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Plantinga Redux: Is the Scientific Realist Committed to the Rejection of Naturalism?

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Abstract

While Plantinga has famously argued that acceptance of neo-Darwinian theory commits one to the rejection of naturalism, Plantinga's argument is vulnerable to an objection developed by Evan Fales. Not only does Fales' objection undermine Plantinga's original argument, it establishes a general challenge which any attempt to revitalize Plantinga's argument must overcome. After briefly laying out the contours of this challenge, we attempt to meet it by arguing that because a purely naturalistic account of our etiology cannot explain the correlation between our preference for simplicity and simplicity's ability to serve as a veridical method of theory selection, the scientific realist is committed to the rejection of naturalism.

Keywords Plantinga · Fales · Naturalism · Scientific realism · Natural theology

Introduction

Plantinga (1993, 2011) has famously argued that acceptance of neo-Darwinian theory commits us to the existence of a Designer. Despite its notable strengths, Plantinga's argument is vulnerable to an objection developed by Evan Fales. In this paper, we will attempt to skirt Fales' criticism and revive Plantinga's argument by contending that the scientific realist is committed to the rejection of naturalism. Our project is largely exploratory; while both authors believe that the argument presented herein is worthy of attention, neither author has an all-things-considered stance on the argument's soundness.

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A Brief Introduction to Debunking Arguments

The central arguments in this paper, both Plantinga's and our own, are instances of debunking arguments. It is thus worth briefly giving the reader some sense for how debunking arguments work. The last decade or so has seen an explosion in the philosophical literature on debunking. Of necessity, the following discussion will not do justice to the complexities of this literature.

By way of a brief introduction to debunking, consider the following vignette:

> Suppose that Josh has many beliefs about a distant village in Nepal. And suppose that very often his beliefs about the village are true. Indeed, a very high proportion of his beliefs about this village are true, and he believes many of the truths about this village. In other words, there is a striking correlation between Josh's beliefs about that village and the truths about that village. (Enoch 2010, 421; cf. Field 1989, 25-30)

Explanations of Josh's veridical beliefs are not difficult to imagine: perhaps Josh lived in Nepal for a period of time, perhaps his parents lived in Nepal and have told him stories of his ancestral home, or perhaps Josh has simply spent too much time on Wikipedia.

Suppose, however, that Josh denied that he had come to form his beliefs about the Nepalese village in any of the usual ways. Rather, he insisted his beliefs about the village were based on nothing more than hunches. It is unlikely we would believe Josh; the correlation between facts about the village and Josh's beliefs is too striking to lack an explanation. In Enoch's words, '[A]bsent some … explanation, the correlation would be just too miraculous to believe' (Enoch 2010, 421).

The vignette about Josh illustrates the general structure of a debunking argument. A debunking argument takes aim at some striking correlation (often a correlation between some agent's belief and the belief's putative truth-maker) and argues that the correlation cannot be explained in any of the normal ways. In such cases, we should either accept a non-standard explanation of the correlation (e.g., Josh possesses psychic powers) or we should doubt that a correlation existed to begin with (e.g., we should doubt the veracity of Josh's beliefs about the village) (Enoch 2010, cf. Kahane 2011).

Plantinga's Argument

Plantinga has famously developed a debunking argument against wholly naturalistic accounts of human etiology (Plantinga 1993, 2011). Briefly, Plantinga notes that, on the naturalist's picture, firing in neural pathways is causally responsible for behavior. Furthermore, on this same picture, the semantic content of beliefs either supervenes on, or is constituted by, neural states. However, because firing in neural pathways is causally responsible for behavior, the semantic content of beliefs is effectively epiphenomenal. In Plantinga's words: 'The content [of a belief] doesn't have to be true, of course, for the neuronal structure to cause the appropriate kind of behavior … it would be a piece of serendipity if this content, this proposition, were *true*; it could just as well be false' (Plantinga 2011, 334).

Thus, while natural selection will select for fitness conducive neural structures, natural selection is indifferent to semantic content, i.e., natural selection is indifferent to truth.

There is a striking correlation between our beliefs about the world and the truth-makers of those beliefs; however, because natural selection is (proximately) indifferent to truth, Plantinga argues that neo-Darwinian theory lacks the tools necessary to explain this striking correlation. We must then either hold that the correlation between our beliefs and their truth-makers does not exist, which amounts to global skepticism, or we can hold that wholly naturalistic accounts fail to provide a complete story of human etiology.

Presented more formally, Plantinga's argument goes as follows:

1. If naturalistic theories offer a complete account of human etiology, then there is no tenable explanation of the correlation between our beliefs and their truth-makers.
2. If there is no tenable explanation of the correlation between our beliefs and their truth-makers, then this correlation is "too miraculous to believe" and our belief-forming mechanisms are likely generally unreliable.
3. If our belief-forming mechanisms are likely generally unreliable, then we have no good reason to believe neo-Darwinian theory (because we have a defeater for all of our beliefs).
4. Therefore, if naturalistic theories offer a complete account of human etiology, then we have no good reason to believe neo-Darwinian theory.

