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# Nothing in biology makes sense except in light of theology?

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ABSTRACT

This essay analyzes Theodosius Dobzhansky's famous article, "Nothing in Biology Makes Sense Except in the Light of Evolution," in which he presents some of his best arguments for evolution. I contend that all of Dobzhansky's arguments hinge upon sectarian claims about God's nature, actions, purposes, or duties. Moreover, Dobzhansky's theology manifests several tensions, both in the epistemic justification of his theological claims and in their collective coherence. I note that other prominent biologists—such as Mayr, Dawkins, Eldredge, Ayala, de Beer, Futuyma, and Gould—also use theology-laden arguments. I recommend increased analysis of the justification, complexity, and coherence of this theology.





"Nothing in biology makes sense except in the light of evolution." Written 40 years ago, Theodosius Dobzhansky's famous phrase has attained creedal status in the present day defense of evolution.[1] It is widely held as an incontrovertible fact and as a rallying cry against the incursion of fundamentalist religion into science. The statement itself is the title of an article in which Dobzhansky presents some of his best arguments *why* evolution alone makes sense of biology.[2] Given Dobzhansky's stature as one of the greatest geneticists of the twentieth century, his arguments warrant careful attention.[3]

Strikingly, all seven of Dobzhansky's arguments hinge upon claims about God's nature, actions, purposes, or duties. In fact, without God-talk, the geneticist's arguments for evolution are logically invalid. In short, theology is *essential* to Dobzhansky's arguments. Moreover, Dobzhansky's theology manifests several tensions, both in the epistemic justification of his particular theological claims and in the collective coherence of these claims. Accordingly, I argue that Dobzhansky's arguments crucially rely upon theology and that the justification and coherence of this theology requires further attention. I do not intend to criticize the justification for evolution per se, but rather to suggest that some of Dobzhansky's best arguments for evolution involve more theology and complexity than one might initially suppose.

Of course, I do *not* claim that evolutionary theory, or the polemic for it, requires theology per se. But while I focus on Dobzhansky's arguments for the sake of specificity, many of his theological claims, and more besides, also inform the justifications of evolutionary theory given by luminaries like Ernst Mayr, Gavin de Beer, Stephen Jay Gould, Richard Dawkins, Niles Eldredge, Francisco Ayala, Philip Kitcher, George Williams, Jerry Coyne, Francis Collins, Kenneth Miller, Douglas Futuyma, and others, including Charles Darwin himself. Accordingly, my conclusions can be widely applied *mutatis mutandis*. For a paradigm that putatively outgrew God-talk a long time ago, the presence of so much theology remains a striking curiosity (Avise, 2010; Ayala, 2006, pp. 25–42, 85–89, esp. 34–36; Ayala, 2007, pp. x–xi, 1–6, 22–23, 76, 88–92,

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[1] Unless otherwise noted, page citations are to Dobzhansky's "Nothing in Biology" piece (2011a).

[2] Several reasons suggest that the arguments in Dobzhansky's article represent his mature reflections. First, Dobzhansky published this article just two years before his death. Second, he describes the biological data—which he believes supports evolution—as "striking and meaningful," "the most impressive," and "undeniably impressive and significant." Presumably, Dobzhansky's arguments *why* these data support evolution do justice to the data itself. Third, the arguments contained within his article are consistent with (and sometimes more explicit versions of) arguments made in his major works during that same time, including 1967, 1970, 1973 and Dobzhansky, Ayala, Stebbins, & Valentine (1977).

[3] Stephen Jay Gould, for example, lauded him as "the greatest evolutionary geneticist of our times" (Gould, 1983, p. 197).

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154–60; Barbour, 2000, pp. 111–14; Collins, 2006, pp. 130, 134–37, 139, see also 176–77, 191, 193–94; Coyne, 2009, pp. 12, 13, 18, 54–58, 64, 71–72, 81–85, 96, 101, 108, 121, 148, 161[4]; Dawkins, 1986, p. 93; Dawkins, 1995, pp. 95–133, esp. 105; Dawkins, 2009, pp. 270, 297, 332, 341, 351, 354, 356, 362, 364, 369, 371, 375, 388–89, 390–96; de Beer, 1964, pp. 46–48, 55, elliptically; Dilley, 2012; Eldredge, 2000, pp. 99–100, 144–46; Futuyma, 1995, pp. 46–50, 121–31, 197–201, 205; Gould, 1977, pp. 91–96, esp. 91; Gould, 1980, pp. 20–21, 24, 28–29, 248; Gould, 1983, pp. 258–59, 384; Gould, 1986, pp. 60–69, esp. 63; Giberson & Collins, 2011, pp. 34, 38, 55, 101–108, 161; Kitcher, 1982, pp. 137–39; Kitcher, 2007, pp. 48–50, 57–58, 123–31; Lustig, 2004; Mayr, 2001; Miller, 1999, pp. 80, 100–103, 267–269; Nelson, 1996, pp. 12–39, esp. 31–34; cf. Numbers, 2003; Shermer, 2006, pp. 17–19, 42–44; Shubin, 2008, pp. 173–98, elliptically; Williams, 1997, pp. 2, 4, 6–10, 104, 132–60).[5]

My essay proceeds in several steps. First, I provide an overview of Dobzhansky's article, focusing on his main areas of emphasis as well as his general style of argument. Second, I explain in detail Dobzhansky's seven arguments, showing how each relies upon one (or more) theological premises; along the way, I raise queries about the justification of these premises. At the end of the essay, I reply to objections and reflect on puzzles implied by Dobzhansky's theological claims.

## 1. Overview of Dobzhansky's article

We may begin with the title of the article, "nothing in biology makes sense except in the light of evolution." The statement appeals to understanding and intelligibility: nothing "makes sense" aside from a particular perspective. Without evolution, biology remains mysterious, impenetrable, and opaque. As Dobzhansky explains, "Seen in the light of evolution, biology is, perhaps, intellectually the most satisfying and inspiring science. Without that light it becomes a pile of sundry facts some of them interesting or curious but making no meaningful picture as a whole" (p. 129). The *meaning* of the organic realm itself is at issue; without evolution, we literally do not understand how biota and their histories fit together into a coherent, compelling mosaic.

These themes of sense making, understanding, and intelligibility resurface repeatedly in Dobzhansky's article. The phrase "makes sense" (or its cousins) appears in all six sections of the article, nearly always closely associated with the core argument in each section. Clearly, Dobzhansky wants to show that key biological data are intelligible only under evolutionary theory. To demonstrate this claim, he provides arguments for evolution in seven crucial areas: radiometric dating, comparative anatomy, embryology, adaptive radiation, biodiversity, molecular homology, and paleontology. In arguing for evolution, Dobzhansky primarily defends common ancestry. At times he explicitly argues for evolution by natural selection, but his central aim is to establish common descent.

As Dobzhansky presents his arguments, he also targets a main rival: "antievolution." Although he does not give a precise definition of the term, his references to Bishop Ussher, a young earth, the creation of multitudes of species by "supernatural fiat," and so on, suggest that he has a version of young-earth creationism in mind. As such, I will use 'antievolution,' 'young-earth creationism,' and 'creationism' as synonyms, even though these terms can have quite different meanings in other contexts. Also, for stylistic variety, I will occasionally refer to the God of creationism as the God of miracles.

Before turning to the arguments themselves, some brief clarifications about Dobzhansky's theology may be helpful. First, scholars disagree about Dobzhansky's personal religious views. Francis Collins writes that Dobzhansky was "a devout Eastern Orthodox Christian" (2006, p. 141).[6] By contrast, Francisco Ayala, Dobzhansky's former student, claims that "he apparently rejected fundamental beliefs of traditional religion, such as the existence of a personal God and of life beyond physical death" (1976, p. 6). Fortunately, Dobzhansky's personal beliefs are irrelevant for present purposes. Instead, my interest centers on the claims he utilizes in his arguments for evolution (and against creationism). I focus on the epistemic role that these theological claims play in establishing evolution, not on whether Dobzhansky personally believed them. Thus, even when I occasionally use the phrase "Dobzhansky's theology," I simply mean his use of theology, regardless of what he personally believed.

In addition, Dobzhansky's God-talk extends beyond simply articulating creationism's own theology in order to evaluate its empirically-testable predictions against the natural world. I call this "*reductio* theology" because it tries to reduce creationists' theology to an absurdity, so to speak, by showing that creationism's predictions conflict with nature (cf. Nelson, 1996, pp. 496–497). While Dobzhansky uses *reductio* theology, he also relies heavily on "*positiva* theology" (Dilley, 2012, p. 30). *Positiva* theology functions at two levels. First, it serves as *positive epistemic support* for evolution. For Dobzhansky, any sensible deity—generic, miracle-working, or otherwise—would have acted in ways supportive of evolutionary theory but contrary to creationism (cf. Radick, 2005, p. 455). In fact, all seven of Dobzhansky's arguments for evolution are comparative in nature, and these comparative arguments ensure that his *positiva* claims do not simply attack creationism, but also help establish descent with modification. Thus, claims about God serve as direct epistemic justification for evolution.

