Theological Implications of the Simulation Argument

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ABSTRACT: Nick Bostrom's Simulation Argument (SA) has many intriguing theological implications. We work out some of them here. We show how the SA can be used to develop novel versions of the Cosmological and Design Arguments. We then develop some of the affinities between Bostrom's naturalistic theogony and more traditional theological topics. We look at the resurrection of the body and at theodicy. We conclude with some reflections on the relations between the SA and Neoplatonism (friendly) and between the SA and theism (less friendly).

1. Introduction

A well-known argument, recently developed by Nick Bostrom, aims to assign a probability to the thesis that we are living in a simulated reality (Bostrom, 2003; see also Weatherson, 2003; Bostrom, 2005; Brueckner, 2008). At least one commentator has said that Bostrom's *Simulation Argument* is the first interesting argument for the existence of God in 2000 years.[1] An overreaction, to say the least! Nevertheless, the Simulation Argument has many intriguing theological implications. And few of them have been worked out. We aim to work out some of them here.

According to Bostrom, simulations can be nested within simulations. Section 2 develops this idea. This nesting parallels certain sequential structures in the traditional arguments for the existence of God. Section 3 examines the relations between the Simulation Argument and various forms of the Cosmological Argument for God. The Simulation Argument is analogous to Leibniz's version of the Cosmological Argument. By taking advantage of this analogy, we obtain a novel version of the Cosmological Argument. One striking feature of this argument is that it uses infinity in a *positive* way.

Section 4 examines the relations between the Simulation Argument and the Design Argument. The Simulation Argument motivates a novel version of the Design Argument. Section 5 develops some of the affinities between Bostrom's naturalistic theogony and John Hick's resurrection theory. Section 6 articulates a simulationist theodicy. Not surprisingly, this is an aesthetic theodicy. And John Leslie's axiarchism allows us to link the simulationist account of value with the simulationist account of divine productivity. Section 7 extends the Simulation Argument to the higher transfinite. Section 8 concludes with some reflections on the relations between simulationism and Neoplatonism (friendly) and between simulationism and theism (not so friendly).

2. The Simulation Argument

Various writers have suggested that our universe is a software process running on some deeper computational substrate (Moravec, 1988; Tipler, 1995; Fredkin, 2003).[2] Our reality is virtual rather than ultimate.[3] More recently, Bostrom (2003) has given an argument for this thesis. His argument is known as the Simulation Argument.[4] We don't want to rehearse it here and we aren't interested in the strength of the Simulation Argument. We're interested in its theological implications.

For our purposes, the most striking feature of the Simulation Argument is that it justifies the existence of a series of *levels* of simulation. Our universe is a virtual machine – a machine running on a deeper machine. As Bostrom writes "virtual machines can be stacked: it is possible to simulate one machine simulating another machine, and so on, in arbitrarily many steps of iteration" (2003: 253).

How deep does the series of simulations go? If it ends after some finite number of steps, we may wonder why. Any finite number seems arbitrary. For any finite n, why n levels rather than n+1? A more general principle is more reasonable. And any reasoning that applies to our universe surely applies with equal force to any universe that is simulating our universe. So if there is any plausibility to the thesis that our universe is being simulated by some deeper universe, then there is equal plausibility to the thesis that every universe is being simulated by some deeper universe. The Simulation Argument supports the general thesis that below every level, there is a deeper level. There is an endless series of ever deeper levels. It is defined by these rules:

2.1 *Initial Rule*. For the initial number 0, there is an initial universe U_0. This is our universe.[5] We have computers in our universe. These are level-0 computers. According to the Simulation Argument, our universe is a software process running on some level-1 computer. This is hardware level 1. Let's refer to this computer as H_1. H_1 is not in our universe. It is in the next deeper universe. The Simulation Argument entails there exists a deeper computer H_1 running in a universe U_1. Presumably, the computer H_1 was built and programmed by a civilization C_1 in U_1.

