuasions foreground what Darwin said about cooperation, morality, and culture in human evolution (Darwin 1871:Chapter 5), and push for the importance of cooperation in social policy (Singer 2000; Wilson 2019). Yet other uses of “Darwinism” will be documented later in the paper.

In this way, in the broader nonbiological context (including both academia and society), “Darwinism” continues to be used as if it were a coherent term. This observation motivates our inquiry into the question what Darwinism is and our goal to provide a framework by which we can make sense of how the different significant uses of the term “Darwinism” interrelate. We especially seek to problematize how the “scientific” and “ethical-political” dimensions of Darwinism relate to each other. As documented later in the paper, the scientific content of Darwinism is often invoked (whether fallaciously or not) in order to support statements about how humans *ought* to act, or about how society *ought* to be organized. One of our core questions is what, if anything, such ethical and political uses of the term Darwinism have to do with the underlying scientific dimension of Darwinism.

In doing so, we will argue against a skeptical view, namely that they have nothing to do with each other. On this view, the invocation of Darwinian science for ethical-political ends constitutes a merely rhetorical or manipulative use of science. It labels Darwin-inspired discourse or policy (such as Darwinian eugenics or Darwinian communitarianism) as imposing a *nonscientific* element (e.g., an ethical or political judgment) onto the scientific core of Darwinism. A concise and clear example of this common view was once provided by Gould who proposed that “the term [Darwinism] should be restricted to the body of thought allied with Darwin’s own theory of mechanism” (Gould 1982:380). We call this the “thin conception” of Darwinism.

In contrast, this paper advances a “thick conception” of Darwinism, where the scientific, ethical, and political dimensions are understood to be intertwined, and to constitute the full meaning of Darwinism. The label “thick” is borrowed from ethics and epistemology, where it refers to concepts that have both evaluative and nonevaluative content: a concept that has evaluative (or normative) content concerns what is “valuable” or what “ought” to happen, whereas a concept that has nonevaluative (nonnormative) content merely describes or explains what is the case or how a specific property should be conceived of. The classic example of a thick concept is a virtue such as “generosity,” which both describes certain actions and also evaluates these actions as “good.” However, in this paper, we repurpose the label “thick” to capture concepts that straddle the is-ought distinction and defy categorization as either ethical or scientific concepts (see Roberts 2013 or Väyrynen 2021 for more background on the thick/thin distinction: we opt to broaden the meaning of “thin concepts” to also refer to concepts with only nonevaluative content. So, although we understand “thick” concepts—as in ethics and epistemology—to contain both evaluative and nonevaluative content, the contrast class of “thin” concepts only contains nonevaluative content).

“Health” is an example of a thick concept, as it describes and defines certain states of the organism, but also passes a value judgment on those states (i.e., as being “good” for the organism). The argument of this paper is that Darwinism is also a thick concept. This means that we seek to establish that the ethical or political uses of “Darwinism” should not necessarily be considered extrinsic instrumentalizations of some core “purely scientific” Darwinism. Rather, such uses often reflect what Darwinism *is*: a notion whose scientific, ethical, and political dimensions cannot be entirely separated.

One potential worry we would like to anticipate from the outset would be how our argument relates to the confusion between “is” and “ought.” After all, the history of Darwinism is replete with such reasoning, and the concepts of fitness, adaptation, and more

recently that of “evolutionary success” (Desmond and Ramsey 2023) are often misunderstood as implying an ethical judgment (e.g., adaptation as “good”). Although we do not aim to fully map or evaluate the various ways in which evolutionary science is used for ethical-political objectives—that is a broader project beyond the scope of this paper—later we will clarify just how the scientific dimensions of Darwinism can *inform* ethical and political deliberation without *determining* it, thus respecting the is-ought distinction.

The paper is structured as follows. After presenting arguments against the thin conception of Darwinism (see the section titled *The Inadequacy of a Thin Conception of Darwinism*), we will construct an account of the thick conception of Darwinism, consisting of three interrelated elements: Darwinism as an explanatory scheme, Darwinism as logic or methodology, and Darwinism as a worldview or ideology. Armed with this material, the concluding section presents a parting vision of how all three dimensions constitute the full meaning of “Darwinism.”

THE INADEQUACY OF A THIN CONCEPTION OF DARWINISM

As we will also discuss later, there can be no doubt that many applications of “Darwinian ideas” have been ill-grounded. This has obviously been the case with the use of evolutionary science to justify controversial political projects and has been the primary motivation for the *thin conception* of Darwinism. According to this conception, the term “Darwinism” should only refer to the scientific ideas that are, if not specifically Darwin’s, then a further elaboration or refinement of Darwin’s ideas.

Gould’s phrasing “the body of thought allied with Darwin’s own theory of mechanism” (Gould 1982:380) fits the thin conception. Moreover, Gould’s advocacy for the thin conception of Darwinism came on the heels of his volume *The Mismeasure of Man* (Gould 1981), a systematic critique of eugenics and work of Arthur Jensen and his research on intelligence and race (Jensen 1969). In the later 1996 edition, Gould expanded the book with a critique of *The Bell Curve* (Herrnstein and Murray 1994). Even

this brief intellectual history illustrates one general, powerful rationale for the thin conception: restrict “Darwinism” to its scientific core to help prevent (potential) abuses of Darwinian ideas from benefiting from the epistemic authority of evolutionary science.

But what *is* the scientific core of Darwinism? An influential thin conception of Darwinism involves the identification of Darwinism with a set of abstract conditions for evolution by natural selection (Hodgson and Knudsen 2006; Aldrich et al. 2008; Hodgson 2019; Schurz 2021). In particular, the three core criteria of variation, differential reproduction, and heritability have been popular among biologists and philosophers as specific criteria for the occurrence of natural selection (e.g., Lewontin 1970; Godfrey-Smith 2007). Accordingly, these criteria can determine the scope of Darwinism on a thin conception: wherever these conditions of application are met, Darwinian explanatory templates can be applied, whether to the evolution of organisms or that of institutions, ideas, or computer programs. Conversely, when these conditions are not met, the purported Darwinian approach can be judged not to be “genuinely” Darwinian and is, at best, a comparatively loose metaphor.

This thin conception can be and has been used to criticize various Darwinian approaches in the social sciences and humanities as ill-founded or confused (e.g., Reydon and Scholz 2015 or Ramsey and De Block 2017). Another benefit of the thin conception is that it provides more clarity on how uses of Darwinian ideas in political or ethical discourse could involve a distortion or instrumentalization of the underlying science. As documented later in this paper, many of the prominent examples of ethically and politically charged Darwinism do not involve precise stipulations of conditions of applicability.

In this way, if we set out to criticize and ultimately reject the thin conception, it is not because we disagree with these cogent motivations. The need to distinguish between “genuine” and “distorted” Darwinisms remains. However, we believe that the effort to reduce the complexity of the meanings of “Darwinism,” and restrict it to a “scientific core” (however defined), ultimately does not work. We offer three reasons: the ethical and

political uses of Darwinism cannot be simply understood as distortions of the science; the instrumentalizability of Darwinism is an explanandum that the thin conception cannot account for; and the thin concept is ultimately self-defeating.