Fales' Response

Unsurprisingly, Plantinga's argument has attracted a wide range of criticisms. Of these, Fales' is of particular interest:

> In a valid argument, *true* premises guarantee true conclusions: so a system that relies consistently upon true inputs to guide inference and action can employ general rules and hope to get things (i.e., action) right. But when a deductive argument employs false premises, the truth-value of the conclusion is *random*. Thus there *cannot* be any set of *general* algorithms which get a creature to use the conclusion of such arguments in a way that reliably promotes successful action. A cognitive system which is not *extremely* limited in the inferential procedures it employs must either give up all hope of successfully directing action or become unintelligibly complex and *ad hoc* in its procedures for connecting belief to action. (Fales 1996, 443)

As there is no general reliable method for moving from false beliefs to pragmatically successful behavior, it is (very) unlikely that an organism with largely unreliable belief-forming mechanisms would generally behave in ways that are fitness conducive. Fales thus rejects (1) of our reconstruction of Plantinga's argument and holds that, because globally pragmatically successful behavior likely requires true belief, neo-Darwinian theory can explain the striking correlation between our beliefs and their truth-makers.

The Challenge of Answering Fales' Objection

Like any debunking argument, Plantinga aims to show that there is some striking correlation that, if unexplained, would be too miraculous to believe. In particular, Plantinga argues that *if a purely naturalist account of human etiology is accurate, the correlation between our beliefs and their truth-makers could not be explained*. Assuming Plantinga has successfully established this conditional, the naturalist has two options. They can either give up naturalism *or* they hold that the correlation between our beliefs and their truth-makers was merely illusory. Plantinga blocks the proponent of naturalism from making the latter move. Holding that the correlation was merely illusory entails accepting a skeptical hypothesis that undermines belief in neo-Darwinian theory.

Fales' response to Plantinga sets up a general challenge for any attempt to revitalize Plantinga's strategy. As Fales notes, the truth of neo-Darwinian theory likely rules out global skeptical hypotheses. Yet a skeptical hypothesis must loom in order to prevent the neo-Darwinian from holding that the putative correlation was merely an illusion.

While neo-Darwinian theory likely rules out global skeptical hypotheses, local skeptical hypotheses remain viable. There is a large literature documenting local unreliability of certain belief forming mechanisms under specific conditions:

> The literature on the fallibility of sense perception is vast and fairly familiar … [Furthermore,] certain sorts of inferences, even though fallacious, are regularly made. The regularities are quite robust: even highly intelligent people fall prey to them … (Fales 1996, 445)

While local skeptical hypotheses remain on the table, they also do not (generally) threaten to undermine neo-Darwinian theory.

Fales not only presents a compelling objection to Plantinga, Fales' objection further threatens to undermine any attempt to revive Plantinga's argument. Plantinga's debunking argument works by forcing the proponent of a purely naturalistic account of human etiology to choose between rejecting neo-Darwinism or accepting a skeptical hypothesis that would undermine neo-Darwinism. Fales convincingly argues that Plantinga-style debunking arguments that rely on global skeptical hypotheses will not be successful. Furthermore, while local skeptical hypotheses remain alive, they will not undermine neo-Darwinian theory. Thus, it would appear that the proponent of a purely naturalistic account of human etiology is immune from Plantinga-style debunking arguments that make use of either global or local skeptical hypotheses.

Any attempt to revitalize a Plantinga-style debunking argument must be built on a skeptical hypothesis whose scope is broad enough to undermine neo-Darwinian theory yet local enough to be plausible given a wholly naturalistic etiological account. This is a significant challenge and tightly constrains the available space for attempted reformulations of Plantinga-style debunking arguments. In what follows, we will attempt to answer this challenge and identify a skeptical hypothesis that is neither too global nor too local.

Before moving on to the argumentative bulk of the paper, it is worth taking a moment to consider the place of our attempt to revive Plantinga's argument in the broader dialectical space. Plantinga's argument has generated an impressive

number of criticisms. Of these, we have chosen to focus on Fales' because we believe his criticism uniquely highlights the structural challenge of revitalizing Plantinga's argument. While there is not enough space in this manuscript to consider how our retrofitted version of Plantinga's argument fares with regard to the other criticisms leveled at the original, critiques of Plantinga generally target one of two of his claims: (i) *if naturalistic theories offer a complete account of human etiology, then there is no tenable explanation of the correlation between our beliefs and their truth-makers* (e.g., Boudry and Vlerick 2014; Law 2011; Robbins 1994; Stephens 2001; Fales 1996) and (ii) *if there is no tenable explanation of the correlation between our beliefs and their truth-makers, then this correlation is 'too miraculous to believe' and our belief-forming mechanisms are likely generally unreliable* (e.g., Beilby 1997; Fitelson and Sober 1998). Our retrofitted version of Plantinga's argument includes neither of these claims. Thus, though we cannot dedicate space to making the case in any detail, it should be clear that our revised version of Plantinga's argument avoids many of the extant criticisms aimed at the original. It remains to be seen if these criticisms can be reformulated to apply to our revised version of the argument.

Plantinga Retrofitted

As noted above, responding to Fales' challenge will require (i) identifying a skeptical hypothesis local enough to be plausible on a neo-Darwinian etiological account and (ii) general enough that, if the skeptical hypothesis is true, we ought not to accept a neo-Darwinian etiological account. In what follows, we will argue that a purely naturalistic etiological account does not have the resources to explain (a) how we came to have a preference for simpler theories while (b) tying this preference to truth. Consequently, if a purely naturalistic etiological account is correct, there is a striking correlation that cannot be explained, i.e., the correlation between our preference for simplicity and simplicity's ability to serve as a veridical method for theory selection. We will further argue that if simplicity is not a veridical method of theory selection, then scientific realism is false. But if scientific realism is false, we should not believe that neo-Darwinian theory accurately describes the world.

