

Gods Evolve

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ABSTRACT: According to theological naturalism, every divine object is natural, and some natural objects are divine. On the basis of the design arguments, theological naturalists argue for an infinite plurality of divine objects. All divine objects are natural gods. Natural gods fall within the scopes of several sciences, including computer science, the sciences of information and complexity, and the sciences of the functional organization of minds and organisms. Natural gods are increasingly complex objects. Since they are complex, they are produced through gradual accumulations of complexity. Divine lineages slowly climb Mount Improbable. Gods evolve.

1. Introduction

A *naturalist* says that all objects are natural. As an apparent application of naturalism, consider the following argument: (1) all traditional gods are supernatural; (2) if all traditional gods are supernatural, then all gods are supernatural; (3) therefore, all gods are supernatural; (4) but naturalists reject all supernatural objects; (5) consequently, naturalists reject all gods. If this argument is sound, then gods do not exist.

Against this line of reasoning, a *theological naturalist* faults the second premise. From the fact that all traditional gods are supernatural, it does not follow that all gods are supernatural. Theological naturalists maintain that there are entirely *natural* gods. Of course, these gods will not be traditional. On the one hand, they will not be like Zeus or Thor; nor will they be like the God of Abraham. On the other hand, they will not be like the Gods of the Philosophers. Theological naturalists are not committed to the existence of God – it is *theologically* possible that God does not exist.¹ And theological naturalists are not committed to the existence of exactly one god – it is *theologically* possible that many gods exist. It is theologically possible that there are many universes, that there is a god at every universe, and that every one of those gods is an entirely natural thing.

2. Naturalistic Existence Arguments

Almost all naturalists accept only *naturalistic arguments*. A naturalistic argument has two main parts. The first main part consists of some empirically justified premises.² The second main part reasons from those premises to some conclusion. A naturalistic argument is an *existence argument* if and only if (iff) its conclusion asserts the existence of some object. For almost all naturalists, including theological naturalists, an object is natural iff it is the output of some naturalistic existence argument.

For most philosophers, including theological naturalists, the various *Indispensability Arguments* are naturalistic existence arguments. These arguments have this form: (1) these objects play indispensable roles in this best scientific theory; (2) if any objects play indispensable roles in our best scientific theories, then they exist; (3) therefore, these objects exist. For example, consider the *Argument for Space-Time Points*: (1) space-time points play indispensable roles in our best physical theories; (2) if some objects play indispensable roles in our best scientific theories, then they exist; (3) therefore, space-time points exist. Since this argument is naturalistic, space-time points are natural objects. Of course, they are not material things. Consequently, theological naturalists affirm that nature is more inclusive than materiality. There are plenty of immaterial natural things.

As another illustration of a naturalistic existence argument, consider the *Argument for Mathematical Objects* (Colyvan, 2001). Mathematical objects are things like numbers, functions, vector spaces, and symmetry groups. The argument goes like this: (1) mathematical objects play indispensable roles in our best scientific theories; (2) if some objects play indispensable roles in our best scientific theories, then they exist; (3) therefore, mathematical objects exist. Since this argument is naturalistic, mathematical objects are natural objects. But mathematical objects are not parts of our universe. They are not even physical things. Consequently, theological naturalists affirm that nature is bigger than our universe and that nature is more inclusive than mere physicality.

3. Naturalistic Arguments for Our Designer

Of course, not all naturalistic existence arguments are Indispensability Arguments. For example, the various *Design Arguments* are naturalistic existence arguments. They reason from some empirically justified premises to the conclusion that our universe has some intelligent designer-creator. One naturalistic version of the design argument is the *Argument from Artifacts* (Cicero, *De Natura Deorum*: 87-89; Hume, 1779: 53). The argument goes like this: (1) Our universe is like an artifact designed by some earthly mind (e.g. a web, a nest, a house). (2) But similar effects have similar causes. (3) So, just as the cause of every artifact is some earthly mind, so also the cause of our universe is some cosmic mind. This cosmic mind is our *Designer*. Of course, since this is a naturalistic existence argument, it implies that our Designer is a natural object.