First, it would not be accurate to hold that the relation between Darwin's ideas and their use in ethical and political discourse is a simple distortion of a value-neutral scientific view. Consider a relatively paradigmatic case of distortion: tobacco executives congregating and scheming about how they could present results from oncology research as more uncertain than they were, thus undermining public trust in oncology research (Oreskes and Conway 2010). There is a clear demarcation between the content of the scientific claim, provided through scientific research, and the intentions or values of the distorters—in this case, tobacco executives. If we would try to apply this demarcation to Darwinism, we quickly run into difficulties because the “distorters” of Darwin's ideas and the greatest scientific advocates of these ideas have often been the same persons. Moreover, these people have viewed Darwinism's scientific and ethical-political content as integral parts of the same package.

A first illustration is found in the very coining of the term “Darwinism” by Thomas Henry Huxley in a book review of *On the Origin of Species* (Huxley 1860). On one level, Huxley intended the term to refer to the novelty of Darwin's contributions, and he explicitly compared their importance to those of Copernicus. However, on another level, one can surmise that Huxley deemed Darwin's ideas worthy of being treated as an “-ism” because, like Copernicus's ideas, he immediately saw their theological implications about humans' place in the cosmos. In fact, a couple of months after writing that review, Huxley used Darwin's ideas in a debate with the Bishop of Oxford about the origin of the human species.

Similarly, another early promoter of Darwin's ideas, Francis Galton, immediately saw their broader implications for social policy. Galton credited Darwin with saving him from “old fashioned ‘arguments from design’” that Galton likened to a “superstition as if it had been a nightmare” (Galton 1869a). For Gal-

ton, this meant that Darwin's ideas opened up a path leading toward a (eugenicist) reorganization of society.

Could one insist, in response, that figures such as Huxley and Galton were distorting the scientific core of Darwinism and instrumentalizing it to promote their own pre-existing values? The subtle and complex relation between eugenics and Darwinism will be discussed at more length later in the paper. However, even if we should grant this objection for the sake of argument, it remains to be answered why natural selection possesses this *instrumentalizability*. This leads us to the second reason for rejecting the thin conception of Darwinism: it renders mysterious why Darwinism seems to possess this unique usefulness outside its original domain of application. Not all scientific theories, even those of wide applicability, possess such instrumentalizability. The second law of thermodynamics, for instance, can be formulated with a high degree of abstraction (especially in the second law's statistical formulation) such that its conditions of applicability are much broader than the original context in which the law was formulated (concerning the potential efficiency of steam engines). “Entropic approaches” have spread throughout various scientific domains, including evolutionary biology (Brooks and Wiley 1988). However, the second law has not provoked political or ethical controversy comparable to that provoked by the theory of natural selection.

Not only activists and public intellectuals such as Galton or Huxley have agitated for the broader scientific and societal significance of evolutionary theory. Biologists have too, ranging from Ernst Mayr's remark that “every component in modern man's belief system is somehow affected by Darwinian principles” (Mayr 2000:83) to Darwin's own assessment that there was “grandeur” to “this view of life” (Darwin [1859] 2008:360). In fact, Darwin was arguably among the first to endorse a broad scope of application of the theory of evolution when he applied it to the origin of the human mind and morality (Darwin 1871). The fields of psychology and anthropology are the two fields in which Darwinian approaches have been applied most influentially, even though heated controversy

(especially regarding evolutionary psychology: cf., e.g., Smith 2020) continues to this day.

If the thin conception is the best, and Darwinism should be restricted to a neutral scientific core, it becomes puzzling why even leading biologists should flout this rule. A somewhat closer inspection of the “scientific core” of Darwinism helps clarify why this is the case. Consider claims such as “smoking causes lung cancer” or “carbon dioxide emissions cause climate change.” These are verifiable causal-empirical generalizations about specific phenomena. Their meaning is delineated and can be distinguished relatively clearly from distortions. Darwin’s ideas are not like that. They entail looking at the world differently. They delineate a way of reasoning—a Kuhnian paradigm, one could say—about change over time. This is why we later (in the section titled Darwinism-as-Logic) introduce the *methodological dimension* of Darwinism: to call an approach “Darwinian” refers to a specific way of investigating and reasoning about phenomena. This style of reasoning can also be applied to the origin of moral norms and even human rationality, and thus Darwin’s ideas seem at least relevant to questions about how we should judge and act. With this in mind, the broad instrumentalizability of Darwinism looks a little less mysterious; however, it does imply that one cannot simply cordon off the political and ethical dimension of Darwinism as the thin conception seeks to do.

Are these reasons decisive for rejecting the thin conception? One could hold that the theory of natural selection is more likely to be instrumentalized than the second law of thermodynamics because it merely contingently speaks to human imagination. This is a rather radical stance since it involves rejecting as misguided the views of a long list of figures, from Huxley and Galton to Mayr and arguably Darwin himself. However, say that one accepts that implication. Would it then be coherent to limit the meaning of Darwinism to its “scientific core,” and categorize all of its uses in other academic fields and public discourse as distortions or instrumentalizations of Darwinism? The problem is that if followed to its logical conclusion, this stance implies that the term “Darwin-

ism” should be simply eliminated. This final reason for rejecting the thin conception of Darwinism: it implies that we should no longer speak of “Darwinism.”

How so? To speak of an “-ism” *reifies* Darwin’s ideas and thus inevitably carries connotations of *doctrine*, if not also a set of *values*. This need not imply that Darwinism must be categorized as similar to Marxism or Freudianism—scholars also speak of “Newtonian” science or the “Newtonian” revolution. However, even the term “Newtonianism” is understood to also refer to Newton’s metaphysical hypotheses and epistemological values (and even his theological and alchemical interests) rather than only to Newton’s specific causal generalizations (Force and Hutton 2004). Similarly, we cannot use the term “Darwinism” without inquiring what nonempirical commitments are involved.

Some have embraced this consequence and have indeed called for the abolition of the term “Darwinism” to describe the scientific theory (e.g., Scott and Branch 2009). However, this attempt at reengineering the term has not been met with much uptake by biologists or nonbiologists. “Darwinism” is not perceived to refer to a single scientific theory or a definable range of hypotheses, and this is both the reason why Darwinism as a term *has* been abandoned by contemporary biologists when talking about current evolutionary biology, and why nonbiologists have *not* abandoned it. The reason to either use or avoid the term “Darwinism” is precisely because of the value-laden dimensions of Darwinism: values on how to conduct scientific research and values on how to guide action and organize society. In this way, the perceived meaning of the term, both in its use and its conscious nonuse, calls for a thick conception.