We can express our retrofitted version of Plantinga's argument as follows:

1. If a wholly naturalistic account of human etiology is accurate, then there is no tenable explanation of the correlation between our preference for simplicity and simplicity's ability to serve as a veridical method for theory selection.
2. If there is no tenable explanation of the correlation between our preference for simplicity and simplicity's ability to serve as a veridical method for theory selection, then this correlation is 'too miraculous to believe' and simplicity is likely not a veridical method of theory selection.
3. If simplicity is likely not a veridical method of theory selection, then scientific realism is false.
4. Therefore, if a wholly naturalistic account of human etiology is accurate, then scientific realism is false.

The majority of the remainder of the paper will be dedicated to defending the first and third premises. There is already a sizeable literature on evolutionary debunking arguments, i.e., the second premise. Our focus on the first and third premises should not be taken to suggest that the second premise is uncontroversial. Rather, it is merely a reflection of the fact that careful consideration of the literature on debunking falls outside of the scope of this paper.

Premise Three: Scientific Realism and the Super-Empirical Virtues

Familiarity with the role which simplicity plays in theory selection will be important for understanding why a purely naturalistic account of human etiology cannot easily provide an explanation for the correlation between our preference for simplicity and simplicity's role as a veridical method of theory selection. For this reason, we will defend premise three before premise one. The goal of this section is to demonstrate that 'if simplicity is likely not a veridical method of theory selection, then scientific realism is false.'

1. Defining Scientific Realism

Providing an adequate characterization of scientific realism is a notoriously difficult task. For our purposes, a rough-and-ready characterization will suffice. Unlike the instrumentalist, the scientific realist (henceforth, realist) holds that our best scientific theories are approximately true (Boyd 1983; Chakravartty 2014). Unlike the constructivist, the realist further holds that scientific truth is theory independent (Boyd 1983; Kuhn 2012). Finally, unlike the constructive empiricist, the realist is further committed to thinking that we have good evidence that (some of) our best scientific theories are approximately true (Boyd 1983; Van Fraassen et al. 1985). Roughly, the realist is committed to the following thesis: we are justified in believing that our best scientific theories are approximately true, where 'truth' is understood to be theory independent. (cf. Chakravartty 2014)

2. The historical role of simplicity in science

There are at least two distinct routes which one could take in attempting to show that scientific realism requires that simplicity be a veridical method of theory selection. First, there is a sizeable literature that draws on simplicity (and other super empirical virtues) in attempting to defend realism from various anti-realist challenges (cf. Churchland 1985; Doppelt 2014; Lipton 2003; Saatsi 2007). Insofar as defenses of scientific realism require that simplicity be a veridical method of theory selection, there is (at least dialectical) reason to believe that the fate of scientific realism depends on the status of simplicity as a method of theory selection. The literature in question is, however, both voluminous and nuanced. While it is worth noting this potential path for defending the third premise, space limitations require we pursue other options.

The second route for defending the third premise is significantly less philosophically arduous:

1. Scientists rely on simplicity as a method for theory selection.

2. If scientists rely on simplicity as a method for theory selection *and* simplicity is likely not a veridical method of theory selection, then it would be a miracle if our best scientific theories turned out to be true (i.e., scientific realism is likely false).
3. Therefore, if simplicity is likely not a veridical method of theory selection, then scientific realism is false.

The following discussion will, by and large, focus on defending the claim that *scientists rely on simplicity as a method for theory selection*. It is, however, worth briefly saying something in defense of the claim that *if scientists rely on simplicity as a method for theory selection and simplicity is not a veridical method of theory selection, then it would be a miracle if our best scientific theories turned out to be true*. The case is most easily made by considering an analogy.

Imagine a society, S*, in which most aspects of scientific inquiry are identical to the methods of inquiry in our society. There is, however, one important difference: in S*, a Magic 8 Ball plays a pivotal role in the process of theory selection. If the Magic 8 Ball is used to select between two competing theories, there is a mere 50% chance that it chooses correctly. If a greater number of theories are party to the competition, the odds are even worse. It would thus be nothing short of a miracle if the scientific theories accepted by members of S* were by-and-large true. Members of S* would be wise to embrace scientific anti-realism.

While somewhat silly, the story about S* illustrates a broader point. When theory selection relies on a non-veridical method, selecting the correct theory becomes a matter of luck. If theory selection relies on a non-veridical method, it would be a miracle if a predominance of our scientific theories turned out to be approximately true. Thus, if scientists rely on simplicity as a method of theory selection and simplicity is not a veridical method of theory selection, scientific realism is likely false.

What then can be said in defense of the claim that *scientists rely on simplicity as a method for theory selection*. This is an empirical claim; an account of the actual practices of actual scientists. Riesch (2010) qualitative research on the practices of scientists offers a promising starting place. Riesch found that a minority of the scientists he interviewed believed that simplicity was a veridical method of theory selection. Nonetheless, only 'a few questioned Occam's razor outright' while 'many … believed Occam's razor to be a pragmatic choice that is only relevant to make the scientist's life easier…' (Riesch 2010, 87). While Riesch's work may challenge the view that most scientists view simplicity as a veridical method of theory selection, it also offers good evidence that, as a matter of fact, reliance on simplicity in theory selection is ubiquitous.