2.2 *Successor Rule*. The Simulation Argument generalizes. Just as our universe U_0 is a software process running on a computer in U_1, so also U_1 is a software process running on a computer in U_2. But then U_2 is a software process running on a computer in U_3; and so it goes. The general rule is this: for every finite n, the universe U_n is a software process running on a computer H_{n+1} in the deeper universe U_{n+1}. This rule is existential: for every n, if there exists a universe U_n, then there exists a universe U_{n+1}. The universe U_{n+1} contains a computer H_{n+1}. Presumably, the computer H_{n+1} was built and programmed by some civilization C_{n+1} in U_{n+1}.

A few features of this sequence are worth noting. The first is that each deeper universe U_{n+1} physically contains the shallower universe U_n. The deeper universe contains the shallower universe both spatially, temporally, and causally. Thus each deeper universe is *longer lasting* both into the past and the future.[6] As we go down through the deeper and deeper universes, their temporal extensions expand without bound. Likewise, the

physical powers of these of these deeper computers increase without bound. Finally, the *intelligences* of the civilizations also increase without bound.

Although the Simulation Argument is naturalistic, Bostrom points out that it has many potentially religious consequences. Suppose that our civilization C_0 is being simulated by a deeper civilization C_1. This deeper civilization is technically superior to ours – it is a post-human civilization. Bostrom writes that

> in some ways, the posthumans running a simulation are like gods in relation to the people inhabiting the simulation: the posthumans created the world we see; they are of superior intelligence; they are 'omnipotent' in the sense that they can interfere in the workings of our world even in ways that violate its physical laws; and they are 'omniscient' in the sense that they can monitor everything that happens. However, all the demigods except those at the fundamental level of reality are subject to sanctions by the more powerful gods living at lower levels. (2003: 253 – 254)

3. The Cosmological Argument

One of the classical arguments for the existence of God is the *Cosmological Argument*. There are many versions of the Cosmological Argument – the first three arguments for the existence of God in Aquinas's list of the Five Ways are all versions of the Cosmological Argument (Aquinas, *Summa Theologica*, Part 1, Q. 2, Art. 3). One version of the Cosmological Argument is based on physical (efficient) causality.[7] This version is Aquinas's Second Way. It goes something like this: (1) every event is caused by a previous event; (2) but the chain of causes cannot go back to infinity; (3) therefore, there is a first cause; and (4) this first cause is God.

One of the standard objections to the classical Cosmological Argument is that the second premise is false. There is nothing impossible in a chain of causes that goes back infinitely. So the classical version of the Cosmological Argument fails. Aware of this objection, Leibniz proposed a more sophisticated version of the Cosmological Argument. It's worth looking at the entire text of the *Leibnizian Argument*. For the sake of readability, we have taken the liberty of breaking Leibniz's text into steps:

> (1) Neither in any single thing, nor in the total aggregate and series of things, can the sufficient reason for their existence be discovered. (2) Let us suppose a book entitled *The Elements of Geometry* to have existed eternally, one edition having always been copied from the preceding. (3) Although you can account for the present copy by a reference to the past copy which it reproduces, yet, however far back you go in this series of reproductions, you can never arrive at a complete explanation. (4) You always will have to ask why at all times these books have existed, that is, why there have been any books at all and why this book in particular. (5) What is true concerning these books is equally true concerning the diverse states of the world, for here too the following state is in some way a copy

> of the preceding one (although changing according to certain laws). (6) However far you turn back to antecedent states, you will never discover in any or all of these states the full reason why there is a world rather than nothing, nor why it is such as it is. (7) You may well suppose the world to be eternal; yet what you thus posit is nothing but the succession of its states, and you will not find the sufficient reason in any one of them, nor will you get any nearer to accounting rationally for the world by taking any number of them together. (8) The reason must therefore be sought elsewhere. (9) Things eternal may have no cause of existence, yet a reason for their existence must be conceived. (10) Hence it is evident that even by supposing the world to be eternal, the recourse to an ultimate reason for the world beyond this world, that is, to God, cannot be avoided. (11) The reasons for the world are therefore concealed in some entity outside the world, which is different from the chain or series of things, the aggregate of which constitutes the world. (Leibniz, 1988: 84 – 85)