DARWINISM AS AN EXPLANATORY SCHEME

As a first step in laying out an alternative, “thick” conception of Darwinism, we briefly review the first important sense in which “Darwinism” is widely used to refer to an abstract explanatory scheme. This dimension of Darwinism is common to both the thick

and thin conceptions of Darwinism, the difference being that, on the thick conception, the explanatory scheme is intertwined with the other dimensions of Darwinism.

An explanatory scheme involves a *type* of explanans and a *type* of explanandum: it shows how types of phenomena can be explained but does not do this for every instance of the phenomenon. In this sense, “the one long argument” of *On the Origin of Species* (Darwin [1859] 2008:338) established several explanatory schemes. The explananda included the observed diversity in species morphology and behavior (including also the fact, emphasized by Darwin, that this diversity involves many commonalities distributed across all families) and the apparent “fit” of morphology and behavior with the immediate environment. The explanantia included: the evolutionary process itself (or transmutation of the species, as Darwin called it), descent from a common ancestor, and evolution by natural selection.

One should emphasize from the outset that “Darwinism” need not be identified with adaptationism. Darwin introduced the selectionist explanatory scheme where the explanandum is defined as some adaptive state of affairs (e.g., a distribution of traits, the existence of a particular species, or the existence of some complex structure; Lloyd 2021:3), and specifies natural selection as the explanans. Yet he also introduced the explanatory scheme based on the hypothesis of common descent, which would similarly define the explanandum as a distribution of traits, but with the difference that this distribution may not necessarily be adaptive and define the explanans as a process of descent with modification.

It is not our purpose here to advance any one view of the structure of these explanations. The main point we want to make is that despite Darwin clearly introducing novel concepts and types of explanation, there has been disagreement and revision on *how precisely* Darwinian concepts such as natural selection can be used for explanatory ends. Darwin himself predominantly targeted the patterns of extinction and adaptive speciation—which he called the “mystery of mysteries”—and spoke of natural selection in terms of the “struggle for existence,” relating

it to Malthus’s struggle between the members of human populations. However, such characterizations of natural selection were abandoned by subsequent specifications and revisions of the selectionist explanatory scheme.

The modern synthesis in the 1930s involved one such radical revision. The revision was prompted by the rediscovery of Mendel’s work on genetics and the realization that Darwin was mistaken about the mechanism of inheritance. This led to a reconceptualization of natural selection away from an ecological “struggle,” as Darwin had put it, and toward viewing selection as based on differential reproduction or differential fitness (see, e.g., Lewens 2010 on the different roles the struggle for existence played in Darwin’s theory and in the modern synthesis). Thus, the three abstract criteria (fitness differences, variation, and heredity), already mentioned in the previous section, have become one influential way of formalizing just how the modern synthesis conceives of natural selection explanations.

There have been many other ways of precisely accounting for the explanatory structure of natural selection. We will limit the discussion in this section to just two further examples. One is Dawkins’s analysis of natural selection in terms of replicators and interactors—sometimes dubbed the “gene’s-eye view” since genes are the replicators in biological evolution (Dawkins 2006). Dawkins himself dubs his view the “Darwinian View of Life,” suggesting that he thought of his analysis of natural selection as the “true” Darwinism (Dawkins 1995). On this view of natural selection, there must be a clear distinction between replicating entities and interacting entities for natural selection to occur.

The other is a set of alternatives to the modern synthesis that have been proposed in the two last decades, and that involve a different conception of natural selection yet again. One overarching theme here is that the organism is conceptualized as playing a more active causal role in evolution: according to the concept of niche construction (Odling-Smee et al. 2003) the organism shapes the selective environment, and according to

recent work on phenotypic plasticity in animal and plants (West-Eberhard 2003; Sultan 2017) the organism can adapt to its circumstances through plastic responses, and this can shape subsequent adaptive evolution (through genetic assimilation). Just how fundamentally different these complex processes are from the modern synthesis's view of natural selection is debated (cf. Laland et al. 2015; Pocheville 2019).

In this way, the multitude of distinct types of "Darwinian explanation," even within the modern synthesis selectionist family of explanations (illustrated, for instance, by the controversies over the meaning of "fitness"), shows how difficult it is to pin down the meaning of "Darwinism" even when restricted to the biological context. The four views discussed here—selection as the struggle; selection as differential fitness; selection as replicator-interactor dynamics; and selection as crucially affected by the actions of organisms—illustrate why biologists in fact will very seldomly (if at all) refer to "Darwinism" to clarify their scientific investigation or their explanatory scheme. Even within the relatively narrow confines of evolutionary biology, Darwinism can refer to a range explanatory schemes, some of which might be useful for population geneticists but not for developmental biologists, others which may be useful for ecologists but not paleobiologists. Hence our negative diagnostic about the usefulness of the term "Darwinism" for purposes of biological research.

Nonetheless, this does not mean one should embrace view that the term "Darwinism" simply has no meaning whatsoever even within biology. There is a family resemblance between these different explanatory schemes in that they explain some adaptive state of affairs without overt reference to human (or divine) agency. This was, of course, a background concern of Darwin: species diversity and adaptive complexity were seen as necessitating such a theistic explanatory scheme, as famously argued by Paley in his work *Natural Theology* (1802). Somewhat paradoxically, such a rough, purely negative characterization of the family resemblance suggests that the explanatory dimension of the term "Darwinism" has a clearer meaning when it is used *outside* the biological context,

where Darwinian approaches are sufficiently distinct from rival explanatory schemes. Thus, the focus of the next section is the use of Darwinism in nonbiological contexts.

DARWINISM-AS-LOGIC

In a telling moment, Wallace once claimed the position of "the advocate of pure Darwinism" (Wallace 1889:viii) and, in effect, to be more "Darwinian" than Darwin himself. This is a particular illustration of the observation how Darwinism has come to not just refer to a set of ideas associated with a person, but also to refer to a research program—or even a doctrine—with a perceived internal consistency.

We call this dimension of Darwinism a "logic" for two reasons. First, the term "logic," in its informal sense, refers to a style of reasoning. Styles of reasoning are often formalizable, and Darwinism has in fact been subject to many such efforts at formalization by 20th-century philosophers of science, beginning with Hempel and Popper. However, such formalization is an attempt to systematize a process of reasoning that may also be carried out informally (see also Popper's "logic" of scientific research; Popper 1935). By referring to Darwinism as a "logic," we wish to capture how Darwinism can come to structure how scientists reason about natural phenomena and, thus, in effect, how Darwinism comes to play a *methodological* role in scientific practice. It offers guidance on how to investigate puzzling phenomena: what properties to investigate (e.g., variation, heritability, tree-like descent with modification, replication, and interaction) and how to relate these properties in a coherent explanation. Such guidance can be followed by biologists, but also by researchers in fields outside the life sciences who envisage Darwinian explanations in their field.

The second reason for calling it a logic—instead of a (Kuhnian) "paradigm"—is inspired by some areas of sociology, where constructs such as a professional ideal (e.g., the ideal of care for physicians) are analyzed both as an "ideology" (system of values) and a "logic" (manner of reasoning; Freidson 2001; Desmond 2020). From a sociological perspective, the "ideology" and the "logic"

of a social organization are two sides of the same coin. Hence, to anticipate a later section, the term “logic” is an attractive one since it helps make sense of how the scientific dimensions of Darwinism can generate its ethical-political dimensions.