While Riesch's work indicates that simplicity is used as a method of theory selection in contemporary science, there is also a wealth of evidence that simplicity has played a pivotal role in theory selection at a variety of notable points in the history of science. Start by considering the Copernican Revolution. While the Ptolemaic theory of astronomy made all of the same empirical predictions as the Copernican model, 'Copernicus and Rheticus identified as important … the simplicity and Unity of the Copernican system' (Martens 2009, 258; cf. Palter 1970). Kepler appeared to agree about the importance of the comparative simplicity of the Copernican system:

> She [nature] loves simplicity, she loves unity. Nothing ever exists in her which is useless or superfluous, but more often she uses one cause for many effects. Now

> under the customary [Ptolemaic] hypothesis there is no end to the invention of cir-cles, but under Copernicus's a great many motions follow from a few circles. (Kepler, *The secret of the universe*, quoted in Martens 2009).

Einstein's attitude toward simplicity appears to mirror the enthusiasm of Copernicus and Kepler: '[N] ature is the realization of the simplest conceivable mathematical ideas' (Einstein, quoted in Norton 2000). Norton argues that Einstein's approbative attitude toward simplicity was a consequence of the role simplicity played in the development of the theory of gravitation. Earlier in his career, Einstein had a much dimmer view of the value of simplicity. What led him to change his view?

> It was his three errant years of struggle to complete the theory [of gravitation]; his last minute reversal over the heuristic power of mathematics; how it had allowed him to bring the theory to a rapid, triumphant close; and how he won his race with Hilbert. In retrospect, Einstein could see that it was so straightforward. He merely needed to let simple mathematical conditions dictate his equations. (Norton 2000, 155)

Norton argues that Einstein's attitude toward simplicity changed in light of the role simplicity played in the development of the theory of gravitation. If Norton is correct, it follows that considerations of simplicity played a central role in the development of one of Einstein's most important theories (Norton 2000).

While Norton argues that considerations related to simplicity played a central role in Einstein's development of the theory of gravitation, Nolan (1997) has argued that considerations related to simplicity played an important role in the discovery of the neutrino:

> Let us suppose that postulating an at-the-time unobserved particle was justified in the explanation of the Beta-particle emission. If this is so, then there are a plethora of very similar neutrino theories which would also explain the "missing energy," the variation of the energies of the emitted electrons and the missing spin. A theory which stated that there were two 'neutrinos' emitted every time Beta-decay occurred would also explain the missing mass-energy … A theory which postulated three "neutrinos" would also work … (Nolan 1997, 333)

Nolan further notes that, had someone proposed any of these theories, it would have 'received short shrift … because it would have been needlessly extravagant' (Nolan 1997, 333.)

Nolan further argues that considerations of simplicity played a central role in the discovery of Avogadro's constant: 'Avogadro assumed the minimum number of atoms in each element to explain the new volumes discovered, but many other ratios of atoms to elements were consistent with the evidence … [I] n selecting the minimum number of atoms per molecule needed Avogadro was proposing a theory simpler than any of the "multiple rivals"' (Nolan 1997, 337).

Concomitant with the preceding discussion, simplicity appears to be an important consideration in phylogeny (Felsenstein 1996). Baker (2007) has argued that a preference for simplicity plays an important role in biogeography. Epstein (1984) has argued that a preference for simplicity shaped the history of psychology.

The centrality of simplicity is a recurring theme in a brief survey of pivotal moments in theory selection in the history of science. Riesch's empirical work further suggests that contemporary scientists continue to rely on simplicity. It would thus appear that there is good evidence for the claim that *scientists rely on simplicity as a method of theory selection*.

As noted at the outset, the project of this paper is exploratory, in part because there is not adequate space in a single paper to provide a full-fledged defense of the argument's premises. While we take ourselves to have provided presumptive evidence for the argument's third premise, i.e., the claim that *if simplicity is not a veridical method of theory selection, then scientific realism is false*, there are nonetheless a number of weaknesses in the evidence we have so far presented. We will briefly consider three of these.

First, in defending the third premise, we argued that: if scientists rely on simplicity as a method for theory selection *and* simplicity is not a veridical method of theory selection, then it would be a miracle if our best scientific theories turned out to be true. As stated, this claim is likely false. Much turns on the extent to which simplicity factors into the decision-making process. If simplicity is a minimally important desideratum, so that it almost never serves as a tiebreaker between theories, simplicity can be a non-veridical method of theory selection without having any important impact on the veridicality of our best theories. Thus, it is not enough to demonstrate that scientists rely on simplicity as a method for theory selection, it must further be shown that theory selection turns on considerations related to simplicity. That said, we take the above case studies to offer presumptive evidence for this stronger claim.

Second, we have relied on a handful of case studies in making the case that *scientists rely on simplicity as a method for theory selection*. Yet each case study relies on controversial interpretations of primary texts. The extent to which simplicity was in fact pivotal in each of the case studies we have offered is not a settled question.