Another version of the design argument is the *Fine Tuning Argument* (Leslie, 1989). It runs like this: (1) The contingent features of our universe include its laws, the free parameters of those laws, and its initial conditions. (2) These contingent features are finely tuned to maximize the probability that some intrinsically valuable things will evolve in our universe (e.g. organisms, persons). (3) The best explanation for this fine tuning is that there is some cosmic mind which has deliberately selected those contingent features in order to maximize the probability of the evolution of the valuable things. This cosmic mind is our Designer. Since Fine Tuning Argument, like the Argument from Artifacts, is a naturalistic existence argument, it implies that our Designer is a natural object.

Our Designer is a mind that designed and created our universe. It is plausible that any thing that designs and creates a universe is not one of the things in that universe. If that is right, then our Designer is not one of the things in our universe. It is also plausible that every universe is closed under all physical relations (it is closed under all spatial, temporal, and causal relations). If universes are physically closed, then it is arguable that our Designer is not in any universe at all. The *Argument for the Nonphysicality of Our Designer* goes like this: (1) suppose that our Designer is in some universe; (2) if something in some universe creates another universe, then it causes that other universe to exist; (3) but no thing in one universe can have any causal relations with any other universes; (4) therefore, our Designer is not in any universe; (5) but since every physical thing must be in some universe, it follows that our Designer is nonphysical. Consequently, our Designer resembles the objects of mathematics. Our Designer is a natural nonphysical mind.

Our Designer is a mind that designed and created our universe. For theological naturalists, any mind that can do those things is *divine*. Thus our Designer is a divine mind. And, for theological naturalists, any divine mind is a *god*. Hence our Designer is a god. On the one hand, since our Designer is not one of the things in our universe, it cannot be like the old pagan gods – it cannot be like Zeus or Thor or even the God of Abraham. On the other hand, since our Designer is natural, it cannot be like the supernatural Gods of the Philosophers. Unfortunately, theological naturalism so far is merely negative. To gain more information about our Designer, theological naturalists turn to science.

4. The Natural History of Earthly Organisms

Theological naturalists aim to develop a naturalistic theory of our Designer. One way to build a naturalistic theory of our Designer is to use the scientific method. However, since our Designer is not one of the things in our universe, it cannot be studied using the scientific method. Fortunately, the scientific method is not the only naturalistic method. Reasoning by analogy is also naturalistic. For theological naturalists, the Argument from Artifacts justifies the use of analogical reasoning to build a naturalistic theory of our Designer. For any scientifically justified feature of earthly designers, if it is appropriate to transfer that feature to our Designer, then our Designer has that feature.

All known earthly designers are organisms. More precisely, they are animals. Animals design and create many types of structures (Hansell, 2005; Schumaker et al., 2011). Animal designers include insects, birds, and mammals. Insects like ants, termites, bees, and wasps build organized dwellings. Spiders build webs. Birds build nests, bowers, and similar structures. Many mammals design structures (e.g. beaver dams and lodges). Among mammals, primates are especially adept at design. Chimps and gorillas design many artifacts. Of course, humans are excellent designers of many artifacts.

For the naturalist, all earthly designers have been produced by evolutionary processes. The naturalistic account of mental complexity is also evolutionary. Thus Dawkins correctly reports that “Entities that are complex enough to be intelligent are products of an evolutionary process” (2008: 98). He also correctly reports that “any creative intelligence, of sufficient complexity to design anything, comes into existence only as the end product of an extended process of gradual evolution” (2008: 52). Theological naturalists do not agree with Dawkins when he denies that our universe was designed. However, they do agree with him when he says that if our universe was designed, then the designer must be the end product of some kind of cumulative evolutionary process (2008: 186).

On the basis of the scientific study of all known designers, theological naturalists now present the *Argument for the Evolution of our Designer*. It runs like this: (1) Our universe was designed by our Designer. (2) Since all known designers are organisms, our Designer is analogous to an organism. (3) But all organisms have emerged through evolution. All organisms that design things appear at very high places in an evolutionary tree. Humans appear at one of the highest locations of that tree. (4) Reasoning by analogy, our Designer exists at some high place in some evolutionary tree that produces at least one cosmic designer. This is the *World Tree*. The World Tree resembles the evolutionary tree that contains organisms. Since the Argument for the Evolution of our Designer is a naturalistic existence argument, all the objects in the World Tree are natural objects. For theological naturalists, all the objects in the World Tree are natural gods.³

For theological naturalists, divinity is ontologically fundamental: gods are not realized by any deeper type of stuff. Consequently, all gods are ontologically equivalent. The being of every god is the same as the being of every other god. And since our Designer is a god, all gods are ontologically equivalent to our Designer. This means that all gods are nonphysical things. This divine nonphysicality motivates the *Argument for Divine Isolation*: (1) if any things participate in physical relations (e.g. in spatial, temporal, or causal relations), then they are physical; (2) so if any gods have any physical relations with each other, then they are physical; (3) but gods are not physical; hence they do not have any physical relations with each other. Gods don't stand to one another in any spatial, temporal, or causal relations. Gods don't exist in space; spaces exist in gods. Gods don't exist in time; times exist in gods. And gods don't causally interact with one another. Gods, like windowless monads, are totally self-enclosed (see Leibniz, *Monadology*, sec. 7).