Second, *positiva* theology is also *sectarian*. Dobzhansky does not simply borrow creationists' own theology in order to counter creationism or to support evolution; instead, he imports partisan theology into his arguments for evolution. In particular, Dobzhansky draws on theological concepts foreign to creationism or appropriates elements of creationist theology in a manner alien to creationism. Dobzhansky, too, adds tendentious God-talk to the discussion.

In the seven arguments below, Dobzhansky typically adopts a basic form of argument:

1. If evolution is true, then natural phenomenon X is expected.
2. If creationism is true, then natural phenomenon X is *un*expected.
3. If a datum is expected given one hypothesis but unexpected given another, then the datum "makes sense" in light of the former hypothesis rather than in light of the latter.
4. Thus, evolution rather than creationism "makes sense" of natural phenomenon X.

Each time Dobzhansky uses this argument-form, premise two hinges upon one or another claim about what the God of miracles would do (or would not do). In some cases, Dobzhansky uses a different form:

1. Either evolution or creationism "makes sense" of natural phenomenon X.
2. The creationist explanation of X implies that God acted in Y manner (or has Z property).
3. God would *not* act in Y manner (or have Z property).

[4] I thank Colin Zwirko, one of my students, for his fine research on the theology-laden arguments of Dawkins and Coyne.

[5] Of course, I do *not* claim that the thinkers listed here have *only* theology-laden arguments for evolution; my claim is just that *some* of their arguments for evolution are theology-laden.

[6] See also Ruse (1996, pp. 385–401, 406–409; 1999, pp. 100–121) and Greene & Ruse (1996).

4. Thus, evolution rather than creationism "makes sense" of natural phenomenon X.

Premise three (especially) turns on a claim about God's actions, nature, or intentions. Like the earlier argument-form, this form requires theology for its logical validity. Having outlined the general form of Dobzhansky's reasoning, we may turn to the particular arguments themselves.

## 2. Radiometric evidence

Dobzhansky begins by noting that in the 1960s, sheik Abd el Aziz bin Baz petitioned the king of Saudi Arabia to suppress a heresy counter to the "Holy Koran, the Prophet's teachings, the majority of Islamic scientists, and the actual facts" which "all prove that the sun is running in its orbit . . . and that the earth is fixed and stable" (p. 125). To the sheik, the testimony of religious and scientific authorities, as well as empirical facts, all pointed unmistakably to geocentricism. "Anyone who professed otherwise," he added, "would utter a charge of falsehood toward God, the Koran, and the Prophet" (p. 125). Among other worries, the sheik wanted people to avoid blasphemy. Surprisingly, Dobzhansky desires the very same thing. After introducing the sheik's view, Dobzhansky offers a few brief criticisms, then turns to his main argument about radiometric dating:

> The estimates of the age of the earth, of the duration of the geologic and paleontologic eras, and of the antiquity of man's ancestors are now based mainly on radiometric evidence—the proportions of isotopes of certain chemical elements in rocks suitable for such studies.
> Shiek bin Baz and his like refuse to accept the radiometric evidence, because it is a "mere theory." What is the alternative? One can suppose that the Creator saw fit to play deceitful tricks on geologists and biologists. He carefully arranged to have various rocks provided with isotope ratios just right to mislead us into thinking that certain rocks are 2 billion years old, others 2 million, while in fact they are only some 6,000 years old. This kind of pseudo-explanation is not very new. One of the early antievolutionists, P. H. Gosse, published a book entitled *Omphalos* ("the Navel"). The gist of this amazing book is that Adam, though he had no mother, was created with a navel, and that fossils were placed by the Creator where we find them now—a deliberate act on His part, to give the appearance of great antiquity and geologic upheavals. It is easy to see the fatal flaw in all such notions. They are blasphemies, accusing God of absurd deceitfulness. This is as revolting as it is uncalled for (p. 126).

Dobzhansky implicitly insists that certain views about biological and geological history should not run counter to correct *theology*. Like the good sheik, Dobzhansky defends God's honor.

More fully, the geneticist's argument runs something like:

1. Either the radiometric dating is correct or creationism is true.
2. If creationism is true, then the Creator is deceptive about isotope ratios.
3. The Creator would not be deceptive about isotope ratios.
4. Thus, creationism is not true.
5. Thus, the radiometric dating is correct.

The argument centers on premises are two and three. The latter functions as Dobzhansky's key premise, claiming that 'the Creator would not be deceptive about isotope ratios.' The denial of this claim constitutes creationism's "fatal flaw." Clearly, premise three is both theological and indispensable. Without it, Dobzhansky's argument loses its logical validity.

Curiously, Dobzhansky provides no defense of premise three except the strident proclamation that denying the premise counts as "revolting" blasphemy. Strikingly, a number of thinkers who wish to *avoid* blasphemy nonetheless reject premise three (or reject a more general form of the premise—namely, the Creator would not be deceptive). Some Orthodox Jews, for example, hold that God can deceive humans, and has done so, without moral culpability. As Dovid Rosenfield delicately puts it in his study of Genesis, "G-d Himself is at times guilty of touching up the facts for a good cause" (2011).[7] Perhaps any respectable deity would tell the truth about matters of crucial importance—say, about how humans may attain salvation, if such a thing is possible. But it may be an open question whether the Creator of the universe must tell the truth about isotope ratios.

Even so, the real issue for Dobzhansky runs deeper. Mind-world affinity is at stake, the very foundation of realist science. The geneticist seems to believe that creationism threatens this foundation, a worry that he elliptically raises in premise two: "if creationism is true, then the Creator is deceptive about isotope ratios." On Dobzhansky's view, the isotope ratios of various elements indicate an ancient universe; but if God actually created the universe in the recent past, then the isotope ratios appear misleading. In essence, He has deceived scientists, leading them astray by providing faulty empirical evidence. At some level, Dobzhansky holds that if creationism is true, then humans cannot reliably discover the truth about the natural world. A deceptive deity undermines science.

Would God ensure realist science and its underlying faith in mind-world affinity—even in matters that bear little on so-called salvation history? The question merits serious attention. Of course, the answer depends in part on which concept of God is in play. Creationists typically believe that God would ensure mind-world affinity. They also affirm that God does not deceive. But they argue that these theological convictions do *not* entail that isotope ratios ought to be understood as Dobzhansky takes them. For example, the seminal creationist text of Dobzhansky's era was John Whitcomb and Henry Morris's *The Genesis Flood* (1961), which held that the universe, Earth, and life appeared to be ancient *only* under the assumption of uniformitarianism. But Whitcomb and Morris held that the biblical God created in ways that defied uniformitarian principles (Ibid., pp. 123–81, 193, 200–203, 219, 238, 289–90, 305, 312, 382, 411, 414–17, 426–32, 437–39, 451–53). Thus, in this case, appeal to the God of creationism only harms Dobzhansky's argument.[8]

What about a generic Creator? Interpreted this way, the claim means that any respectable deity would ensure mind-world affinity for humans. A critic might reply that we can't reliably assess whether a free Creator would create (or allow) human beings *at all*, much less provide them the capability of pursuing realist science. In any case, the query becomes even more pressing in light of the fact that Dobzhansky does not believe that God guided, planned, or caused the evolution of human beings (Dobzhansky, 1967, pp. 50–62, 108–137; 1973b, pp. 97–116; Dobzhansky et al., 1977, pp. 438–463). How could a respectable God ensure the advent of creatures capable of realist science when He did not have

[7] Rosenfield argues that Genesis 18 portrays God as justifiably telling a lie in order to further a greater good than truth—in this case, keeping peace within Abraham's family. Rosenfield's view is consonant with a larger Jewish tradition that dates back at least to Maimonides.