Third, there are a variety of ways a theory could be simpler than its competitors (cf. Rudner 1961). One's view about the type of simplicity that is relevant for the practice of science may intersect with our defense of our argument's third premise, and our argument as whole, in a number of ways. Unfortunately, tracking the intersections between different views of simplicity and the argument we will develop here is a task of enormous complexity and must be left for another time. For now, we will merely note that, as the preceding discussion indicates, some type(s) of simplicity appears to play an important role in the actual practice of science. However one understands the relevant type of simplicity, the arguments we develop in this paper should apply. Concomitantly, in the remainder of the manuscript, when we write about 'simplicity,' we leave open the exact type of simplicity in question.

We cannot, here, definitively establish the argument's third premise. Completing this task would require attention to a variety of considerations that, due to space constraints, must wait for another time. Nonetheless, we take ourselves to have made a strong prima facie case that the third premise is true. Given that the project of the paper is exploratory, this should be adequate for our purposes.

In Defense of the First Premise

We have now introduced scientific realism and argued that the realist is committed to holding that simplicity is a veridical method of theory selection. In this section, we will defend the first premise of our argument: if a wholly naturalistic account of human etiology is accurate, then there is no tenable explanation of the correlation between our preference for simplicity and simplicity's ability to serve as a veridical method for theory selection.

1. Cultural accounts

Preferences are notoriously elastic and tend to be highly dependent on culture (see, e.g., Masuda et al., 'Culture and aesthetic preference: Comparing the attention to context of East Asians and Americans', 2008). Thus, it may seem natural to suppose that our preference for simplicity is not a consequence of evolutionary factors but rather an artifact of cultural influence. Things are not, however, so straightforward. Though we are aware of no research directly investigating whether the preference for simplicity is cross-cultural, there is at least some reason to believe that the preference for simplicity appears in both traditional Chinese (Wu 1969) and African (Horton 1967) thought. Cross-cultural ubiquity may indicate that a trait is innate (cf. Machery and Mallon 2010), i.e., that a cultural etiology of a trait is unlikely to be successful. There is thus at least some reason to be antecedently doubtful of the veracity of any cultural account of the etiology of our preference for simplicity.

Yet even if we set this concern aside, any attempt to provide a vindicating cultural etiology of our preference for simplicity faces a significant challenge. In order to see why, we will consider a handful of potential etiological accounts. Start by supposing that our preference for simplicity has its historical roots in the work of a particularly untalented pre-Socratic artist. In need of a steady income but incapable of producing richly textured artwork, the artist set out to change the esthetic standards of his potential clientele. While he was no more than a mediocre artist, he found himself to be an immensely talented sophist. Before long, he had convinced his contemporaries that simple artwork, like the work he produced, was the zenith of esthetics; the richly textured and technical work of his competitors was fit only for the hoi polloi. The artist's efforts to convince his contemporaries was so successful that the preference for simplicity was passed down, generation to generation, and eventually came to be relied on as a method for theory selection in the empirical sciences.

While this is, of course, a silly etiological story, it is nonetheless instructive. For were this the correct etiology of our preference for simplicity, it seems clear that the correlation between our preference for simplicity and simplicity's status as a veridical method of theory selection would be 'too miraculous to believe.' Unless an etiology includes some tie to truth, it will be difficult to see how our preference for simplicity could serve as a veridical method of theory selection.

It may, however, seem as if there is a relatively straightforward way to account for the etiology of our preference for simplicity while also accounting for the preference's ability serve as a veridical method of theory selection. Scientists with a preference for simplicity would have a comparative advantage over their peers who lacked this preference. This would likely lead scientists who had a preference for simplicity to be comparatively successful. As a consequence of the success of simplicity-preferring

scientists, we would expect scientists to put a high premium on simplicity, and, concomitantly, to enculture young scientists to have an esthetic preference for simplicity.

If it were accurate, this etiological account would offer an elegant explanation of the correlation between our preference for simplicity and simplicity's ability to serve as a veridical method of theory selection. The etiological account is, however, almost assuredly inaccurate. Reliance on simplicity in theory selection dates at least back to Aristotle (Barnes 1994) and is evident in the work of Aquinas (1945) and Ockham (Spade and Panaccio 2016). Yet Aristotelian physics dominated science until at least the fifteenth century. Thus, we did not stumble upon our first approximately true scientific theory until well after the historical evidence suggests that simplicity was being used as a method for theory selection. It is consequently profoundly unlikely that the genesis of our preference for simplicity is rooted in the simplicity's value as a veridical method of theory selection.

There are, however, similar etiological stories one could offer that tie the genesis of our preference for simplicity to the truth. In addition to a preference for simpler scientific theories, we appear to have a preference for more parsimonious mathematical theories (Jackson 2013, 922). Suppose that a preference for simplicity is truth-conducive in mathematics. Mathematicians with an esthetic preference for simplicity would likely be particularly successful. In addition to the usual mathematical toolkit, such individuals would have an extra truth-conducive preference guiding their work. One could thus tell an etiological story whereby the success of simplicity-preferring mathematicians was causally responsible for our preference for simplicity.