5. The Natural History of Divine Organisms

According to the *biological analogy*, gods are analogous to organisms and the World Tree is analogous to the evolutionary tree of organisms. Of course, the biological analogy must be handled at an appropriate level of abstraction. Features of organisms that depend on their specific material substrates cannot be transferred to gods. But those features of organisms that are substrate independent can be transferred to gods. For theological naturalists, all organisms are *living machines*. They are not animated by any

mysterious *elan vital*. And since mechanicity is substrate independent, theological naturalists infer that (A) just as organisms are living machines, so gods are living machines.

All organisms store and process information. More precisely, they perform various computations. It is arguable that life is essentially a computational process. On the basis of these arguments, theological naturalists affirm that (B) just as every organism is a living computing machine, so every god is a living computing machine. It is further arguable that every organism has some positive degree of intelligence. Hence theological naturalists also affirm that (C) just as every organism has some positive degree of intelligence, so every god has some positive degree of intelligence. Just as every organism is a mind, so every god is a mind. Since our most scientific theories of minds are computational, theological naturalists affirm that every mind is realized by some computational substrate. For the theological naturalist, the computational theory of mind is fully general: every possible mind is a computer running some intelligent program. Hence theological naturalism entails that every god is a living computing machine running some intelligent program.

Of course, the most distinctive feature of organisms is their self-reproduction. Living things are self-reproducing things. And self-reproduction is substrate independent: organisms realized by carbon self-reproduce and patterns in cellular automata also self-reproduce (von Neumann, 1966; Poundstone, 1985: ch. 12). Consequently, theological naturalists affirm that (D) just as organisms are self-reproducing computing machines, so gods are self-reproducing computing machines. According to the Argument for the Evolution of our Designer, the World Tree is an evolutionary tree of gods. As gods beget gods, they evolve. And since evolutionary principles are substrate independent, they apply to gods as well as to organisms. Specifically (E) just as the evolution of organisms involves descent with modification, so the evolution of gods involves descent with modification and (F) just as organisms gain functional complexity through gradual accumulation (see Dennett, 1995: 72), so gods gain functional complexity through gradual accumulation. Much like earthly organisms, gods evolve.

Since gods are self-reproducing, every god produces at least one successor god. On the one hand, divine productivity is not *physical causality*. It does not involve any changes in any material stuff. It happens neither in time, nor in space, nor by means of any causal forces. It requires no energy. On the other hand, divine productivity is not *logical entailment*. If you deny that some god produces its successors, then you have not stated a logical contradiction. Since divine productivity is neither logical entailment nor physical causality, it lies between them. Divine productivity is metaphysical productivity. As such, the principles that govern it are metaphysical necessities (like the identity of indiscernibles, or the principle of sufficient reason). All metaphysical productivity is *rational determination*: every god contains the complete reason for the existence of each of its successors, and that complete reason is sufficient. Every god determines the existence of its successors, and that determination is effective. Divine reproduction is pure creativity: when gods reproduce, they create their successors *ex nihilo*.

6. Divine Self-Reproduction

Since gods are solitary, they do not reproduce sexually – they reproduce asexually. Forrest argues that gods may reproduce by something analogous to fission (2007: 122, 142-143). Of course, since gods are not physical, this does not mean that gods divide like yeast or bud like hydras. It merely means that every successor of every god depends *entirely* on its predecessor for both the fact that it is and for the way that it is.

Since divine reproduction is asexual, the evolution of gods is analogous to the evolution of a population of asexual organisms. For organisms, asexual evolution is an algorithm that involves four steps: (1) There is an initial generation of parent organisms. (2) Every parent produces some randomly generated set of randomly mutated offspring. (3) As they grow up, these offspring face various randomly generated environmental challenges. Those offspring that survive and grow to adulthood are the *fittest*. (4) The fittest offspring become parents in the next generation. Hence the algorithm continues at step 2.