In this section, we give an argument for why Darwinism should (partially) be understood as a “logic” and we then discuss how Darwinism-as-logic interacts with Darwinian explanatory schemes.

DARWINISM-AS-METAPHOR?

Consider how the theory of natural selection and the Tree of Life hypothesis have inspired a wide proliferation of “evolutionary approaches” in other domains, as illustrated by the list in Table 1. Whether it concerns the evolution of firms, scientific theories, or fashion trends, the evident fecundity of Darwin’s ideas strongly suggests they are a way of investigating and thinking about a broad range of natural and social phenomena.

One need not conclude that “Darwinism” here plays a strongly unifying methodological role. Rather, one could somewhat skeptically claim that Darwinian ideas are here largely operating as evocative metaphors. Perhaps some applications are permitted—for instance, when the conditions of fitness differ-

ences, heritability, and phenotypic variation are met—but these tend to be limited and narrowly defined. In any case, the broad applicability of Darwinian ideas could in this way be seen as evidence for how they stimulate the human imagination rather than their explanatory and predictive power.

Consider the context in which the term “Darwinism” was coined: although not decisive, it is suggestive of what is at stake. The term was coined in a passage where Huxley worried whether Darwin’s ideas were *too* elegant, *too* simple, and therefore insufficiently restrictive with respect to the explanations it allowed. In Huxley’s words: “What if the orbit of Darwinism should be a little too circular?” (Huxley 1860:569). What he meant by this, was: what if evolutionary change was not as simple as described by Darwin and what if Darwin’s work eventually was to be superseded by the work of a biological Kepler? The worry about empirical adequacy was the flipside of the great attractiveness of Darwin’s ideas of natural selection, namely, their simplicity and elegance. In this way, Huxley already had in mind how Darwinism could operate as a “logic,” even if this meant that the logic could not be mindlessly applied across contexts.

Moreover, Huxley was among the first to generalize the Darwinian logic to distant domains, as evident in his remark: “The struggle for existence holds as much in the intellectual

TABLE 1

Evolutionary approaches have invaded a broad swathe of domains in the social sciences and humanities, but also in medicine and engineering

Evolutionary domain	Illustrative references
Evolutionary economics	Nelson and Winter (1982); Witt (2014); Hodgson (2019)
Evolutionary anthropology and cultural evolution theory	Boyd and Richerson (1985); Richerson and Boyd (2005); Mesoudi et al. (2006); Mesoudi (2011)
Evolutionary sociology	Dietz et al. (1990); Hopcroft (2016); Turner and Machalek (2018)
Evolutionary psychology	Barkow et al. (1992); Buss (2019)
Evolutionary literary studies	Carroll (2004); Gottschall and Wilson (2005)
Evolutionary archeology	Maschner (1996); Barton and Clark (1997)
Evolutionary history	Russell (2011); Turchin (2018)
Evolutionary medicine	Nesse and Williams (2012); Stearns (2012); Perlman (2013)
Evolutionary computation	Eiben and Smith (2003); De Jong (2016)
Evolutionary robotics	Nolfi and Floreano (2000); Bongard (2013)
Evolutionary electronics	Stoica et al. (2002); Zebulum et al. (2017)
Evolutionary epistemology	Popper (1972); Cziko and Campbell (1990); Gontier and Bradie (2021)
Evolutionary ethics	Ruse and Wilson (1986); Joyce (2006)
Evolutionary aesthetics	Voland and Grammer (2003); Kozbelt (2017)
Evolution of science and technology	Hull (1988); Brey (2008); Mesoudi et al. (2013); Scerri (2016); Tucker (2022)

as in the physical world” (Huxley 1880:15–16). In other words, Huxley surmised very early on that natural selection is in principle not just applicable to competing biological species, but also to competing scientific theories, and thus anticipated the concept of cultural evolution and cultural selection. In this way, he anticipated much later work on an evolutionary perspective on scientific change (Hull 1988; Smaldino and McElreath 2016).

The notion of cultural selection has come in for much fundamental criticism (e.g., Ramsey and De Block 2017), but even if its relation to the concept of natural selection is not very strong, it is important to distinguish between different types of metaphorical relations between ideas. The weakest type of relation would be one idea *causing* the other idea through a sequence of psychological states. For the sake of clarity, here is an artificial example. Einstein played the violin for inspiration: say that in playing one of Mozart’s violin sonatas he, otherwise inexplicably, was inspired by the idea of general relativity. If Einstein did not play these sonatas, he may not have had the inspiration or creativity to think of the principle of relativity. However, in no way do those sonatas do any explanatory work in special or general relativity. With this extreme in mind, it is obvious that the relation between Darwin’s ideas and Darwinian ideas in nonbiological fields (e.g., natural selection and cultural selection) is much closer than that between Mozart’s violin sonatas and general relativity. One may debate how precisely Darwin’s ideas are being reused, but *some* elements of Darwin’s ideas are clearly being reused in the novel domain. Even a relatively skeptical stance on Darwinism-as-logic that sees the use of Darwinian ideas as merely metaphorical must acknowledge that Darwin’s ideas are not playing the role of arbitrary inspiration. In other words, even a skeptical stance must inquire *how precisely* the Darwinian logic operates as an evocative metaphor because it is not wholly irrational or arbitrary. Indeed, see, e.g., Hesse (1988) for the view that all scientific concepts are in some sense metaphorical.

Another aspect of Darwinism that is rendered mysterious by a skeptical stance is why, even if Darwin’s ideas are being used

as a mere metaphor, it is clearly a scientifically very fecund metaphor (see Table 1). A qualitative style of reasoning could be what is being exported, even if not a precisely defined concept or formal model. There are different ways of characterizing what is being exported, ranging from loose concepts that “modestly unify” biological evolution and other evolution in other domains (Reydon 2021) to a type of “population thinking” (as opposed to typological thinking; Mayr 1976; see also Ariew 2008). How precisely one should reconstruct the “logic” of Darwinism (and what is being exported to other nonbiological domains) is a further question we do not broach here, just as we do not take a stance on how exactly one should reconstruct “Darwinism-as-explanation” (see previous section). The lesson we draw, instead, is that one cannot simply claim that Darwin’s ideas are “merely metaphorical” when they are applied to nonbiological domains because this is not only too imprecise (as it entails the question how to distinguish between a metaphor that merely offers idiosyncratic inspiration and a metaphor that guides investigation) but also leaves unexplained just why this “metaphor” has been so fruitful for different areas of science.