We are, however, skeptical that any such account is likely to be successful. Suppose that having a preference for simplicity gives one a comparative advantage, in terms of discovering mathematical truths, over mathematicians who lack this preference. Presumably, this preference helps one discover mathematical truths because of some important fact about whatever-it-is that mathematicians study. This is, of course, a general principle about what makes any set of methods appropriate for inquiry into some domain. For example, microscopes are useful for inquiry into cellular structure because cells are very small, and microscopes use magnification to help us see things that would otherwise be too small to observe. Similarly, particle accelerators are useful for inquiry into the subatomic because when atoms collide at very high speeds, they break into their constituent parts. Similarly, if a preference for simplicity plays an important methodological role in mathematics, it must also be due to some facts about the domain which mathematicians study.

Notice, however, that whatever-it-is that mathematicians study is fundamentally different from the objects of study of the empirical sciences. Concomitantly, the methods of mathematics and the methods of the sciences are strikingly different, e.g., mathematics can be done from the armchair, whereas empirical science cannot. This leaves the etiological account we have sketched unable to explain how simplicity could start as a veridical method of inquiry in mathematics and be successfully transferred to theory selection in the empirical sciences. This would be roughly analogous to holding that the empirical sciences should be done a priori, as this is a successful approach to mathematics. Indeed, if the etiological account we have sketched is accurate, we should doubt that our preference for simplicity can serve as a veridical method of theory selection in the natural sciences. By the lights of this etiological account, our reliance

on simplicity in the natural sciences appears to be a cultural byproduct of our reliance on simplicity in a fundamentally distinct domain of inquiry. Without some further explanation of an underlying similarity in the two domains of inquiry, it would be quite miraculous if the methods used to study one domain could so easily be applied to a distinct domain of inquiry (just as it would be miraculous if a compound microscope turned out to be an appropriate tool for investigating subatomic particles).

As the preceding discussion indicates, any attempt to provide a vindicating cultural etiology of our preference for simplicity faces a dilemma. The etiology may include a link to truth or it may lack such a link. If a cultural etiology lacks a link to truth, it leaves the correlation between our preference for simplicity and simplicity's role as a veridical method of theory selection completely mysterious (as in the example of the mediocre pre-Socratic artist). Alternatively, the etiology may include a link to truth. However, the genesis of our preference for simplicity appears to pre-date our first approximately true scientific theory. Consequently, the truths involved in the link between our preference for simplicity and truth must be from some domain other than the empirical sciences. This again leaves the correlation between our preference for simplicity and simplicity's ability to serve as a veridical method of theory selection in the empirical sciences a mystery.

2. Neo-Darwinian Etiological Accounts

In this portion of the paper we will consider a handful of potential etiological accounts that aim to tie our preference for simplicity to its value in ensuring survival and reproduction. We will argue that none of the accounts we consider are able to adequately explain the correlation between our preference for simplicity and simplicity's role as a veridical method of theory selection. We will conclude by considering a general problem any neo-Darwinian etiological account of our preference for simplicity is likely to face.

1. The initial challenge

The most straightforward way to provide a neo-Darwinian explanation of the reliability of a belief-forming mechanism is to demonstrate that the mechanism's reliability would have been fitness conducive. At first glance, this looks like a relatively compelling strategy for explaining how we came to have a preference for simplicity. If simplicity is a mark of a true scientific theory, and true scientific theories are pragmatically successful, then there is a straightforward link between our preference for simplicity and survival value. This rather straightforward account cannot, however, be successful. Aristotelian theories remained dominant through the fifteenth century. Yet, by the lights of our best contemporary scientific theories, Aristotelian theories are not even approximately true. Thus, for the overwhelming majority of our evolutionary history, humans lacked even approximately true scientific theories. Consequently, any attempt to explain the etiology of our preference for simplicity will have to involve a rather more circuitous link to truth.

2. Simplicity and cognitive efficiency

Our preference for simplicity may be the result of selective pressure to minimize energy spent on computation. The brain is responsible for approximately 20 % of our resting

metabolic rate (McKenna et al. 2005). There is at least some evidence that challenging cognitive tasks further increase the brain's metabolic rate (Fairclough and Houston 2004). Consequently, selective pressures may have pushed in the direction of computational shortcuts. Simpler explanations likely take less processing power. Thus, natural selection may have favored a preference for simplicity.

As this putative etiological account lacks a link to truth, even if accurate, it fails to answer the skeptical challenge. If this is the correct account of the genesis of our preference for simplicity, the correlation between our preference for simplicity and the simplicity's status as a veridical method of theory selection remains a miracle.

3. Health and an esthetic preference for simplicity

Symmetry appears to be a signal of 'genetic quality and developmental stability' (Jones et al. 2001). Furthermore, the equations required to describe a symmetrical shape are simpler than the equations required to describe a similar asymmetrical shape. Thus, our preference for simplicity may be a consequence of selective pressure to find symmetry appealing.

Again, this etiological account also leaves the preference for simplicity unmoored from truth. If this is the correct account of the etiology of our preference for simplicity, it would be a miracle if simplicity just so happened to turn out to be a veridical method of theory selection. On this account, the correlation between our preference for simplicity and simplicity's role in theory selection remains too miraculous to believe.

4. Folk psychology and simplicity

When offering a folk psychological explanation, it is likely that simplicity is an indicator of truth. It is a safe bet that any given behavior reflects a relatively sparse motivational set, e.g., the fact that Sarah got up to get food likely indicates that she is hungry, rather than indicating complex min-maxing calculations on Sarah's part. The ability to correctly understand the behavior of fellow humans (and non-human animals) has clear selective advantages. Thus, our preference for simpler explanations may be a consequence of simplicity being an indicator of truth in folk psychological explanation.