For organisms, fitness varies randomly. On the basis of that randomness, it seems likely that the evolutionary tree of organisms exhibits no tendencies, but rather merely wanders without direction across an ever-shifting fitness landscape. Nevertheless, many biologists have argued that evolution appears to tend to drive organisms to greater heights of complexity. The *arrow of complexity hypothesis* “asserts that the complex functional organization of the most complex products of open-ended evolutionary systems has a general tendency to increase with time” (Bedau, 1998: 145). On the basis of this arrow of complexity hypothesis, theological naturalists argue that every successor god is minimally more complex than its predecessor.⁴ Gods therefore accumulate functionality. And theological naturalists also argue that if any functionality is accumulated by some god, then it is conserved: all the descendents of that god inherit that functionality.

Since divine productivity is metaphysical, the principles that govern it are metaphysical necessities. Since those principles are metaphysical necessities, divine evolution does not involve any arbitrariness, randomness, or chance. Consequently, divine evolution looks like this: (1) There is some initial generation of simple gods. (2) Every parent god generates all possible successors. (3) The offspring that are minimally more complex than their parents are the fittest. (4) The fittest offspring become parents in the next generation. Theological naturalists now conclude that divine evolution is governed by several rules. The *initial rule* states that there is at least one initial god. For any god, there are some ways to make it minimally more complex. The *successor rule* states that, for every god, for every way to make it minimally more complex, it produces a successor which is more complex in that way. Divine evolution is self-bootstrapping and self-amplifying. It recursively builds on itself. As gods evolve, they become more powerful and intelligent.

Since the gods in the initial generation are simple things, theological naturalists now argue that there can be only one initial god. The argument uses the Leibnizian principle of the Identity of Indiscernibles (*Monadology*, sec. 9). The *Argument for the Initial*

Singularity goes like this: (1) any initial gods are simple; (2) but if any two things are simple, then they do not differ in any ways; (3) therefore, any two initial gods do not differ in any ways; (4) but if two things do not differ in any ways, then they are indiscernible; and if they are indiscernible, then they are identical; (5) consequently, there exists exactly one initial simple god. This initial simple god is *Alpha*.⁵ It is the ultimate first cause of all things. However, since the perfections of Alpha are minimal, Alpha is not God. And, since our Designer exists at a high level in the World Tree, Alpha is not our Designer.

7. The Natural History of Earthly Designers

Among many types of earthly designers, biological evolution supports technological evolution. For example, spiders design webs; but the design of spider webs evolved (Kaston, 1965; Volrath, 1988; Blackledge et al., 2009). As another example, birds build nests; but the design of bird nests evolved (Collias, 1964; Winkler & Sheldon, 1993; Collias, 1997; Zyskowski & Prum, 1999).

Animals like spiders and birds can be referred to as *artisans*. They are genetically hardwired to design and create their artifacts. These artisans run genetic programs that define neural patterns in their brains. When they run those neural programs, they design and create their artifacts. For animals like spiders and birds, the evolution of their artifacts is tightly coordinated with their biological evolution. When one of these animals has offspring, it passes down its genetic program to each offspring. The genetic program governs the way that the offspring produces its artifact. As a result of natural selection, some offspring survive while others do not. Thus natural selection shapes the evolution of both the artisans and their artifacts. Although these animal artisans intelligently design their artifacts, they do not intelligently design the minds of their offspring.

Although human designers are also animals, they differ significantly from other animal designers. All human designers are *engineers*. Since engineers are animals, they reproduce biologically: they make human children. However, the reproduction of engineers does not entirely follow the reproduction of human animals. Engineers do not make engineers in the way that avian nest-builders make avian nest-builders. On the contrary, engineers reproduce culturally. The cultural successors of engineers are their apprentices. Engineers educate their apprentices. And when they do, they *intelligently design* the minds of their cultural successors. As engineers train their apprentices, the knowledge transmitted does not remain constant: there is descent with modification. Hence the generations of engineers form an evolutionary tree in which the successor relation is the apprentice relation.