[8] In private correspondence with Dobzhansky, creationist Frank Lewis Marsh argues for the compatibility of a young earth and God's integrity. Strikingly, much of the seventy-two pages of correspondence between Dobzhansky and Marsh centers on whether evolution or creation is most compatible with God's moral character (The Dobzhansky-Marsh Correspondence, 1944–1945, pp. 7, 13–16, 18–19, 24–26, 31, 34, 37, 43, 64–66).

anything to do with their formation? Of course, the human line might have evolved the ability to do realist science simply by a series of fortuitous accidents in evolutionary history, *sans* divine help or planning. Alternatively, human beings (or some conscious beings like them) might have developed powers of realist science as the outcome of evolutionary progressivism and cosmic holism—again without divine direction or purpose.[9] But these possibilities don't concern us. Instead, Dobzhansky thinks that a Creator would *ensure* mind-world affinity and have *nothing* to do with the origin of humans. In this view, God is both involved and uninvolved. A perplexing image springs to mind of a deity, entirely indifferent to human evolution, somehow kindly outfitting humans to study the natural world, perhaps so they will discover they were unplanned.[10]

Curiously, Dobzhansky provides no evidence for his particular claims about God in premises two and three. But whatever their plausibility, these claims are transparently theological. Indeed, God's moral probity functions as an anchor for science and as grounds for the long eras required by descent with modification. Even though creationists also affirm divine honesty, Dobzhansky appropriates the concept in a way foreign to creationism. In this case, Dobzhansky's particular take on the Almighty's integrity serves as positive justification for evolution.

## 3. Diversity of living beings

Dobzhansky observes that the "diversity and the unity of life are equally striking and meaningful aspects of the living world" (p. 126). He saves his exposition on the unity of life for the next section; here, he focuses on diversity.[11] His basic strategy is to describe the data of biological diversity and then to argue that evolution alone "makes sense" of the data, rendering them "reasonable and understandable" (p. 127). The data are twofold: first, millions of species exist today and millions more have gone extinct in the past. Second, organisms exhibit stark differences in size, complexity, and adaptability. Regarding the latter data, Dobzhansky notes the difference in *size* between the foot-and-mouth virus and the blue whale, the difference in *complexity* between viruses and humans, and the difference in *adaptability* between "overspecialized" creatures and humans (p. 127). Dobzhansky focuses especially on adaptability, observing that humans have the ability to live in many environments whereas overspecialized creatures only live in highly specific and rare environments. He writes:

> Perhaps the narrowest ecologic niche of all is that of a species of the fungus family Laboulbeniaceae, which grows exclusively on the rear portion of the elytra of the beetle *Aphenops cronei*, which is found only in some limestone caves in southern France. Larvae of the fly *Psilopa petrolei* develop in seepages of crude oil in California oilfields; as far as is known they occur nowhere else. This is the only insect able to live and feed in oil, and its adult can walk on the surface of the oil only as long as no body part other than the tarsi are in contact with the oil. Larvae of the fly *Drosophila carcinophila* develop only in the nephric grooves beneath the flaps of the third maxilliped of the land crab *Geocarcinus ruricola*, which is restricted to certain islands in the Caribbean (p. 126).

Such creatures are "seemingly whimsical and superfluous," he says (p. 126).

Having detailed the explananda, Dobzhansky then surveys what he takes to be the relevant competing explanans: creationism, neo-Lamarckianism, and natural selection. He dispatches neo-Lamarckianism in a mere two sentences,[12] instead focusing his energies on establishing natural selection and attacking creationism. His opening argument centers on the differential pattern of extinction and survival of organisms:

> The evidence of fossils shows clearly that the eventual end of most evolutionary lines is extinction. Organisms now living are successful descendants of only a minority of the species that lived in the past—and of smaller and smaller minorities the farther back you look. Nevertheless, the number of living species has not dwindled; indeed, it has probably grown with time. All this is understandable in the light of evolution theory; but what a senseless operation it would have been, on God's part, to fabricate a multitude of species ex nihilo and then let most of them die out! (pp. 126–127)[13]

Although it is a bit difficult to discern Dobzhansky's precise argument, it runs roughly:

1. Having dispensed with neo-Lamarckianism, the two main explanations which attempt to 'make sense' of the data (or render the data "understandable") are evolutionary theory and creationism.
2. If evolutionary theory is true, mass extinction in the past as well as millions of living species in the present are "understandable".
3. If creationism is true, mass extinction in the past as well as millions of living species in the present are "senseless".
4. If one hypothesis renders the data "understandable" whereas a competing hypothesis renders the data "senseless," then the former hypothesis, as opposed to the latter, 'makes sense' of the data.
5. Thus, the pattern of mass extinction in the past as well as millions of living species in the present make sense in light of evolutionary theory rather than in light of creationism.

The argument centers on premises two and three. The latter claims that the pattern of extinction and survival does not make sense given creationism. As Dobzhansky put it, "what a senseless operation it would have been, on God's part, to fabricate a multitude of species ex nihilo and then let most of them die out!" Later in the passage, he adds, "But what is the sense of having as many as 2 or 3 million species living on earth?" (pp. 126–127). In other words, he sees no intelligible reasons why God would create a huge number of species and let most of them perish, or allow millions of species to exist in the present day. For Dobzhansky, the God of miracles is neither the One who gives abundant life nor the One who takes it away. Instead, such a Being would create a limited number of species and generally ensure their survival. The Almighty, it seems, favors restraint and longevity over innovation and risk. Precisely this view of the divine serves as crucial justification for evolution.

The second argument in the passage, which builds on the first, takes matters deeper. Here Dobzhansky focuses on the wide disparity in size, complexity, and adaptability of organisms. In this

[9] Arguably, Dobzhansky's view was along these lines (Delisle, 2008, 2009, 2011; for a different view of Dobzhansky, see Ruse, 1996, pp. 385–401, 406–409; 1999, pp. 100–121; Greene & Ruse, 1996).

[10] Of course, on this view, humans might still be valuable and also be capable of ushering in an era of increased creativity and harmony (cf. Dobzhansky, 1967, pp. 58–62, 108–137).

[11] In *Genetics of the Evolutionary* Process, Dobzhansky blends the two, making a similar (but more elliptical) argument than given here (1970, pp. 1–29).

[12] "The environment does not impose evolutionary changes on its inhabitants" but rather "the environment presents challenges to living species, to which the latter may respond by adaptive genetic changes" (p. 126).

[13] It is worth noting that creationism generally holds that God created 'kinds' rather than species. Did Dobzhansky misrepresent the creationist view? The question is not easy to answer, especially in light of The Dobzhansky-Marsh Correspondence (1944–1945). See also Dobzhansky (1945, pp. 73–75).

argument, he emphasizes that such organic diversity manifests no purpose or plan. He then implies that a lack of purpose or plan is expected if the Creator operated by natural selection, but highly unexpected if the Creator produced species by direct fiat.

Dobzhansky begins, "There is, of course, nothing conscious or intentional in the action of natural selection." Instead,

> Natural selection is at one and the same time a blind and creative process. Only a creative and blind process could produce, on the one hand, the tremendous biologic success that is the human species and, on the other, forms of adaptedness as narrow and as constraining as those of the overspecialized fungus, beetle, and flies mentioned above (p. 127).

What does this mean vis-à-vis the creationist explanation? Dobzhansky drives home his argument, starting with the very next sentence:

> Antievolutionists fail to understand how natural selection operates. They fancy that all existing species were generated by supernatural fiat a few thousand years ago, pretty much as we find them today. But what is the sense of having as many as 2 or 3 million species living on earth? If natural selection is the main factor that brings evolution about, any number of species is understandable: natural selection does not work according to a foreordained plan, and species are produced not because they are needed for some purpose but simply because there is an environmental opportunity and genetic wherewithal to make them possible. Was the Creator in a jocular mood when he made *Psilopa petrolei* for California oil-fields and species of *Drosophila* to live exclusively on some body-parts of certain land crabs on only certain islands in the Caribbean? The organic diversity becomes, however, reasonable and understandable if the Creator has created the living world not by caprice but by evolution propelled by natural selection (p. 127).

Natural selection renders the diversity of life "understandable" because it "does not work according to a foreordained plan." It operates on species "not because they are needed for some purpose but simply because there is an environmental opportunity and genetic wherewithal to make them possible." Natural selection acts without a plan or purpose.[14] This fact matters for Dobzhansky precisely because he detects *no* discernible purpose or plan in the eclectic facts of organic diversity; nothing like a unified plan can be found in the varying size of organisms, or in their disparate complexity, or in their differential adaptability, or in their pattern of extinction and existence.

This lack of purpose poses a major problem for creationism: it does not make "sense" for a purposive God to create organic diversity without evident purpose. Dobzhansky attacks creationism by asking questions designed to point out that there is no intelligible reason why God would directly make life as we find it: "But what is the sense of having as many as 2 or 3 million species living on earth?" and "Was the Creator in a jocular mood when he made *Psilopa petrolei* for California oil fields and species of *Drosophila* to live exclusively on some body-parts of certain land crabs on only certain islands in the Caribbean?" (p. 127). He ends his argument by contrasting the reasonableness of a Creator operating by natural selection with the whim of a Creator operating by direct fiat. As he says, "The organic diversity becomes, however, reasonable and understandable if the Creator has created the living world not by caprice but by evolution propelled by natural selection" (p. 127). In short, no respectable God would operate with such "caprice."