While this neo-Darwinian account ties our preference for simplicity to truth, folk psychological explanations look radically different from the explanations offered by contemporary physics, chemistry, biology, etc. We previously argued that, if our preference for simplicity originally arose in mathematics and only later became a guide to theory selection in the empirical sciences, we should doubt simplicity's ability to serve as a veridical method of theory selection in the empirical sciences. Without some underlying unity across domains of inquiry, the methods of inquiry in one domain are unlikely to be veridical when applied in some other domain. This principle applies equally well to the etiological account currently under consideration. Without some reason to believe that the methods conducive to forming true folk psychological judgments would also be truth conducive when applied to theory selection in the empirical sciences, the current etiological account leaves the correlation between our preference for simplicity and simplicity's ability to serve as a global method for theory selection too miraculous to believe.

One may, however, remain optimistic about the broad strokes approach of the above etiological account. Folk psychology is only one of many folk theories one could deploy in offering a vindicating neo-Darwinian etiological account. Suppose considerations related to simplicity play an important role in the ability of our folk theory of physics to generate accurate predictions. Individuals with a preference for simplicity would have thus been more likely to survive, as they would have been more likely to make accurate predictions about the behavior of physical objects. Our preference for simplicity would thus be linked to simplicity's role in helping our ancestors make veridical predictions about the world. As the folk theory in question is a theory of physics, it seems that this etiological account is immune to concerns related to the plausibility of methods generalizing across domains of inquiry.

Despite its apparent strengths, this etiological account faces its own challenges. Notably, our folk theory of physics is not even approximately true (Rosfort 2013). This is the case even though predictions made based on folk theory are generally accurate. Given that our folk theory of physics is not even approximately true, it follows that 'there *cannot* be any set of *general algorithms*' (Fales 1996, 443) for moving from the hypotheses of folk physics to reliable predictions. Consequently, in order to be pragmatically successful, folk physics must be '*extremely* limited in the inferential procedures it employs' (ibid.). There is thus good reason to believe that the inferential procedures involved in making predictions based on our folk theory of physics cannot generalize beyond the tight constraints of folk physics, i.e., would not be a veridical method of theory selection in the empirical sciences. Yet again, if the etiological account under consideration turned out to be accurate, the correlation between our preference for simplicity and simplicity's ability to serve as a veridical method of theory selection would be too miraculous to believe.

5. The general problem for neo-Darwinian accounts

Neo-Darwinian etiological accounts face a dilemma: the etiological account may explain the genesis of our preference for simplicity without reference to truth *or* it may include truth conduciveness as part of the etiological story. If the etiology does not include reference to truth, it would be pure luck if our preference for simplicity happened to also serve as a veridical method of theory selection in the empirical sciences.

Alternatively, the etiological story may include a tie to truth in its account of the genesis of our preference for simplicity. The candidates for potential links to truth are, however, quite limited. Because of the comparatively late development of our first approximately true scientific theory, at the relevant stage in our evolutionary history, our best theories were folk theories. There are, roughly speaking, two routes one could take in attempting to provide an etiological account tied to a folk theory. One might attempt to build an etiological account from an approximately true folk theory, e.g., folk psychology, or one might attempt to build an etiological account from a folk theory that is not approximately true but nonetheless affords a wide range of veridical predictions, e.g., folk physics.

Suppose one attempts to build an etiological account around a folk theory that is approximately true. As folk theories of physics, folk theories of biology, etc. are not even approximately true, the only approximately true folk theories will be in domains

importantly distinct from the domains of inquiry of contemporary physics, biology, and chemistry. Any such etiological account will face the challenge of explaining how a method appropriate for inquiry into one domain, e.g., predicting the behavior of fellow humans and/or animals, turned out to be appropriate for inquiry into an importantly distinct domain, e.g., particle physics. Lacking such an explanation, any such etiological account will leave the correlation between our preference for simplicity and simplicity's ability to serve as a veridical method of theory selection too miraculous to believe.

Alternatively, suppose one attempts to build an etiological account around a folk theory that is not approximately true but nonetheless affords veridical predictions, e.g., folk physics or folk biology. Given that the folk theory in question is not even approximately true, there cannot be a set of generalizable algorithms that allow one to move from the (false) premises of the folk theory to true conclusions. Consequently, it would be a miracle if the inferential rules of the relevant folk theory generalized to scientific inquiry more generally.

Answering Fales' Challenge?

In his seminal argument against naturalism Plantinga argues that, if a wholly naturalist account of human etiology is accurate, then the correlation between our beliefs and their truth-makers is too miraculous to believe. There are two ways for the naturalist to proceed. First, the naturalist could argue that a purely naturalist account of human etiology has the required explanatory resources. Alternatively, the naturalist could hold that the putative correlation was merely illusory. Plantinga elegantly blocks this latter move. To reject the correlation is to embrace global skepticism, which in turn requires one to surrender commitment to neo-Darwinian theory.

Fales' response to Plantinga's argument is equally elegant. Fales rejects the central conditional: if a wholly naturalist account of human etiology is accurate, then the correlation between our beliefs and their truth-makers is too miraculous to believe. Fales argues that it is highly implausible that natural selection would have endowed us with globally unreliable belief-forming mechanisms. Not only does this work to undermine the conditional at the core of Plantinga's argument, it further problematizes any attempt to resurrect Plantinga's argument. In order to revitalize Plantinga's argument, one needs a skeptical hypothesis global enough to undermine neo-Darwinian theory but not so global as to be evolutionarily improbable.