HISTORICAL DEVELOPMENT OF DARWINISM-AS-LOGIC

If Darwinism is a logic, then this status was not immediately socially recognized. Huxley, Galton, and others may have quickly seen Darwinism’s potential to revolutionize biology (and beyond), but not all naturalists did. Early objections played some role in this, such as Jenkin’s swamping argument (Jenkin 1867; see discussion in Gayon 1998), which purported to show that the winnowing effect of natural selection was incompatible with the fact that large variation remains in most natural populations of sexually reproducing species. The traditional story here (although not uncontested; Bulmer 2004) is that this was a genuine anomaly for Darwin’s theory of natural selection, and commentators such as Julian Huxley saw it as one of the triggers for the so-called “eclipse of Darwinism” in the late 19th and early 20th centuries (Huxley 1942).

Even though Jenkin's counterargument subsequently turned out to be a merely apparent falsification (i.e., the problem did not lie in the principle of natural selection but in Darwin's assumptions about the mechanism of inheritance), the removal of doubt concerning the hypothesis of natural selection was a process that played out over several decades. After the rediscovery of Mendel's work in 1900 (independently by de Vries, Correns, and von Tschermak), and more definitively after the 1920s and 1930s through the integration of Mendelism with natural selection by Fisher, population genetics provided an exact model of evolution by natural selection. The discovery of the double helix structure of DNA in 1953 and the subsequent development of molecular biology further clarified how evolution by natural selection could occur. There are other and more detailed stories to be told of how the modern synthesis arose (e.g., Gayon 1998; Pence 2021). Even so, at a certain point, the main worry was no longer whether natural selection was applicable but whether natural selection explanation was *over* applied, leading to another "-ism," namely "adaptationism" (following Gould and Lewontin 1979). That there was a perceived need to criticize adaptationism (i.e., to criticize the construal of the logic of Darwinism as adaptationism) is evidence that Darwinism had been established as a logic.

Outside of biology, doubts concerning the precise scientific status of the theory of natural selection lingered for a surprising length of time—for instance, as late as the 1970s, Karl Popper famously called it a "metaphysical research program" rather than a testable scientific theory (Popper 2009:167). Moreover, the social status of evolutionary biology was initially not that of a recognized subdiscipline within biology. Until the second half of the 20th century, biologists using "Darwinian" methods were housed in zoology and botany departments, natural history museums, or genetics laboratories (Huneman 2019). There were no "evolutionary biology departments" until the late 1960s and early 1970s. The University of Arizona, for example, claims that its Department of Ecology and Evolutionary Biology (founded in 1975)

was one of the first of its kind "pioneering a model for the organization of biology now used in many of the world's leading universities" (University of Arizona 2019). Harvard University set up a committee for Organismic and Evolutionary Biology in 1971, which became a department in 1982. Stony Brook University's Department of Ecology and Evolution was founded in 1969 "and was one of the first departments of its kind in the world" (Stony Brook University 2022).

Disciplinary journals were also a surprisingly late development. For instance, the journal *Evolution* was launched in 1947, almost a century after the publication of *On the Origin of Species*. These markers that a group of researchers has formed a "discipline" (university departments, scientific societies, disciplinary journals) form further evidence of how the recognition of Darwinism as a sound logic or scientific methodology was a gradual, social process.

Not only the epistemic authority of Darwinism-as-logic has changed over time, but also arguably the content. The occasion for revising Darwinism-as-logic has often been its application to new fields: as the methodology is adapted to produce good explanations of some target phenomena, this can in turn occasion revisions of how "the" methodology is conceived. An example here is how the development of the modern synthesis transformed the core concepts of fitness and natural selection. Ronald Fisher, one of the foundational figures of the modern synthesis, seemed to be less directly motivated by the purely intellectual goal of synthesizing Darwinism and Mendelism, but rather by eugenic and agricultural goals: to statistically analyze biometrics or "the causes of human variability" (Fisher 1919:399) and to analyze the causes of variations in crop yields. In other words, Fisher used and applied Darwinian ideas to novel domains—the statistical analysis of patterns of heritability in human populations or crops—and in the process transformed the original Darwinian ideas.

Such historical episodes fall well short of robust, generalizable patterns, but it is not altogether implausible that new applications of Darwinism today may lead to future revisions in how we understand fundamental

concepts such as natural selection and fitness. For instance, attributing a greater causal role to the organism through niche construction and phenotypic plasticity alters the fundamental understanding of fitness and natural selection according to some proponents of alternatives to the modern synthesis (Laland et al. 2015; Müller 2017; Sultan 2017; see also Lewontin 1983a). Alternatively, in the subfield of adaptive dynamics, which seeks to unify populational dynamical and evolutionary processes in a single mathematical framework, fitness is redefined as the long-term growth rate of a variant in a given environment (Tuljapurkar 1990:41; Metz et al. 2008: 631). In somewhat the same way in which Kuhn described how the meaning of the terms “mass” or “energy” changed across paradigms in physics, the perceived primary meaning of terms such “fitness” and “selection” can shift as new frameworks become dominant—although what often seems to happen in evolutionary biology is that the meanings of such core terms multiply as multiple competing frameworks arise, adaptive dynamics and niche construction being only two cases.

In sum, in light of the continued history of the reception and use of Darwin’s ideas, it seems fair to say that Darwinism refers to more than just a scientific theory, but also to a logic that can structure scientific inquiry (recall that we use the term “logic” in a broad, informal sense as a style of reasoning). This logic likely cannot be formalized in a fixed doctrine, as a thin conception of Darwinism would attempt to do, since the logic has remained contested and has changed over time. The modern synthesis version of Darwinism differed from Darwin’s own version, and the currently emerging alternatives will be yet different. Nonetheless, one cannot conclude that the various reconstructions of the Darwinian logic have nothing to do with each other. Both the thick and the thin conceptions of Darwinism thus hold in common that there is some unity to the term “Darwinism”; the difference is that the thick conception holds that the scientific dimensions cannot be pinned down (as we have just shown) and cannot be entirely disentangled from the nonscientific dimensions of Darwinism (as we will turn to next). Insofar

as it is a style of reasoning rather than a set of verifiable hypotheses, it continues to structure new inquiry into new phenomena, sometimes prompted by societal concerns and this, in turn, can prompt revisions of how we conceive of the “Darwinian” style of reasoning.

DARWINISM-AS-WORLDBVIEW

From a historical perspective, Darwinism’s perceived ethical and political significance arose much more quickly than Darwinism’s status as an established scientific methodology. Thomas Henry Huxley may have perceived how Darwin’s ideas implied a whole new way of investigating natural phenomena, but his other realization—namely, that they had far-reaching theological implications—was shared more widely and more immediately with his contemporaries, as is evident in Huxley’s debate with Bishop Wilberforce in 1860. That did not exhaust the nonscientific interest in Darwinism: Galton, for instance, quickly saw how Darwin’s ideas opened the possibility of “designing” the human species through eugenic policies.