Essentially, Dobzhansky's argument amounts to:

1. Having dispensed with neo-Lamarckianism, two remaining accounts attempt to make the data of organic diversity "reasonable and understandable": a Creator operating by natural selection or a Creator acting by direct creative fiats.
2. If a Creator made the earth's organic diversity by natural selection, there should *not* be a discernible plan or purpose in this organic diversity.
3. If a Creator fashioned earth's organic diversity by supernatural fiats, there should be a discernible plan or purpose in this organic diversity.
4. There is no plan or purpose to the planet's organic diversity.
5. Thus, a Creator did not fashion earth's organic diversity by supernatural fiats.
6. Therefore, (only) a Creator operating by natural selection makes the data of organic diversity "reasonable and understandable".

A few observations about this argument are in order. First, one might wonder about the very first premise of Dobzhansky's argument. In it, Dobzhansky omits as possible explanations agnostic or atheistic moorings for evolution, and does so without argument. Second, Dobzhansky's argument directly implies that God did not "foreordain" human beings; like all organisms, we, too, are the result of natural selection which produced us "simply because there [was] an environmental opportunity and genetic wherewithal" to make humans possible (p. 127). Although Dobzhansky speaks of a Creator operating via natural selection, he clearly rejects a deity that guides, plans, or orchestrates organic history, in keeping with his other major works at the time (e.g. 1967; 1973b; Dobzhansky et al., 1977).

Third, Dobzhansky's fourth premise nods toward theology. The premise asserts that there is no plan or purpose to the planet's organic diversity. But *how* does the mere fact of organisms' varying size, complexity, and adaptability indicate that a purposeful Creator did not fashion them? Dobzhansky provides no reason or argument. He assumes that a miracle-working God would make organisms *closer* in size, complexity, and adaptability. Apparently, a God of immense power and creativity would not freely produce stunning diversity, but constrain Himself to fashion creatures of attenuated variety. In this vision, the Almighty resembles a temperate conservative rather than an expressive artist. Thus, in the flora and fauna of organic diversity, God's moderation serves as key justification for evolution.

This notion of God deserves closer inspection. Suppose our world contained organisms that were closer in size than we actually observe. Instead of the diminutive foot-and-mouth virus, on the one hand, and the massive blue whale, on the other, imagine our world modestly contained only organisms ranging in size between bees and buffalos. Would *this* diversity of size accord with the purposes of God or not? Or suppose that our world boasted a wider range of organismal adaptation than it currently does. Instead of the current gulf between humans and oil-field flies, suppose there were organisms just like humans, but capable of surviving in many more environments, *and* suppose that oil-field flies could only survive on one specific acre of one particular oil field. Would *this* difference in adaptation run contrary to divine plans or purposes? Answering these questions in a principled, defensible manner may require additional work.

[14] The phrase "natural selection acts without a plan or purpose" reflects Dobzhansky's view that although natural selection is non-random and end-directed (in a certain sense), there is "nothing conscious or intentional in the action of natural selection" (p. 127). Thus, when I use 'plan' or 'purpose' in this essay, I refer to conscious or intentional states of mind directed toward a goal. A progressivist view of natural selection, even within the context of cosmic holism, lacks a 'plan' or 'purpose' in this sense.

But for argument's sake, grant that there is no plan or purpose to the planet's organic diversity (premise four). Dobzhansky apparently arrives at this premise by carefully analyzing the facts of organic diversity and, after much thought, failing to detect any clear plan or purpose to these facts. More fully, his tacit argument runs:

1. So far as I can discern, there is no plan or purpose to the planet's organic diversity.
2. If there was a plan or purpose to the planet's organic diversity, I would discern it.
3. Thus, there is no plan or purpose to the planet's organic diversity.

This is a 'noseeum' argument, well-known in contemporary discussions of the problem of evil (Wykstra, 1984, 1996). These arguments follow the general structure:

1. So far as I can discern, there is no X.
2. If there was an X, I would discern it.
3. Thus, there is no X.[15]

Consider premise two. When generalized beyond Dobzhansky's personal view, it holds that if there was a divine plan or purpose, certain humans would be in a position to see this plan or purpose. Recall that this claim, combined with premise one, undergirds premise four of the original organic diversity argument. Thus, the original argument relies on the following:

1. Even though an omniscient and omnipotent God has available to him purposes of nearly unimaginable complexity and creativity in the miraculous creation of earth's organic diversity, certain human beings in the late 20th century are in a position to discern these purposes and, if they find none, to conclude that no such purposes exist.

In many religious traditions, God grants certain humans the knowledge and cognitive capacity to discern His purposes on matters of salvation. But whether they can know divine ways regarding organic diversity remains an open question. Not so for Dobzhansky. For him, such matters are accessible. Divine transparency thus serves as prime justification for evolution.

## 4. Unity of life

"The biochemical universals," Dobzhansky writes, "are the most impressive and the most recently discovered vestiges of creation by means of evolution" (p. 128). Three universals common to all species stand out: the genetic code, the process of translation into proteins, and certain features of cellular metabolism. Dobzhansky argues that evolution, rather than creationism, explains the presence of these biochemical universals:

> What do these biochemical or biologic universals mean? They suggest that life arose from inanimate matter only once and that all organisms, no matter now diverse in other respects, conserve the basic features of the primordial life. (It is also possible that there were several, or even many, origins of life; if so, the progeny of only one of them has survived and inherited the earth.) But what if there was no evolution and every one of the millions of species were created by separate fiat? However offensive the notion may be to religious feeling and to reason, the antievolutionists must again accuse the Creator of cheating. They must insist that He deliberately arranged things exactly as if his [sic] method of creation was evolution, intentionally to mislead sincere seekers of truth (p. 127).[16]

So, the "biochemical or biologic universals" imply two facts: (i) "life arose from inanimate matter only once" and (ii) "all organisms, no matter how diverse, in other respects, conserve the basic features of the primordial life." That is, given evolution, we would expect a single source of (enduring) life. We would also expect that all organisms, having arisen from this single source, would share basic attributes. In short, evolution predicts the unity of life to a high degree.

What about the alternative? If "every one of the millions of species were created by separate fiat" then unsettling implications follow: the Creator cheated, intentionally misleading sincere seekers of the truth. Dobzhansky's argument for this claim can be expressed:

1. The only way for creationism to make sense of biochemical universals is to hold that the Creator cheated, deliberately arranging things to *appear* that He created via evolution when He actually created via miracles.
2. If the Creator deliberately arranged things to appear that He created via evolution when He actually created via miracles, then He has intentionally misled sincere seekers of truth.
3. But a Creator would not intentionally mislead sincere seekers of truth on such matters.
4. Thus, it is not the case that the God of miracles cheated, deliberately arranging things to appear that He created via evolution when He actually created via miracles.
5. Thus, creationism does not make sense of biochemical universals.

Premise three contains overt theology: the Creator would not intentionally mislead sincere seekers of truth about biochemical universals. Once again, we see Dobzhansky's affirmation of divine honesty and its importance to the validity of the argument.[17]

Premise one assumes that biochemical universals are *unexpected* given separate miraculous design.[18] That is, given the creationist view of God—who created species by individual fiats—we would be surprised to discover common biochemical structures, pathways, and processes. Thus, Dobzhansky's final argument:

1. If evolutionary theory is true, certain biochemical universals are very much expected, like the genetic code, the process of translation into proteins, and certain features of cellular metabolism.
2. If creationism is true, then certain biochemical universals are unexpected, like the genetic code, the process of translation into proteins, and certain features of cellular metabolism.
3. If the evidence is very much expected on one hypothesis but unexpected on another, then the evidence 'makes sense' in light of the former rather than the latter.

[15] Alternatively:

1. So far as I can discern, there is no X.
2. If there was an X, I would probably discern it.
3. Thus, there probably is no X.

Although this is a stronger version of the argument, it does not appear to be the version given by Dobzhansky. In any case, it rests on an assumption similar to one explored above—namely, that certain humans probably could discern God's plans or purposes in organic history were there any.

[16] At the end of the section, Dobzhansky also argues that the distribution pattern of mutant hemoglobins among human beings "make[s] sense in the light of evolution" (p. 128).

[17] Notably, premise two makes a claim about God's *intentions*, not just His existence, actions, or character.

[18] Or, at a minimum, premise one assumes that biochemical universals are 'not expected.'

4. Thus, evolutionary theory, as opposed to creationism, makes sense of certain biochemical universals, like the genetic code, the process of translation into proteins, and certain features of cellular metabolism.