Since engineers make artifacts, the evolutionary tree of engineers supports an evolutionary tree of artifacts. The evolution of engineering supports the *evolution of technology* (see Basalla, 1988; Temkin & Eldredge, 2007; Brey, 2008). The evolution of technology also includes the evolution of computers (Kempf, 1961; Dyson, 1997; Kurzweil, 2005). Since engineers learn from their experiences, they tend to pass down

superior skills to their apprentices. Hence the evolution of engineering exhibits an arrow of complexity: over the generations, engineering skill tends to accumulate. As engineers accumulate their skills, they get better and better at making ever more functionally complex artifacts. Since the evolution of engineering exhibits an arrow of complexity, the evolution of technology also exhibits an arrow of complexity. Many lineages of artifacts exhibit their own arrows. For computers, the arrow of complexity is Moore's Law (1965).

As an illustration of the evolution of artifacts, consider the evolution of cellular automata. Apparently working without the benefit of any prior art, John von Neumann is the initial engineer who designs the first cellular automata (1966). The second generation of engineers consists of the inventor of the game of life, John Conway (see Gardner, 1970). The game of life is the second generation technology. Over the years, later generations of engineers developed many third-generation variants of the game of life. These include variants (1) that change the values of the parameters in the life rule (Eppstein, 2010); (2) that use triangular or hexagonal cells (Bays, 2005); (3) variants that run in three dimensions (Bays, 2006); (4) that use continuous space (Rafler, 2011); (5) that use larger neighborhoods (Evans, 2004); and (6) that involve semi-quantum physics (Flitney & Abbott, 2005). Later generations of engineers used the third-generation variants to develop fourth-generation variants. These include variants that use hexagonal cells with more than two possible cell values (Wuensche, 2004); variants that use large interaction neighborhoods and continuous space (Pivato, 2007); and variants that use full quantum superposition of cell states (Bleh et al., 2012).

Although the real history of engineering involves many messy contingencies, it is possible to ignore those contingencies in order to define an ideal *algorithm for earthly innovation*. The abstraction of this ideal algorithm from the messy history of engineering resembles the abstraction of a scientific law from the noisy data (e.g. the abstraction of the ideal gas laws from noisy data). This algorithm looks like this: (1) An initial engineer has an initial diagram which describes an initial artifact. (2) The engineer uses her diagram to make the artifact. (3) As she makes her artifact, she learns from her experience. She records the ways that the artifact can be improved. For each way, she designs an improved diagram for an improved artifact. (4) The engineer acquires some apprentices and trains them. On the basis of her experience, she equips her apprentices with superior skills. (5) When the apprentices finish their training, the engineer sets them up with projects of their own. She gives one of the improved diagrams to each apprentice. (6) Each apprentice is now an engineer with her own diagram, and the process repeats at step two.

8. The Natural History of Divine Designers

Among earthly organisms, there are many designers. These include insects, birds, beavers, and primates. The capacity for design has evolved many times and along many widely divergent lineages of organisms. The Argument for the Evolution of our Designer asserts that the capacity for divine design has emerged at least once in the evolutionary of

gods. And since that capacity has emerged many times in the evolutionary of organisms, it seems likely that it has emerged many times in the evolution of gods. Since the principles of divine evolution are metaphysical necessities, the tendency to evolve divine designers is universal. Along every lineage of gods, some designer eventually evolves.

Any god that is a designer is a *titan*. Titans are analogous to earthly artisans – they are like divine spiders or birds. Our Designer may be a titan that weaves our universe like a spider weaves its web (Hume, 1779: 90-91). Just as artisans are hardwired to make their artifacts, so titans are hardwired to make their universes. Just as artisans have offspring, so titans have offspring. Theological naturalists argue that all descendents of titans are also titans. The argument goes like this: titanic functionality is accumulated; but all functionality accumulated in divine evolution is conserved in divine evolution; hence all the descendents of titans are also titans. Since the principles of divine evolution entail that every offspring titan is minimally more complex than its parent, and since the nature of any titan includes its blueprint for designing and creating its universe, every offspring titan inherits a minimally more complex version of that blueprint. As titans evolve, they grow ever more functionally complex and their universes grow ever more physically complex.

Among earthly artisans, there is at least one lineage that evolves into engineers. Early primates appear to be artisans. And early hominids display the transition from artisans to engineers (Panter et al., 2002). Of course, some of these early hominids evolve into human engineers. On the basis of the biological analogy, theological naturalists argue that divine artisans also evolve into divine engineers. Titans that intelligently design the minds of their cultural successors are *olympians*. Since the principles of divine evolution are metaphysical necessities, the tendency for divine artisans to evolve into divine engineers is universal. Along every lineage of titans, some olympian eventually evolves. Since olympic powers are gained by accumulation, olympians always beget olympians.