The structure of the Leibnizian Argument is analogous to the structure of the generalized Simulation Argument. All you need to do is to replace the notion of a previous edition of *The Elements of Geometry* with a deeper finite computer. The computational version of the Leibnizian argument is the *Computational Argument*. It goes like this: (1) Neither in any single thing, nor in the total aggregate and series of things, can the sufficient reason for their existence be discovered. (2) Let us suppose an endless series of finite computers, each computer always being simulated by a deeper finite computer. (3) Although you can account for any given finite computer by a reference to the deeper finite computer, which simulates it, yet, however far back you go in this series of finite computers, you can never arrive at a complete explanation. (4) You always will have to ask why at all times these finite computers have existed, that is, why there have been any finite computers at all and why these finite computers in particular. (5) The best explanation for this whole series of finite computers is the existence of an *infinite* computer.

This infinite computer is deeper than any finite computer. It is infinitely deep. This infinite computer is more powerful than any finite computer. It is infinitely powerful. Now, mathematicians use the symbol ω to refer to the least number that lies beyond all finite numbers. So we refer to the infinite computer as H_ω. The infinite computer is ultimate – it is the sufficient reason for all other computers. It is God. On the basis of the Computational Argument, we add a Final Rule to our previous rules:

3.1 *Initial Rule*. For the initial number 0, there is an initial universe U_0. This is our universe. It is a software process running on a finite computer H_1 in a deeper universe U_1. Our universe U_0 stands to the computer H_1 as software to hardware. H_1 was built and programmed by a civilization C_1 in U_1.

3.2 *Successor Rule*. For every finite n, the universe U_n is a software process running on a finite computer H_{n+1} in the deeper universe U_{n+1}. The universe U_n stands to the computer H_{n+1} as software to hardware. The computer H_{n+1} was built and programmed by some civilization C_{n+1} in U_{n+1}. Each deeper finite computer is longer lasting both into the past and future. It is causally responsible for its universe.

3.3 *Final Rule*. There is an infinitely deep computer. For every finite n, the universe U_n is a software process ultimately being run by God. For every finite n, U_n stands to God as software to hardware. However, God does not stand as software to any deeper hardware. Extrapolating from the features of the computers in the finite series, it follows that: God is infinitely powerful; God is infinitely intelligent; God is everlasting both into the past and future. God is causally responsible for every finite universe at every moment of its existence.[8] God is a self-conscious and self-directing intellect. Thus God is maximally early, creative, powerful, and intelligent. On this view, God is functionally equivalent to an infinite self-programming computer.

These rules define an endless series of increasingly deep finite computers. This series converges to a computer that lies outside of the series – it converges to God. To be sure, these rules generate many theological implications. We cannot look at them all. However, two of these theological implications are worthy of explicit attention.

First, these rules imply that God is infinite in a mathematically (and thus computationally) precise way. For every finite number n, there is a computer whose power is proportional to n. More powerful computers have more memory and are faster. The series of increasingly powerful finite computers converges to an infinitely powerful computer. Any *universal Turing machine* has infinite memory (UTM; Turing, 1936; Hopcroft, 1984). But any UTM only operates at some finite speed. For truly infinitely powerful computers, we need to turn to *accelerating universal Turing machines* (ATMs). ATMs can compute functions that cannot be computed by any UTM (Copeland, 1998a, 1998b). ATMs can perform super-tasks (Koetsier & Allis, 1997). This leads to the unusual conclusion that God is functionally equivalent to (at least) an ATM.[9]