That Darwinism is more than “just” a scientific theory is not a new observation, including among biologists. We already mentioned the example of how Fisher’s study of patterns of differential reproduction in human populations was motivated by his belief in eugenicist goals (Box 1978; Kruskal 1980). There are many others, of which only a few can be mentioned here (for other examples, see Alexander and Numbers 2010). For instance, John Maynard Smith’s Marxist sympathies influenced, by his own admission, how he understood and analyzed the evolution of altruism (Maynard Smith 1997). Richard Levins and Richard Lewontin even devoted a book-length study to a “Marxist” view on biology (Levins and Lewontin 1985). Interestingly, Lewontin elsewhere quite explicitly endorsed a thick conception of Darwinism: “While they are more relevant to proteins than to politics, Darwin’s writings have a great deal more in common with those other grand theorists of the nineteenth century, Marx and Freud, than with, say, Newton” (Lewontin 1983b). Although we would not necessarily endorse the specifics of Lewontin’s comparison, we would agree with the

spirit, namely that the significance of Darwin's writings cannot be limited to their scientific significance.

Darwinism can be called a "worldview" in the sense that it contains statements about the evolutionary origin of traits and behavioral dispositions of human beings that are perceived as highly relevant for how we deliberate on what is ethically and/or politically desirable. This aspect of Darwinism has been noted by other scholars. Consider, for instance, Mary Midgley emphasizing that Darwinism is not just "an inert piece of theoretical science. It is, and cannot help being, also a powerful folk-tale about human origins" (Midgley 2022:1). Michael Ruse gives another reconstruction: "there is a side to Darwinian thinking, what I refer to as Darwinism, that functions as a religion, or if you prefer, a secular religious perspective" (Ruse 2019:213) that in fact constitutes "a [secular-] religious alternative to Christianity" (Ruse 2019:141).

Notwithstanding our acceptance or rejection of the abovementioned claims, the more difficult question here—and the main concern of this paper—is how precisely the perceived ethical and political relevance of Darwinian theory is related to the science. And here the view we wish to argue against is that the scientific dimensions of Darwinism have nothing to do with the worldview dimension. On this view, Darwinism-as-worldview could be explained away as resulting from other factors: a product of actors distorting a scientific theory for ideological or political purposes or scientists unwittingly influenced by their social contexts. It results in (at least) *two* Darwinisms, one for the societal sphere and one for the scientific sphere.

Although neither Midgley nor Ruse systematically discuss this question, they do offer some reasons to support this view. Midgley emphasizes the specific historical environment in which Darwin's ideas saw the light: "The existing intellectual furniture produced a powerful optical illusion, making the doctrine of the survival of the fittest look like the precept 'each for himself and the devil take the hindmost.' Evolution seemed to endorse egoism and, thereby, unbridled capitalism" (Midgley 2022:172). Here she is echoing Marx's comment in 1862 that

"[i]t is remarkable how Darwin rediscovers, among the beasts and plants, the society of England with its division of labour, competition, opening up of new markets, 'inventions' and Malthusian 'struggle for existence'" (Marx 2010). Ruse, by contrast, emphasizes Darwin's educational and religious context. On Ruse's account, Darwinism was able to assume the role of secular religious alternative to Christianity because of the Anglican context in which Darwin's education took place, for instance, by studying at the University of Cambridge, which Ruse describes as "a Church of England institution where many of the teachers and professors were ordained priests" (Ruse 2019:21).

Neither Midgley nor Ruse necessarily explicitly claim that the worldview dimension of Darwinism has nothing to do with the scientific dimensions of Darwinism; however, emphasizing the social and historical context of Darwinism—whether capitalism, Englishness, or Anglicanism—does downplay the role the scientific dimensions of Darwinism played in generating the various Darwinian worldviews. Could one hold that Darwinism's scientific dimensions and worldview dimensions have nothing to do with each other? We would like to argue that this is not plausible, and that these dimensions are intertwined.

WORLDVIEWS AS EXPRESSIONS OF SOCIAL CONTEXTS?

On the view we aim to defend—the thick conception of Darwinism—the "logic" of Darwinism can sometimes be applied to ethical and political questions about what social policies should be enacted to regulate human behavior. Loosely, one could say that the generalizability of the logic or style of reasoning entailed by Darwinism generates the "ideological" side of Darwinism. Later, we will discuss how this does not violate the isought distinction, but first we would like to discuss a number of concrete cases that illustrate just how Darwinian "worldviews" pick up on specific elements of the Darwinian "logic."

The case we would like to begin with is the case of eugenics. Eugenics ostensibly justified its prescriptions by reference to evolutionary science (Galton 1869b, 1883) and was promoted by its advocates as "applied science"

(Kevles 1995; Leonard 2016). However, even so, one can ask whether those rhetorical strategies were misleading or even manipulative. To what extent can eugenics be categorized as a misunderstanding or distortion of evolutionary science?

This issue is, of course, very controversial and complicated, and doing justice to it would require a level of systematicity with regard to historical detail that is not the purpose of the paper. However, it is helpful to acknowledge some of the complications in the relation between eugenics and evolutionary science.

One complication, for instance, is how the versions of eugenics taken up by Nazi Germany from the 1930s were based on beliefs about genetic determinism that had been clearly falsified by then. Nazi eugenics—unlike early eugenics—was a pseudoscience in the eyes of contemporaries. However, even in the case of Nazi eugenics, which involves significant distortion of evolutionary science, the question persists about how it relates to the Darwinian logic. Based on a passage in *Mein Kampf* where some “survival of the fittest” rhetoric is clearly being invoked, Gregory Radick notes that the two extreme views that “Darwinism was somehow *responsible* for the death camps” and that “Darwinism had *nothing to do* with the death camps” are “equally unappealing” (Radick 2019:299). Some elements of the Darwinian logic were being exported, even if there was also a lot of distortion (see, e.g., Richards 2013 for in-depth analysis).

When one turns attention to early eugenics, it becomes yet more difficult to disentangle Darwinism-as-logic from Darwinism-as-worldview. In contrast to the Nazi eugenics of the 1930s, in the early days of eugenics (the late 19th and early 20th centuries) the mechanism of inheritance was a genuine unknown. The main rationale supporting eugenics relied heavily on the theory of natural selection. In particular, for early proponents of eugenics, Darwin’s ideas seemed to offer the clear prediction that the lack of selection pressures in modern society would lead to the “degradation” of the “human stock.” In particular, it was seen as problematic that the lower socioeconomic classes—which allegedly possessed hereditary traits such as “pauperism,”

feeble-mindedness, or imbecility (Kevles 1995: 20–21)—were outreproducing the upper classes. The eugenicist reasoning was that, in a “natural” environment (i.e., without the improved nutrition and health care of modern societies), this discrepancy would not be observed and, hence, an intervention was needed to change the distribution of traits over a population to counteract the detrimental influence of modern societies.