Premise two warrants consideration. Curiously, Dobzhansky offers no argument on its behalf. He tacitly assumes that the God of creationism would not draw upon a common design, modifying it as appropriate for each new species. Instead, this God would fashion new species from completely different biochemical elements—without a similar digital code, method of translation, or metabolic process. As philosopher Paul Nelson observes in a similar context, the underlying assumption is that "If the creator is free to do as he pleases, the appearance of [a] plan can become the appearance of limitation or constraint, suggesting an unimaginative or even slavish repetition of structures along some predetermined pattern" (1996, p. 511, emphasis altered). Dobzhansky assumes that the "apparent uniformity of certain biological patterns is inconsistent with the freedom of a creator to act as he wishes" (Nelson, 1996, p. 511; cf. Lustig, 2004, pp. 75–76). The God of miracles would fashion *different* types of digital codes, translation mechanisms, and metabolic processes for each species He created. An unconstrained God would always start from scratch.[19]

We may call this '*de novo* theology.' Significantly, this theology plays an essential role: remove it and both arguments about biochemical universals become invalid. Moreover, recall that Dobzhansky deemed biochemical universals as "the most impressive" evidence for evolution (p. 128). Accordingly, the geneticist's *best* argument for descent with modification relies indispensably on theology. Once again, Dobzhansky appeals to things above to defend his theory about things below.

In this theology, originality and diversity enamor the Almighty, who regards the creation of new species from a common design as anathema. Curiously, in the "diversity of life" section, Dobzhansky expresses confidence that the deity would circumscribe his creativity by making organisms with less diversity of size, complexity, and adaptability than we find in the actual world. But here in the "unity of life" section, Dobzhansky avers that God would exercise expansive creativity, producing an array of digital codes, metabolic processes, and the like. Evidently, the Creator enjoys innovation and variety on certain occasions but not others.

## 5. Comparative anatomy and embryology

"Comparative anatomy and embryology proclaim the evolutionary origins of the present inhabitants of the world," Dobzhansky affirms in the next section (p. 128). How so? Starting in the next sentence, Dobzhansky gives his comparative anatomy (or homology) argument in full:

> In 1555 Pierre Belon established the presence of homologous bones in the superficially very different skeletons of man and bird. Later anatomists traced the homologies in the skeletons, as well as in other organs, of all vertebrates. Homologies are also traceable in the external skeletons of arthropods as seemingly unlike as a lobster, a fly, and a butterfly. Examples of homologies can be multiplied indefinitely (p. 128).

Stated in deductive form, the argument proceeds:

1. In 1555 Pierre Belon established the presence of homologous bones in the superficially very different skeletons of man and bird.
2. Later anatomists traced the homologies in the skeletons, as well as in other organs, of all vertebrates.
3. Homologies are also traceable in the external skeletons of arthropods as seemingly unlike as a lobster, a fly, and a butterfly.
4. Examples of homologies can be multiplied indefinitely.
5. Thus, the data of comparative anatomy (help) proclaim the evolutionary origins of the present inhabitants of the world.

Clearly, this argument is an enthymeme. As stated, the conclusion does not follow from the premises. What premise would make the argument valid? Given the present context, the missing premise strikes a familiar cord: the God of creationism would create skeletons (and organs) in certain new species de novo rather than from a common pattern. So, features which share a common pattern—such as the external skeletons of lobsters, flies, and butterflies—are unexpected given creationism. The presence of these commonalities, thinks Dobzhansky, indicate the falsity of the creationist account. Thus, the deeper argument runs roughly:

1. If evolution is true: (i) homologous skeletons and organs are highly expected among all vertebrate species, and (ii) homologous exoskeletons are also highly expected among seemingly unalike arthropod species.
2. If creationism is true: (i) homologous skeletons and organs are *un*expected among all vertebrate species, and (ii) homologous exoskeletons are also *un*expected among seemingly unalike arthropod species.
3. As a matter of biological fact, there are homologous skeletons and organs among all vertebrate species. There are also homologous exoskeletons among seemingly unalike arthropod species.
4. If the evidence is highly expected on one hypothesis but unexpected on a competitor, then the evidence strongly supports the former hypothesis over its competitor.
5. Thus, (i) homologous skeletons and organs among all vertebrate species and (ii) homologous exoskeletons among seemingly unalike arthropod species both strongly support evolution over creationism.

Premise two presupposes that, within certain phyla (or subphyla), the God of creationism must create certain homologous features afresh—not fashioning new traits for new organisms by drafting off previous designs, but creating novel traits every time.[20] As we have seen, Dobzhansky utilizes a version of this claim in his argument about biochemical universals. But again he provides no justification for why the God of miracles would behave in just this manner. Perhaps Dobzhansky (again) thinks it unworthy of the Almighty to build on previous work, as if divine freedom mandated vigilant originality. Or perhaps he believes that use of a common design is wasteful or inefficient, contrary to God's orderliness and competence.[21] Whatever the case, Dobzhansky's de novo theology serves as indispensable grounds that comparative anatomy makes sense only in light of evolution.

[19] More precisely, the God of special creation would start from scratch, never drawing on a common design. Or, if He did use a common design, He would erase any trace of having done so. For ease of exposition, I will focus upon the former assumption both here and in related arguments below.

[20] In correspondence with Dobzhansky, Frank Marsh directly disputed this assumption, but Dobzhansky did not reply (The Dobzhansky-Marsh Correspondence, 1944–1945, pp. 42–43).

[21] This view of the divine might be called 'the-gods-must-be-tidy' theology.

Having made his argument about anatomy, Dobzhansky next turns his attention to embryology. After briefly critiquing Ernst Haeckel's claim that 'ontogeny recapitulates phylogeny,' Dobzhansky avers that "embryonic similarities are undeniably impressive and significant" (p. 128). He then gives his argument in full:

> Probably everybody knows the sedentary barnacles which seem to have no similarity to free-swimming crustaceans, such as the copepods. How remarkable that barnacles pass through a free-swimming larval stage, the nauplius! At that stage of its development a barnacle and a *Cyclops* look unmistakably similar. They are evidently relatives. The presence of gill slits in human embryos and in embryos of other terrestrial vertebrates is another famous example. Of course, at no stage of its development is a human embryo a fish, nor does it ever have functioning gills. But why should it have unmistakable gill slits unless its remote ancestors did respire with the aid of gills? Is the Creator again playing practical jokes? (p. 128)

The paragraph contains two main arguments. The first concerns the embryological similarities between sedentary barnacles and free-swimming crustaceans, while the second focuses on similarities between fish and the embryos of humans and other vertebrates. For brevity's sake, I will focus on the second, with emphasis on the fish-human comparison.[22] The argument can be represented as follows:

1. Either evolutionary theory or creationism provides a plausible explanation for the gill slits in human embryos.
2. The evolutionary view that humans had a remote ancestor that respired with the aid of gills is a plausible explanation for human embryo gill slits.
3. The creationist explanation for human embryo gill slits implies that the Creator is jocular or deceptive.
4. Explanations that imply that the Creator is jocular or deceptive are implausible.
5. Thus, the creationist explanation is implausible.
6. Thus, evolutionary theory provides the (only) plausible explanation of the gill slits in human embryos.

Theology plainly informs premise four, which serves as another important invocation of divine honesty. In fact, the argument as a whole turns on this claim. In embryology, as elsewhere, God's moral integrity bolsters the case for evolution.

Premise three also contains theology. It states that the creationist explanation of the data implies that the Creator is jocular or deceptive. Why is this so? Dobzhansky does not explicitly say. But his broader reasoning suggests a familiar assumption: the Almighty would avoid creating certain kinds of similarity between organisms. In this case, Dobzhansky assumes the God of miracles would not create a species with a passing feature that bears some resemblance to a permanent feature of a species in a different taxonomic class. Strikingly, this assumption steps beyond the *de novo* theology of earlier arguments. These arguments held that God would not create certain kinds of similar, enduring structures (or processes) between different species. Here, Dobzhansky implies God would not make a species with even a *temporary* similarity to a permanent feature of a species in a different class. It seems the deity would exercise originality in every jot and tittle of creation.

Dobzhansky does not specify why God would act in this fashion. But the main point concerns the geneticist's reliance on theology in premises three and four. God's probity and creativity rise to the fore once again, this time serving as vital justification that evolution alone makes sense of embryological similarities.

## 6. Adaptive radiation: Hawaii's fruit flies

In the peculiar and fascinating features of Hawaiian fruit flies, Dobzhansky finds another strong argument for evolution (and against creationism). He observes that as many as 500 of the 2,000 species of drosophila in the world occur in Hawaii. More than 95% of these 500 are endemic to the archipelago, and many of these flies occur in particular niches rather than throughout the islands. Dobzhansky asks, "What is the explanation of this extraordinary proliferation of drosophilid species in so small a territory?" (p. 129). He answers in the next sentence: the "work of H.L. Carson, H.T. Spieth, D.E. Hardy, and others makes the situation understandable" (Carson, Hardy, Spieth, & Stone, 1970).