Most versions of the Argument from Artifacts treat our Designer as an olympian. One early version of that argument went like this: (1) our universe is like an orrery (Cicero, *De Natura Deorum*: 87-89); (2) just as an orrery is made by a human engineer, so our universe is made by our Designer; (3) by analogy, our Designer is like a human engineer. Another version of the argument goes like this: (1) our universe is like a computer; just as computers are made and programmed by human engineers, so our universe is made and programmed by our Designer; (3) by analogy, our Designer is like a human engineer.⁶ More precisely, our Designer is like a human engineer who designs and creates cellular automata. On all these versions of the Argument from Artifacts, our Designer is an olympian. And since our Designer is a computing machine (like every god), it follows that our Designer is able to both design universe-programs and to run them on some part of itself.

Since each olympian is a divine engineer, its behavior is defined by an *algorithm for divine innovation*. This divine algorithm is analogous to the algorithm for earthly innovation. It therefore works like this: The divine algorithm takes an input parameter. Its input is a universe-generating program (it is a *script*). The divine algorithm has

several steps: (1) Each olympian runs the script which it accepted as its input. (2) As it runs its script, it generates its universe. As it generates its universe, it records all the ways to make that universe minimally more complex. (3) For each way, it intelligently designs a new script (a *revision*) that is more complex in that way. As it designs each revision, it also designs the *diagram* for a new olympian that will run that revision. Each diagram is more complex in the ways that are needed to run the more complex revision and to design more complex successors. (4) For every revision and diagram, it produces *ex nihilo* a successor olympian which realizes that diagram and which takes that revision as its input script.

Since any initial gods have no predecessors, they have no inputs. But if they have no inputs, then their input scripts are empty, and the universes they generate are mere voids. As they run the divine algorithm, they make their successors – and their successors do get input scripts. As these input scripts grow ever more complex, the universes generated by running them also grow ever more complex. Every god is physically foundational. It serves as the hardware ground of the physicality of its universe. It serves as the hardware ground of a physically closed system of spatial, temporal, and causal relations. On this point, the gods of theological naturalism resemble the Spinozistic deity (Bennett, 1984; Viljanen, 2007). All material things are patterns that supervene on the invariants in divine computation. They are like gliders that supervene on some computer running the game of life.

9. The Ascent to Divine Infinity

As they design their toy universes, human designers make extensive use of computers. And human designers have begun to design artificially intelligent computers (*artillects*). Some of these artillects can design their own toy universes. Artillects have used genetic algorithms to design cellular automata exhibiting self-replicating patterns (Lohn & Reggia, 1995); to design cellular automata performing global information-processing (Crutchfield & Mitchell, 1995); and to design cellular automata which exhibit Turing universality (Sapin et al, 2004). And artillects have used self-directing evolutionary algorithms to design cellular automata supporting self-moving patterns (Ripps, 2010).

Artillects already play chess better than humans. It may soon come to pass that they will be better at designing toy universes than humans. Thus humans are designing designers which may become superior to their creators. Of course, it is likely that any agent that designs universes must be far more powerful and intelligent than any human. But the only approach to super-human intelligence has been from artificial intelligence. If that is right, then our Designer is most similar to some super-human artillect. As these artillects become more intelligent, it is often argued that they will be able to understand their own designs, and that they will be able to improve those designs to make even more intelligent successors. These artillects will get better at making themselves better – they will engage in recursive self-improvement (Good, 1965; Kurzweil, 2005: 27-28; Schmidhuber, 2007; Chalmers, 2010: 11-22). They will design both universes and universe-designers.

As artillects grow ever greater, they tend towards infinity. Following the mathematical account of infinite complexity, theological naturalists affirm that every endless series of increasingly complex gods produces some *limit gods*. Every god in that endless series contributes to the design and creation of each limit god. The limit of any endless series of gods is more complex than every god in that series. More formally, the limit rule for gods states that, for every endless series of increasingly complex gods, for every way to define a god that is minimally more complex than the entire series, there exists some limit god that is more complex in that way. Every limit god is an infinitely powerful computer running an infinitely intelligent program.⁷ It is a *supermind* (Steinhart, 2003). Each limit god runs some *limit universe*. The universe it runs is the limit of the series of universes run by the series of gods of which it is the limit. Like any god, each limit god runs the divine algorithm. It thereby produces transfinite successors.