Insofar the eugenicist reasoning leaned heavily on elements of the Darwinian logic (especially the parallel between natural and artificial selection), the Darwinian logic was *perceived* to justify a host of policy measures all involving “artificial selection” to “counterbalance” natural selection: antimiscegenation laws, forcible sterilization, and worse. In fact, Darwin’s own understanding of how natural selection acts in contemporary human populations could easily be interpreted to imply the necessity of eugenic policies—as Darwin wrote: “the reckless, degraded, and often vicious members of society tend to increase at a quicker rate than the provident and generally virtuous members” (Darwin 1871:174). Later, half of Fisher’s *The Genetical Theory of Natural Selection* (1930), which laid the groundwork for the mathematical treatment of natural selection, was concerned with applying this novel understanding of natural selection to further his eugenicist goals.

Note that we are not claiming that Darwinian logic justified (or justifies) eugenicist reasoning—far from it. The point is a negative one, namely that one cannot hold that eugenics was merely “myth” or “story” or “secular religion” that was merely loosely inspired by Darwinian logic and had no further relation to it. Similarly, early eugenics cannot be entirely dismissed as being based on a *misunderstanding* or *distortion* of the theory of natural selection. The 19th-century commentators who believed Darwinism gave rise to eugenics turned out to be ultimately *wrong*, largely because they lacked relevant facts about heredity, but they did not egregiously misrepresent the action of natural selection. Eugenics focused on elements present in Darwinian logic and used (and overapplied) them for social reorganization.

Would a similar judgment be tenable for other Darwinian worldviews? The variety of worldviews is too vast for any detailed treatment. Still, even a cursory examination of some major “worldviews” suggests they pick up on aspects of the scientific dimensions of Darwinism. Consider how Darwinian ideas about competition have inspired broadly varying policy ideas. Early on, Herbert Spencer emphasized this aspect of the Darwinian logic (coining the phrase “survival of the fittest”) to support laissez-faire social policies, where relatively unregulated competition between individuals was presumed to benefit the collective good. This was one component—the state-driven reform of eugenics being the other (see Leonard 2009 for a discussion)—of the “worldview” that later became known as social Darwinism (Hofstadter [1944] 1992).

Later on, E. O. Wilson’s sociobiology strongly emphasized a different area of Darwinian logic: adaptation and genetic inheritance. He was interested in identifying the “human biogram” that he understood as “the behaviors and rules by which individual human beings increase their Darwinian fitness” (Wilson 2000:548). Although he did not deny the role of plasticity in human behavior and social organization, and while there are also Spencerian motifs in sociobiology, Wilson did tend to emphasize the role of genetics. Consider, for instance: “If the planned society—the creation of which seems inevitable in the coming century—were to deliberately steer its members past those stresses and conflicts that once gave the destructive phenotypes their Darwinian edge, the other phenotypes might dwindle with them. In this, the ultimate genetic sense, social control would rob man of his humanity (Wilson 2000:575). This resulted in a worldview that Wilson himself roughly summarized as one where “genes hold culture on a leash” (Wilson 2004:167). This was perceived to be ethically and politically laden, since it seemed to undermine the plausibility of attempts to reform various aspects of human culture, ranging from gender roles and family structure (Wilson 2000:553–554) to concepts of justice (Wilson 2000:562). And it led to a harsh criticism of Wilson’s so-

ciobiology by fellow evolutionists Lewontin, Gould, and Levins, triggering the “sociobiology wars” that are still ongoing, albeit slightly shifted toward evolutionary psychology (e.g., Smith 2020).

Quite different worldviews result once the emphasis is placed on cooperation and/or the environmental influence on the expression of traits. Beginning with Kropotkin (1902), emphasizing the importance of cooperation has been another perennial theme. The ethicist Peter Singer, for instance, decried the “right-wing takeover” of Darwinism (Singer 2000:10–12) and instead presented a vision of human evolution where, despite competitive drives for power and status, most humans welcome opportunities to cooperate. Based on this understanding of human dispositions, “left-wing” policies can be better designed to support the “weak, poor and oppressed” (Singer 2000:62). Other examples in this family of worldviews include David Sloan Wilson’s vision, which highlights the importance of social learning and cultural selection in human evolution and uses this to promote policies that encourage and regulate the formation of small groups, as this will promote both intragroup cooperation as well as (beneficial) intergroup competition (Wilson 2019).

Other worldviews pick out yet other scientific elements in Darwinism. The Tree of Life hypothesis was foregrounded in a major UNESCO statement on race, where it was held that “[i]t is further generally agreed among scientists that all men are probably derived from the same common stock; and that such differences as exist between different groups of mankind are due to the operation of evolutionary factors” (UNESCO 1950:8). Yet another family of worldviews foregrounds *variation* and its maintenance in a population as a central concept. After all, the Darwinian logic does not only describe directional evolution and the winnowing of variation (toward certain optimal traits) but also the production of variation (through drift, mutation) and the maintenance of variation through selection. Worldviews that seek to support the value of diversity and inclusion tend to emphasize this aspect of Darwinism especially, and currently there is some

debate as to what extent such worldviews can shape basic education in evolutionary biology (Zemenick et al. 2022; Fagundes and Coyne 2023).

Our purpose here is not to attempt a systematic overview of the various Darwinian worldviews that have been advanced in the past century and a half. We wish to emphasize these cases since they provide counterexamples to the view that Darwinian “worldviews” have nothing to do with “the science,” and instead merely reflect historical contexts, social norms, or political values. Although the relation between the scientific dimensions of Darwinism and the societal/worldview dimension is not one-to-one, it cannot be claimed that there is no relation at all. The ethical or political views here surveyed were not preexisting ideologies that simply appeared dressed anew by their promoters; rather, they were grounded in some genuine elements of the Darwinian logic. In this way, a thick conception of Darwinism makes more sense than a thin conception.

INTERACTION BETWEEN WORLDVIEW AND LOGIC

The further question arises here of how precisely the scientific dimensions of Darwinism influence Darwinian worldviews. Why should a causal theory of the evolution of some human traits be invoked to support ethical or political claims about what humans ought to do? This presents a potential objection to a thick conception of Darwinism: even if specific Darwinian worldviews have portrayed themselves as being supported by various aspects of the scientific dimensions of Darwinism, one could still dismiss such claims as fallacious or at least highly misleading. In this way, it seems one could classify social Darwinism, sociobiology, left-wing Darwinism, and the UNESCO statement on race as instances of how the science can be *re-purposed* for ethical or political purposes. This undermines the thick conception of Darwinism because it maintains the distinction between two Darwinisms: a scientific Darwinism and a fallacious and confused Darwinism, even if sometimes well-intentioned.