Dobzhansky goes on to explain the research of Carson and company, which centers on adaptive radiation. He writes: "A single drosophilid species, which arrived in Hawaii first, before there were numerous competitors, faced the challenge of an abundance of many unoccupied ecologic niches. Its descendants responded to this challenge by evolutionary adaptive radiation, the products of which are the remarkable Hawaiian drosophilids of today" (p. 129) After detailing some of the diverse and remarkable features of Hawaiian fruit fries, Dobzhansky brings his argument to the fore (quoted in full):

> Oceanic islands other than Hawaii, scattered over the wide Pacific Ocean, are not conspicuously rich in endemic species of drosophilids. The most probable explanation of this fact is that these other islands were colonized by drosophilid after most ecologic niches had already been filled by earlier arrivals. This surely is a hypothesis, but it is a reasonable one. Antievolutionists might perhaps suggest an alternative hypothesis: in a fit of absentmindedness, the Creator went on manufacturing more and more drosophilid species for Hawaii, until there was an extravagant surfeit of them in this archipelago. I leave it to you to decide which hypothesis makes sense (p. 129).

The argument can be expressed as follows:

1. Either adaptive radiation or creationism "makes sense" of endemic species of drosophila on Hawaii as compared to other Pacific islands.
2. Adaptive radiation makes sense of the data.
3. Creationism implies, in this case, that the Creator absentmindedly made an extravagant surfeit of endemic drosophila species on Hawaii but not on other Pacific islands.
4. The claim that the Creator absentmindedly made an extravagant surfeit of endemic drosophila species on Hawaii, but not on other Pacific islands, does not make sense.
5. Thus, adaptive radiation, as opposed to creationism, makes sense of endemic drosophila species on Hawaii as compared to other Pacific islands.[23]

Before turning to the theology-laden premises, I note that some creationists might object that Dobzhansky misrepresents their view.[24] According to them, God created "kinds," not species, and fruit flies are all of one kind—and so one might expect adaptive radiation and diversity from a basic drosophilid kind.

In any case, theology runs through premise four. This premise focuses on the incomprehensibility of God creating an

[22] In analyzing the second argument, I also leave aside Dobzhansky's comparison of the 'gill slits' of non-human terrestrial vertebrates with the gill slits of fish.

[23] My interpretation of the fruit fly argument focuses on 'sense-making' as Dobzhansky's key adjudicating epistemic criterion. He also mentions probability, arguing that evolution is "[t]he most probable explanation" of the fruit fly data. Perhaps in this case, Dobzhansky thinks that sense-making should be understood in terms of probability.

[24] But see note 13.

"extravagant surfeit" of fruit flies. The word "surfeit" generally means "an excessive amount," in which "excessive" can be either descriptive or evaluative. The descriptive definition denotes "exceeding the usual degree" while the evaluative one denotes "exceeding a reasonable or proper limit." Let us initially suppose Dobzhansky had the former meaning in mind. Premise four would then hold that it is nonsense that God would create far more drosophila species on Hawaii than on other Pacific islands.[25] This claim assumes that the God of creationism would create (and maintain) a roughly similar number of drosophila species across various Pacific islands, Hawaii included. On this view, God is not an artist who exercises extraordinary creative expression in whatever location he wishes. Instead, he resembles an accountant who carefully limits differences from one deposit to the next. Elsewhere Dobzhansky emphasizes God's creative innovation; here he emphasizes God's evenhanded conservatism.

But Dobzhansky might have a different meaning for premise four in mind. Perhaps "excessive" should be understood in an evaluative way, rather than a descriptive one. Premise four would then mean that it is nonsense that the Creator fashioned (and maintained) more than a "reasonable limit" of drosophila species on Hawaii as compared to other Pacific islands. Two main questions surface. First, just *what* is the reasonable or proper limit? To say that God would not transgress a reasonable limit presupposes a boundary beyond which God would not (justifiably) go. But Dobzhansky does not indicate what this boundary might be, even roughly. Are 500 species of drosophila on Hawaii over the limit whereas 400 species are not? How about 217 species? Or does the boundary have nothing to do with quantity but rather with fruit fly distribution, physical characteristics, behaviors, or the like? If so, what are the reasonable limits in these areas? These questions admit no easy answers.

Second, supposing a boundary can be drawn (even roughly), *why* would God observe it? That is, what is the boundary's legitimate justification? Or, put differently, what is God's purpose for—or obligation with respect to—fruit flies on the Hawaiian Islands vis-à-vis other Pacific islands? Is the Creator's purpose or obligation to preserve a certain distribution of drosophila species in that general region of the world? Or is it to maintain the beauty and order of the cosmos as a whole, which occurs at a level that transcends local time and space? Or something else entirely? Clearly, the justification of (this interpretation) of Dobzhansky's adaptive radiation argument turns on engaging serious theological questions.

My own speculation is that Dobzhansky did not see a biological, ecological, environmental (or any other) purpose to the number, distribution, characteristics, or behavior of Hawaiian fruit flies in comparison with those of other Pacific islands.[26] He concluded, therefore, that there was no purpose. Moreover, he reasoned that if the God of creationism had made the Hawaiian drosophila, then there would be evidence of divine purpose. Hence, it made little sense to claim that the God of miracles had done so. Thus, Dobzhansky reasoned in a familiar noseeum fashion:

1. So far as I can discern, there is no divine purpose to the number, distribution, characteristics, or behavior of Hawaiian fruit flies as compared to those of other Pacific islands.
2. If there was a divine purpose to the number, distribution, characteristics, or behavior of Hawaiian fruit flies as compared to those of other Pacific islands, then I would discern it.
3. Thus, there is no divine purpose to the number, distribution, characteristics, or behavior of Hawaiian fruit flies as compared to those of other Pacific islands.[27]

When generalized, the argument holds that even though an omniscient and omnipotent Creator has available to him purposes of nearly unimaginable complexity and creativity in the miraculous creation of fruit flies on the Hawaiian Islands, certain human beings in the late 20th century are in a position to discern these purposes and, if they find none, to conclude that no such purposes exist. Once again, divine transparency plays a prime epistemic role.

Even setting aside my speculation regarding Dobzhansky's noseeum reasoning about divine purposes, he plainly uses theology to undergird his argument that God would not (or must not) create a "surfeit." In the end, God's nature, purposes, or duties serve as crucial grounds for evolution.

## 7. Summary

We may now step back and recount the central claims of this essay. Before enumerating the theological premises and assumptions in Dobzhansky's arguments, it may be helpful to note that, rather than simply drawing on theology to undergird minor areas of biology, Dobzhansky uses theological claims to help justify his evolutionary views on an array of important areas, including biochemical homology, gross structural homology, embryology, antiquity of human ancestry, age of the earth, age of fossils, organic diversity, and adaptive radiation.

Several theological claims are in play. These claims portray Dobzhansky's views about the characteristics and behavior appropriate for either the God of miracles or a (generic) Creator:

1. The Creator is not deceptive.
2. Morality-laden categories, such as 'non-deceiver,' properly apply to a supreme divine Being.
3. God would ensure a 'realist' science, in which human researchers enjoyed mind-world affinity.
4. God would ensure human mind-world affinity even though he did not plan, cause, or orchestrate the advent of human beings.
5. The God of creationism would make organisms closer in size than they are in the actual world.
6. The creationists' God would make organisms closer in complexity than they are in the actual world.
7. The God of miracles would make organisms closer in adaptability than they are in the actual world.
8. The creationists' deity would not fabricate a multitude of species *ex nihilo* and then let most of them die out.
9. The God of miracles would not create (or allow) two or three million species to live on Earth at the same time.
10. If the Creator deliberately arranged things to appear that He created via evolution when He actually created via miracles, then He intentionally misled sincere seekers of truth.
11. The God of miracles would make each species with a different genetic code.
12. The God of creationism would fashion each species with different processes of translating genetic code(s) into proteins.
13. The creationists' deity would create each species with different metabolic processes.

[25] If differences in the *quantity* of fruit flies (between Hawaii and other Pacific islands) are not Dobzhansky's main focus, then premise four could be interpreted alternatively. For example: 'It is nonsense that God would create drosophila on Hawaii that exhibit a greater degree of diversity in physical characteristics, behaviors, distribution, etc. than on other Pacific islands.' Readers who prefer this interpretation (or one like it), may adjust my argument accordingly.

[26] See note 14 for the definition of 'purpose.'