We have now argued that, if naturalism is true, then the correlation between our preference for simplicity and simplicity's status as a veridical method for theory selection in the empirical sciences is too miraculous to believe. Presuming that we have successfully made the case for this conditional, can the naturalist escape the force of the argument by holding that the putative correlation is merely illusory? The answer appears to be 'no.' To hold that the correlation is illusory is to hold that simplicity is not a veridical method of theory selection in the empirical sciences. Yet, as we have argued, this move is not available to the scientific realist. Thus, rejection of the correlation in question is tantamount to rejection of scientific realism. In turn, rejection of scientific realism draws into doubt the status of neo-Darwinian evolutionary theory. But neo-Darwinian evolutionary theory is the cornerstone of contemporary naturalism. The

naturalist thus cannot hold that the putative correlation between our preference for simplicity and simplicity's role as a veridical method of theory selection is illusory.

Like Plantinga's original argument, the argument we have developed here prevents the naturalist from holding that the correlation in question is merely illusory. Does our argument fall prey to Fales' criticism, i.e., is scientific anti-realism evolutionarily plausible? Here, the answer is clearly 'yes.' While evolution may make globally unreliable belief-forming mechanisms unlikely, it does not similarly make scientific anti-realism unlikely. For the overwhelming majority of human history, our best theories about the natural world were not even approximately true. It thus appears that our reconstruction of Plantinga's neo-Darwinian argument has successfully answered Fales' challenge. It identifies a skeptical hypothesis global enough to undermine belief in neo-Darwinian theory while not being so global as to be evolutionarily implausible.

An Objection and Response

A compelling defense of scientific realism takes the following form:

1. The methods of the sciences are continuous with the methods of everyday reasoning.
2. If the methods of the sciences are continuous with the methods of everyday reasoning, then scientific anti-realism threatens global skepticism.
3. Therefore, scientific anti-realism threatens global skepticism. (cf. Churchland 1985)

If sound, this argument leaves our argument vulnerable to Fales' criticism. We have argued that one can either accept scientific realism or naturalism, but not both. We have further argued that our argument avoids Fales' criticism because, unlike global skeptical hypotheses, scientific anti-realism is plausible given the truth of neo-Darwinian theory. If, however, the above objection is sound, scientific anti-realism entails global skepticism. It would follow that, given the truth of neo-Darwinian theory, scientific anti-realism is no more plausible than global skepticism. Perhaps our retrofitted version of Plantinga's argument is no improvement on the original after all.[1]

While we must defend our argument from this objection, we nonetheless do not wish to criticize the above defense of scientific realism. Happily, it appears we can have our cake and eat it too. Whether scientific anti-realism threatens global skepticism will depend on the reasons one has for embracing anti-realism. Seminal objections to scientific realism identify some putatively epistemically problematic feature of scientific practice, e.g., the problem of underdetermination of theory by evidence raises doubts about the epistemic credentials of the inference from an observation set to a concomitant theory (Stanford 2016) while empiricist concerns regarding unobservables targets the epistemic credentials of beliefs about theoretical entities (van Fraassen 1980). But if the methods of the sciences are continuous with the methods of everyday reasoning, then concerns about the epistemic credentials of scientific reasoning will spill over into everyday reasoning, threatening global skepticism. Thus, the problem of

[1] Many thanks to Evan Fales for helping us see this concern.

underdetermination of theory by evidence haunts everyday judgments about medium-sized dry goods and, because it is notoriously difficult to demarcate the observable from the unobservable, concerns about the epistemic status of beliefs about theoretical entities challenge our everyday beliefs about medium-sized dry goods.

The structure of the debunking argument we have offered is importantly distinct from the structure of standard anti-realist challenges. The cornerstone of the challenge we have offered is identical, whether one is proffering a cultural or neo-Darwinian etiology of our preference for simplicity: the preference for simplicity significantly predates our first approximately true theory; thus, any account of the etiology of the preference must hold that the preference arose because of its utility in some domain other than the empirical sciences. This allows us to accept the veridicality of everyday reasoning while doubting the ability of simplicity to serve as a veridical method when applied outside of the everyday context, i.e., when used as a method for theory selection in the empirical sciences. We considered two etiological accounts that fit this model. On the first account, our preference for simplicity came about because simplicity was a guide to truth in mathematics. On the second account, our preference for simplicity came about because simplicity was an indicator of truth in folk psychological explanations. Note that, in both instances, the etiological account assumes that everyday reasoning is epistemically unproblematic. The trouble comes when veridical methods of everyday reasoning are transferred to the context of scientific theorizing. Thus, while some arguments for anti-realism may threaten global skepticism, the argument we have offered does not. Rather than arguing that some aspect of scientific practice is epistemically suspect (which given the continuity of scientific reasoning and everyday reasoning threatens skepticism), we happily embrace the veridicality of simplicity as a method in everyday reasoning. The challenge is to explain how, given the distant origins of our preference for simplicity, our preference for simplicity turned out to be truth-conducive when used a method for theory selection in the empirical sciences.

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