The crucial step here is to realize a causal theory of human evolution can *inform* ethical

reasoning without *determining* it (Desmond 2021). The facts and theories about human origins can be relevant for conducting ethical and political deliberation without these facts and theories deciding the outcomes of that deliberation. There is a variety of ways in which a causal theory can be relevant for ethical (and political) questions:

1. By providing selectionist explanations of certain traits or patterns of behavior, Darwinism directly supports certain specifications of what “normal” traits are or “normal” patterns of behavior. Such concepts of normality inform ethical reasoning about whether the causal-evolutionary normality should be endorsed or rejected as an ethical norm. Examples:
 - i. Altruism and cooperation are “normal” (i.e., have been selected for) and should be ethically endorsed (e.g., Singer 2000).
 - ii. Selfishness and competition are “normal,” but should be rejected by rational beings (e.g., Dawkins 1995).
 - iii. Selfishness and competition are “normal” and should be endorsed as ultimately contributing to a greater good (examples reviewed in Bannister 1979).
2. By providing selectionist explanations of certain traits or behavior patterns, Darwinism provides information about how easily or how difficult it would be for changes in the social environment (either through changes in ethical norms or through policy change) to change those behavior patterns.
3. By providing Tree of Life explanations, value hierarchies and asymmetries between the moral standing of different species are undermined. Thus, they emphasize the commonality between humans and other previously “lower” animals. They undermine the hierarchy of races. The perceived normative implications (i.e., the ethically or politically laden implications for what we “ought” to do, what “ought” to be the case, or what we should think of as good and bad) of Tree of Life explanations can be in tension with the perceived normative implications of selectionist thinking (which can reinforce value hierarchies, for example, by describing some trait states as better adapted to a specific environment than others).

In these lines of reasoning, the ethical-political dimension of Darwinism does not *determine* precise ethical and policy consequences. Since the is-ought distinction is respected, acknowledging that Darwinism can refer to a worldview—a set of statements that can be used for ethical and political deliberation—need not entail a naturalistic fallacy. Darwinism (as worldview) implies a view of the human species and society where many (although not all) of our traits and behaviors have evolved and have been handed down by ancestors, where they have been shaped by a long history of natural selection, among other processes. The Darwinian view provides a causal history of how human cognition and behavior arose. Although this does not determine ethical or political deliberation, it simultaneously *does* imply that human thought and behavior cannot be engineered by ethics or policy without constraint. For the ethicist or political thinker, this conclusion is consistent with almost any plausible ethical or political view. In this way, Darwinism can be construed as referring to a specific worldview, although in the generic, Darwinism does not support any particular ethical or political view. As a worldview, Darwinism therefore constrains any ethical or political worldview by delimiting a sense of the biologically possible. At the same time, it includes elements likely to be used—as our examples above have shown—within a given ethical stance or political ideology, and in opposition to other ethical or political views. Darwinism is indeed a worldview—as the thick conception advocates—but a worldview that displays an inner tension between its elements, as is exemplified by the above-mentioned tension between stances inspired by natural selection and those inspired by the Tree of Life hypothesis.

We are arguing for the relatively modest position that Darwinism-as-worldview *need not* involve a fallacious interpretation of the science. Yet, that does not mean some Darwinian worldviews do not rely on fallacious interpretations of science. For instance, learning about the causal etiology of sex and gender differences could prompt sexist individuals to find a confirmation of their prejudices in Darwinism. This distorts Darwinism

since explaining some properties of gender differences caused by a history of natural selection does not hold any strong conclusions about how gender types can culturally evolve, especially as social environments change through technological and scientific progress. The same point can *a fortiori* be made about racist abuses of Darwinism, where the theory of natural selection is used to downplay—to an extent that is empirically falsifiable—the role of the environment in the expression of genotypes. Even though views may self-identify as “Darwinian,” on our account, if such worldviews involve clear distortions of the scientific dimensions of Darwinism, they do not qualify as genuinely Darwinian.

At this point, we would like to acknowledge an aspect we have not yet given any attention to, namely, how the meaning of “Darwinism” should be conveyed in education or public communication. Although it may be inaccurate to say that the scientific dimensions of Darwinism have nothing to do with its societal manifestations, it could be prudent to present Darwinism *as if* it were a value-neutral scientific theory. For instance, upon learning about the history of eugenics and evolutionary theory, some members of the general public may be liable to reject all of evolutionary science. Acknowledging that Darwinism-as-logic can generate a multiplicity of political worldviews could lead to the mistaken belief that all scientific disagreements in evolutionary biology are political or ideologically motivated despite having the appearance of disinterested epistemological inquiries. In this way, one could speculate whether this is one area where the thin conception of Darwinism could be preferable to the thick conception. The history of how Gould came to advocate for the thin conception illustrates this use of the thin conception, and although Lewontin stopped short of explicitly promoting a thin conception of Darwinism (and, indeed, in some places he advanced his own thick conception), he did label eugenics and Jensen’s work as “vulgar Darwinism,” partially for its adaptationist tendencies (Lewontin 1983b), and thus implicitly introduces distance with more scientifically grounded construals of Darwinism.

Although the thin conception may not yield a complete understanding of Darwinism, it may still be a useful category for science communication.

In sum, acknowledging this third and most complex dimension of Darwinism—Darwinism-as-worldview—helps make sense of why the theory of natural selection has been imbued with ethical and political significance in the past century and a half. Darwinism is not itself an ethical or political theory: it does not generate any specific judgments that can guide concrete action or determine what we “ought” to do or what the best state of a society would be. However, neither is it a value-neutral theory like quantum mechanics or general relativity arguably are. Darwinism has a subtle *protonormative* status in the sense that can be used to lend (often indirect) support to specific value judgments about what ought to be done. It is not an ethical theory, but not irrelevant to ethics either. It is politically neutral, but as certain concepts are emphasized over others (e.g., cooperation over competition, diversity over adaptation), different worldviews are generated that have more determinate ethical and political consequences.

CONCLUSION

Given the great confusion and political controversy surrounding the term “Darwinism,” it is tempting to create order by restricting it to a purely scientific context. In this paper, we have argued why we should be dissatisfied with this option. Suppose one tries to restrict Darwinism to the biological context only. In that case, one quickly becomes confused about the precise causal and explanatory structure of key components of Darwinism, such as the theory of natural selection or the Tree of Life hypothesis. Moreover, these theoretical elements play a methodological role: they structure scien-

tific inquiry into natural phenomena. This role is underlined by its social manifestation in how disciplinary journals, departments, and societies dedicated to evolutionary theory have emerged in the field of biology. Today, the theory of evolution by natural selection is seen as one of the most outstanding scientific achievements—a paradigm, even—to the extent that the question is no longer *whether* it informs a broadly applicable logic or methodology, but *to what extent* it should do so.

Once this logic is applied to the origin of human traits, Darwinism assumes a more overtly value-laden dimension and is no longer neutral with regard to moral and political deliberation. This is also exemplified by the long history of the reception of Darwin’s thought: from its inception, it has continued to be perceived as ethically and politically significant. Explaining this dimension of Darwinism away as politically or ideologically motivated distortion does not do justice to the reality that scientifically sophisticated commentators have promoted Darwinian worldviews—even though, of course, some so-called “Darwinian” worldviews are, in fact, distortions or misrepresentations of the science. The thick conception inevitably complicates the analysis of Darwinism. It motivates the necessity of a genuinely interdisciplinary investigation. Still, a thick conception of Darwinism is necessary to do justice to the richness of Darwinism and its influence in the past century and a half.

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