[27] For a more circumspect version of the argument, see note 15.

14. The creationists' God would create skeletons and organs in all vertebrate species from scratch—not drafting off of previous designs, but creating these items *de novo*.
15. The God of miracles would create exoskeletons in seemingly different arthropods from scratch, not drawing on a common design but creating these exoskeletons *de novo*.
16. The God of creationism would not fashion members of one species so that, while in their embryological stage of development, they have a temporary similarity to a permanent feature of a different class of species.
17. The creationists' God would create (and maintain) a roughly similar quantity (or a similar pattern of behavior, physical traits, etc.) of drosophila on Hawaii as on other Pacific islands.

Four features of this list stand out. First, in the context of Dobzhansky's arguments, these claims (or their application) are *sectarian*: they represent a tendentious theological point of view. In particular, this *positiva* theology (or its application) contrasts with creationism's theology. Dobzhansky does not simply articulate creationism's own theology in order to evaluate its empirical predictions against the natural world. Instead, he brings to bear a partisan idea of what God would or would not do. Any generic Creator worth His salt would act in accord with the first four theological doctrines. And any reasonable God of miracles would act in accord with all seventeen, except number four.

Second, these doctrines function as positive epistemic justification for evolution. Because of the comparative nature of Dobzhansky's arguments, these doctrines do not simply attack creationism, but also establish evolution. Third, each of Dobzhansky's arguments *require* one (or more) of these doctrines. Without God-talk, the geneticist's arguments are logically invalid. Of course, empirical evidence and 'naturalistic' concepts remain vital; but on their own, non-theological elements fail to establish Dobzhansky's conclusions.

Fourth, underneath most of these theological claims lies an epistemological assumption that human beings can know the aims of God in very specific domains of the natural world. For example, some humans are so perspicacious that:

1. They are in a position to discern the purpose of an omniscient and omnipotent Creator in making earth's organic diversity—or even in the creation of endemic fruit flies on the Hawaiian Islands—and, if they do not find a divine purpose, to conclude that no such purpose exists.

In fact, Dobzhansky's view implies a high level of divine transparency generally. And, because the case for evolution is obvious, then essential features of this case—including theological claims—should be obvious as well. Regarding evolution, Dobzhansky writes, "Evolution as a process that has always gone on in the history of the earth can be doubted only by those who are ignorant of the evidence or are resistant to evidence, owing to emotional blocks or to plain bigotry" (p. 129). An indispensable part of the "evidence" is the doctrinal statements above. Accordingly, Dobzhansky's theology can be doubted only by those who are ignorant, emotionally impaired, or ill motivated.

However, the content of Dobzhansky's doctrinal statements—in addition to his general confidence in divine transparency—contrasts sharply with a range of long-standing theistic traditions. That is, Dobzhansky's *positiva* theology contrasts not only with creationist theology but also with the theologies of an array of theistic views. For example, some traditions emphasize divine elusiveness (rather than transparency), in which God hides to one degree or another, enabling humans to develop wisdom, virtue, and faith as they struggle to see through a glass darkly. Other traditions center on apophatic theology, in which one can only justifiably speak of what God is not, rather than what He is. Still other traditions conceive of the deity as the "ground of all being," with qualities (or actions) very different from those delineated by Dobzhansky. Of course, one does not have to adhere to a theistic tradition in order to do theology; atheists and agnostics can reason about God as well: if a generic Creator exists, then He has property X and, given this property, we would expect natural phenomenon Y. Or, if the God of miracles exists, then He has property A and, given this property, we would expect natural phenomenon B.[28] But whatever one's worldview, determining what a given conception of God implies about the natural world requires serious thought, particularly with counterfactuals in play. Can we simply claim that those who dissent from Dobzhansky's theology-laden arguments are ignorant, emotionally hampered, or bigoted?[29] Or, is it possible that some atheists, theists, and others have reflected deeply on theological matters and justifiably arrived at views contrary to Dobzhansky's?

## 8. An objection

A critic might claim that Dobzhansky draws on theology *only* because he attacks a view already rife with divinity (creationism). Indeed, Dobzhansky's article originally appeared in *The American Biology Teacher*, a journal for science educators, opposite an article by creationist Duane Gish (1973). In this particular context, little wonder that Dobzhansky steps beyond science and uses theology in order to make his case.[30] But in many other contexts, including strictly scientific ones, God-talk stands irrelevant to the justification of evolution. The specter of LaPlace, one might say, looms over biology.

I provide several points by way of reply. First, just to be clear, I am *not* arguing that theology-laden arguments should be considered 'scientific.' I defend an epistemic rather than demarcational thesis: Dobzhansky's seven arguments for evolution depend upon God-talk, whether these arguments are 'scientific' or not. So, even if Dobzhansky steps beyond science in his polemic, I simply contend that he offers theology as a *key reason to accept evolution*. For present purposes, epistemic claims take center stage; honorific labels like 'scientific' matter less.

This clarification leads directly to a second point. Let us suppose for a moment that a thoughtful case for evolution can be made *sans* theology, as the objection claims. (If it matters, I sympathize with this view.) Nothing in my essay contests this claim, nor does my thesis devalue non-theological elements in the case for evolution. Without harm to my argument, I can grant the *de jure* point that God-talk is not essential for the justification of evolutionary theory.

Instead, I focus on *de facto* matters. As I have noted, a range of thinkers use *positiva* theology in some of their arguments for evolution. I do not claim that all of their arguments for evolution

[28] Depending upon their other beliefs, at least *some* types of atheists and agnostics can coherently reason in this way. But *inter alia* see Darwin's concern below that unguided evolution (of human beings) supports theological anti-realism rather than theological realism.

[29] Strictly speaking, Dobzhansky says that those who reject the evidence for evolution—not *his arguments* for evolution—are ignorant, emotionally imbalanced, or bigoted. But because Dobzhansky purports to give clear and persuasive arguments for evolution, presumably those who resist his arguments would fall into the aforementioned camp. Otherwise, Dobzhansky would be in the odd position of claiming that the evidence for evolution is irresistible to fair-minded, informed, emotionally balanced people, but that his arguments do not provide any such evidence.

[30] Dobzhansky was no stranger to publically engaging 'pseudo-scientific' perspectives (Gordin, 2012).

include theology, nor do I claim that all biologists use *positiva* theology in some way. The mere mention of a *de jure* possibility hardly alters the significance of the *de facto* reality for some thinkers, including eminent ones like Ayala, de Beer, Eldredge, Gould, Mayr, Kitcher, Coyne, and Dawkins. A surprising number of *actual* justifications for evolution hinge upon God-talk.

As such, supposing that a robust case for evolution can avoid theology, we may return to the matter at hand: have Dobzhansky and company provided *sound* theology-laden arguments? To answer this question, we must grapple with the complexities of 'making sense' of biology by relying on partisan notions of God's nature, duties, purposes, or actions. In talks with colleagues about my thesis, I find that some immediately race to the 'theology-ain't-necessary' objection without examining their own polemic for evolution or that of top experts. But surely, our *actual* arguments, not to mention those of luminaries, warrant serious care and attention.

Third, the objection misses the significance of the distinction between *reductio* and *positiva* theology. If Dobzhansky had been inclined, presumably he could have attacked creationism by using *reductio* theology, in which he contrasted creationism's empirically-testable claims with the natural world. This would not have required importing any additional theology into the discussion, but rather simply dismantling creationism on its own terms. Moreover, he could have elected to ground the positive case for evolution on entirely 'non-theological' grounds. And, in both attacking creationism and establishing evolution, he could have used epistemic values that are theologically neutral, like explanatory power and fruitfulness.[31] As such, he could have dispatched a rival and established his favored theory with little theological infestation. Instead, Dobzhansky freely adds *positiva* theology—*sectarian* theological ideas or appropriations *foreign* to creationism. And this theology provides crucial positive support for evolution (and against creationism). Simply rebutting creationism does not require Dobzhansky to bring *positiva* theology to bear. So the objection above falters; Dobzhansky's dialog with a creationist only required Dobzhansky to draw on *reductio* theology at most. His use of *positiva* theology is entirely elective.

Fourth, the objection holds that evolutionary theory enjoys justification in some contexts, especially scientific ones, without a hint of God-talk. I do not contest this claim; yet curiously, *positiva* theology often surfaces where least expected. For example, several atheistic (or agnostic) biologists freely employ *positiva* theology. Gould, Dawkins, and Coyne, among others, all reject the notion of a personal God, yet make claims on behalf of evolutionary theory about what the Almighty would or would not do in organic history. They may not preach that old time religion, but they preach just the same.