For theological naturalism, the gods in the World Tree form lineages. These lineages are as long as the longest logically possible ordinal number line. Since every god has some simple ancestor (e.g. Alpha), the gods in these lineages can be sorted into generations: the n-th god in any lineage is in the n-th generation of gods. Gods in higher generations are higher gods, and the universes made by higher gods are higher universes. Higher gods are more complex than lower gods. Likewise, higher universes are more complex than lower universes. Dennett suggests that *intrinsic value* can be defined in terms of complexity (1995: 511-513). If that is right, then higher universes are more intrinsically valuable. But more intrinsically universes are better universes. Since gods that make better universes are more benevolent, higher gods are more benevolent than lower gods. If *perfection* is the conjunction of power, intelligence, and benevolence, then higher gods are more perfect than lower gods. However, the rules for the self-reproduction of gods ensure that there is no maximally perfect god. Just as every ordinal is surpassed by some bigger ordinal, so every god is surpassed by some greater god. Since there is no unsurpassable god, there is no God. Theological naturalists deny the existence of God.

10. Conclusion

According to theological naturalists, all divine things are natural, and some natural things are divine. These divine things are natural gods. On the basis of the arguments given here, which are naturalistic existence arguments, these gods are the computational foundations of physical universes. These gods stand to their universes as hardware to software. They do not appear within their universes any more than the computer itself appears within any simulation of physics that is running on that computer. As cosmic computers, these gods fall within the scopes of many sciences. Specifically, they fall within the scopes of the abstract sciences. The abstract sciences include at least logic, mathematics, computer science, information theory, complexity theory, and the sciences that study the functional organizations of minds and organisms (these sciences are abstract cognitive science and abstract biology). For theological naturalists, all gods lie within the domains of these sciences. Consequently, theology itself is one of the abstract sciences.

Notes

¹It is philosophically and theologically standard to say that God is a maximally perfect person (Morris, 1987; Swinburne, 1994: 125). Thus God is a person who is all-powerful, all-knowing, and all-good. This definition of God is used here.

²Following Salmon (1966), an *empirically justified* statement is either an observation statement or some statement that is the conclusion of a correct inductive or deductive argument that has only empirically justified premises.

³Our Designer is a god; just as the ancestors and descendants of organisms are organisms, so the ancestors and descendants of gods are gods; since every object in the World Tree is either a descendent of our Designer or a descendent of some ancestor of our Designer, it follows that every object in the World Tree is a god.

⁴Theological naturalists argue that every successor god is minimally more complex than its predecessor. The argument goes like this: if gods do not generally tend to increase in complexity, then it is not likely that any god as complex as our Designer will ever emerge in the tree of gods; but our Designer has emerged in the tree of gods; hence it is likely that gods generally tend to increase in complexity; however, since the principles that govern divine evolution are metaphysical necessities, this likely general tendency must be universal: every successor god is more complex than its predecessor. For gods, fitness is greater complexity. Since the principles that govern divine evolution are metaphysical necessities, they involve no arbitrariness; but the only non-arbitrary increase in complexity is minimal; hence every successor god is *minimally* more complex than its predecessor.

⁵The initial simple god (Alpha) is similar to the Dawkinsian first cause. Dawkins affirms that there exists an ultimate first cause (2008: 184). He says that “The first cause that we seek must have been the simple basis for a self-bootstrapping crane which eventually raised the world as we know it into its present complex existence” (2008: 184-185). Dawkins denies that the first cause is God (1996: 77; 2008: 101, 184). And Dawkins states that, if our universe has a designer, then it is not the first cause (1996: 77).

⁶According to *digital cosmology*, our universe is a software-process running on some computational substrate. Many physicists have argued for digital cosmology (e.g. Deutsch, 1985; Zeilinger, 1999; Lloyd, 2002; Fredkin, 2003). Many computer scientists have made similar arguments (e.g. Schmidhuber, 1997; Steinhart, 1998; Wolfram, 2002). Digital cosmology is supported by highly accurate simulations of our universe at both the large scales of relativity theory (Springel, 2005) and at the high levels of resolution of quantum mechanics (Gattringer & Lang, 2009).

⁷For infinitely powerful computers, see Copeland (1998), Hamkins (2002), Koepke & Siders (2008), as well as related work by these authors. For continuous computation on real numbers see Moore (1996); Blum et al. (1998).

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