More deeply, as Paul Nelson observes, theology-laden arguments creep up in 'neutral' or 'purely scientific' areas, like encyclopedia entries or textbook descriptions. Such areas lack an immediate theological context but simply purport to explain the arguments for evolution in a straightforward way. Their rhetorical setting is that of a lecture, not a debate (Nelson, 1996, pp. 496–497, 506–508). Yet those who voluntarily deploy *positiva* arguments in these contexts apparently do so because they think such arguments are appropriate and sound, rather than intrusive. If (sectarian) theology is basically irrelevant to the justification of evolution—especially in 'neutral' or 'scientific' areas, rather than debates—then its frequent presence remains a puzzle (e.g. Audesirk, Audesirk, & Byers, 2005, pp. 264–281, esp. 274–277; Barton, Briggs, Eisen, Goldstein, & Patel, 2007, pp. 65–83, esp. 70, 75, 81; Belk & Maier, 2010, pp. 224–253, esp. 235, 238, 247; Freeman & Herron, 2007, pp. 37–72, esp. 42, 55, 57, 60; Futuyma, 2005, pp. 523–537, esp. 49, 530, 531, 535; Hall & Hallgrímsson, 2007, p. 672; Reece et al., 2011, pp. 460–468, esp. 463; Relethford, 2008, pp. 22–23).[32]

Having raised this point, I should note once again that I am not arguing that evolutionary theory or its justification requires theology. Instead, I am making a *de facto* observation—namely, one often finds *positiva* arguments for evolution even in settings otherwise barren of theology, including creationist theology. Although I believe it is possible to justify evolutionary theory in a purely non-theological way, quite a few thinkers, including atheists, frequently take a different tack.

I close this section on a self-critical note. I just mentioned that God-talk is not necessary for the justification of evolutionary theory. In the context of scientific testing, a critic may argue that this claim (or something like it) may be difficult to defend. Briefly, the conventional view holds that scientific testing is contrastive, at least when a hypothesis does not entail an observation or vice versa. As such, testing (and confirming) evolutionary theory may entail comparison with creationist rivals. For example, according to Bayes theorem, if one wants to know the probability of evolutionary theory given the data of homology, paleontology, embryology, and so on, then *inter alia* one must calculate the likelihood of the negation of this theory in light of the data. Given that evolutionary theory does not include a God of miracles, what falls within the likelihood claim includes statements about what the God of miracles would or would not do vis-à-vis organismal anatomy, the fossil record, embryological development, and the like.

But if one wants to have purely non-theological confirmation of evolutionary theory, then one cannot evaluate these statements, since doing so involves a great deal of God-talk. Accordingly, one could not assess the likelihood of the negation of evolutionary theory in light of the data. But according to Bayes theorem, this implies that one could not assess the probability of evolutionary theory given the data. Thus, one could *not* say whether the data confirm evolutionary theory *at all*.[33] Accordingly, even so-called 'non-theological' confirmations of evolutionary theory may rely heavily on theology (cf. Sarkar, 2011; Sober, 2008, 2011a, 2011b, 2011c). I mention this line of thinking not because I accept it, but because I find it puzzling and potentially significant. In any case, my thesis simply holds that *some* arguments for evolution require theology. This claim stands independently of the truth or falsity of the critic's stronger argument that *all* scientific confirmation of evolution involves the divine.

## 9. Puzzles and conclusions

Two puzzles remain. The first concerns the *basis* for Dobzhansky's bold God-talk. *Qua* evolutionary biologist, can Dobzhansky speak authoritatively for God? To my mind, evolutionary biologists per se do not possess any special insight into what a generic Creator would or would not do. Moreover, I am also unsure how Dobzhansky knows what the God of creationism would or would not do,

[31] Of course, scholars dispute whether any meaningful and significant epistemic value is ultimately theologically-neutral.

[32] Abigail Lustig offers a provocative explanation: evolution's historical moorings make God-talk inevitable. The theory was "born in theology" as a response to "the theological argument from design" and can only be understood in light of its Paleyan heritage (Lustig, 2004, p. 70).

[33] In brief, let 'D' be the data of homology, paleontology, molecular biology, and the like. Let 'ET' be evolutionary theory, which relies upon mutation, selection, etc. rather than God's miraculous action. According to Bayes theorem, evaluating Pr(ET/D) takes the form: $Pr(ET/D) = Pr(D/ET)\,Pr(ET)/[Pr(D/ET)\,Pr(ET)] + [Pr(D/\sim ET)\,Pr(\sim ET)]$. Evaluating Pr(ET/D) in part depends upon evaluating Pr(D/∼ET). But 'non-theological' testing of evolutionary theory precludes consideration of claims about what the God of miracles would or would not do. As such, one would not be able to evaluate Pr(D/∼ET) and, hence, would not be able to evaluate Pr(ET/D).

especially since he provides no careful treatment of canonical religious texts central to creationism.

The problem becomes more poignant when we consider that, according to Dobzhansky's understanding of evolution, human beings were not created by God in order to know God, but were produced "simply because there [was] an environmental opportunity and genetic wherewithal to make them possible" (p. 127).[34] In fact, it may be the case that, given this view of evolution, we cannot reliably know God's existence, character, obligations, purposes, or subjunctive actions. Darwin concludes as much in his mature reflections, doubting whether the human mind, which had evolved from a primitive form, can be "trusted when it draws . . . grand conclusions" about God (1958, pp. 92–93).[35] If Darwin is correct, then evolutionary theory undermines the very theology that supports it. As such, each of Dobzhansky's seven arguments for evolution contains at least one unjustified premise. The same is true of the *positiva* arguments for evolution by Mayr, Gould, Dawkins, Ayala, Coyne, Darwin, and others. Thus, given their understanding of evolution, some evolutionary biologists may have powerful reasons that undermine their claims about God's nature and ways. Their theory, in short, harms its own foundation.

A final puzzle concerns the fragmented deity portrayed in Dobzhansky's article. On the one hand, God resembles an miserly accountant who fastidiously restricts the number of species on Earth, limits their diversity of size, complexity, and adaptability, and makes sure that members of certain species are evenly distributed in number, behavior, and traits across the locales they inhabit. On the other hand, God also resembles a bold and original artist who fashions many different digital codes, vertebrate organs, arthropod exoskeletons, and the like—even obsessing about creativity and originality to the point of ensuring that temporary similarities don't crop up in embryos of different classes. What is the common denominator between these two theologies? I am no theologian, but as far as I can tell, there is *no* coherent conception of God underneath it all. Instead, I speculate that Dobzhansky aims to vindicate the predictions of evolutionary theory as fully as he can. His method typically involves discerning what evolutionary theory would predict about a certain phenomenon, then claiming that the God of creationism would do otherwise. Once evolutionary theory's prediction is vindicated (and creationism's falsified), then evolutionary theory emerges as the reasonable view. Thus Dobzhansky says, for example, that natural selection would allow life on earth to unfold in its current diverse panoply. He *also* says that the God of creationism would fashion earth's diversity in a much more constrained way. As such, the data of diversity confirms evolutionary theory but disconfirms creationism.

However, Dobzhansky gives no reason at all why the God of creationism must act in this manner. Creationism itself does not seem to suggest or entail any such thing. More generally, when Dobzhansky finds diversity in the natural world, he claims that the God of miracles would fashion similarity; but when he encounters similarity, he claims the God of miracles would create diversity. In neither case does Dobzhansky explain why. In fact, in his various arguments, the geneticist imports a hodgepodge of theological ideas simply because they give evolutionary theory the edge in explaining the data, regardless of their collective incoherence or lack of connection with any stable theological tradition. This 'tactical potpourri theology,' as I call it, deploys muddled content in order to achieve a polemical victory.[36]

In sum, I have argued that *positiva* theology plays an indispensable role in several arguments for evolution by Dobzhansky (and others). I have also contended that justifying this theology involves greater complexity than one might initially think. Of course, this result does not dispute the truth of evolution or the cogency of its justification, which is much broader than explored here. Moreover, I have not made an in principle claim but rather a modest *de facto* one. Indeed, I have not made a *de facto* claim about the polemic of all biologists but rather about seven of Dobzhansky's arguments, noting that my analysis applies to some arguments of several other prominent biologists as well. A modest argument requires a modest conclusion: it may be that nothing in biology makes sense except in light of evolution. If Dobzhansky is correct, then making sense of evolution includes not just looking at things below, but also at things above.

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[34] Of course, on Dobzhansky's view, mutation and selection ought to be understood within the context of evolutionary progressivism and cosmic holism. See note 9.

[35] Some contemporary Darwinists echo the same refrain (Churchland, 1987, pp. 548–549; Ruse, 2003, pp. 350–351).

[36] Darwin uses a similar approach in the *Origin* (Dilley, 2012, pp. 48–52).

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