Second, these rules imply that the nature of God is distinct from the natures of the other computers in significant ways. For every finite n, the universe U_n stands to computer H_{n+1} as software to hardware. Thus every computer in U_n stands to H_{n+1} as software to hardware. For each finite n, the computer H_n stands to the computer H_{n+1} as software to hardware. Hence every finite computer is both software and hardware. However, God is outside of this series. God is not software to any deeper hardware. God is pure hardware (which, for the simulationist, is perhaps analogous to saying that God is pure being). And since the physicality of every universe (and every computer in it) is derived from the fact that it is being simulated (that it is being produced by an algorithm), it seems reasonable to associate physicality with software. As a software process, every deeper universe (and every computer in it) is more richly physical. However, since God is pure hardware, God is not physical. The reality of God is somehow deeper than any physicality. Thus, in accordance with classical theories of the divine nature, God would be a pure mind, a pure unity, whose self-directed thought processes generate all physical complexity.

4. The Design Argument

Another classical argument for the existence of God is the *Design Argument*. It shows up as Aquinas's Fifth Way (*Summa Theologica*, Part 1, Q. 2, Art. 3). It goes something like this: (1) we see that our universe contains complex internal structure; (2) if there is any thing with some complex internal structure, then that thing was produced by an intelligent designer; (3) therefore, our universe has an intelligent designer; (4) it is conventional to refer to the intelligent designer of our universe as God; (5) consequently, God exists.

And yet, if the Simulation Argument is right, then the designer of our universe is not God. It is just a deeper civilization. Nevertheless, just as we used the Simulation Argument to develop a novel version of the classical Cosmological Argument, so we can use the Simulation Argument to develop a novel version of the classical Design Argument. The sequence of deeper civilizations is a sequence of deeper designers. God is the limit of the sequence of designers. These rules present the sequences:

4.1 *Initial Rule*. There is an initial civilization C_0. It is our civilization. It is temporally latest and the least intelligent of all civilizations. Our civilization is not fundamental. It is part of a software process running on a computer. This computer was built and programmed by a deeper civilization C_1. This deeper civilization is more intelligent and more powerful than our civilization.

4.2 *Successor Rule*. For every finite n, if there is a civilization C_n, then there is a deeper civilization C_{n+1}. The deeper civilization C_{n+1} is earlier than, more powerful than, and more intelligent than the shallower civilization C_n. Each deeper civilization looks like a unitary mind to any shallower civilization. The deeper civilization C_{n+1} is an intelligent designer that guides the activity of C_n.

4.3 *Final Rule*. There is an earliest and causally original designer. It is the unmoved mover; the uncaused cause; the undesigned designer. It is more powerful than and more intelligent than every finite civilization. It is infinitely powerful and intelligent. It is an infinitely powerful mind. It guides the activities of all the civilizations of which it is the cause. This infinitely deep designer is God.

We now have a nice model of the degrees of perfection argument. An early version of this argument is presented by Augustine (1993: 40 – 64). Anselm presented his version in Chapter 4 of his *Monologion* (Anselm, 1076: 14 - 16). A later version is Aquinas's Fourth Way (*Summa Theologica*, Part 1, Q. 2, Art. 3). The degrees of perfection argument posits a series of degrees of perfection. Things in the higher degrees are more perfect than the things in the lower degrees. A computer x is more perfect than a computer y if and only if (iff) x can do whatever y can do but y cannot do whatever x can do. For any computers x and y, *x is more perfect than y* iff x can simulate y but y cannot simulate x. On this view, degrees of perfection are degrees of computation.

If this picture is right, then God is something like the ground of being (Tillich, 1951). God supports an infinite hierarchy of simulators. Each simulator in this hierarchy produces the next shallower simulator. This picture of divine productivity does not have much in common with the picture of divine creativity painted by traditional theism. The Simulation Argument does not depict God as the traditional Judeo-Christian creator. On

the contrary, this picture of divine productivity is quite similar to the picture painted by various versions of Neoplatonism. Generally speaking, Neoplatonism says that, God (the One) is the source of all reality. Reality is stratified into a hierarchy of levels of perfection (degrees of being). God emanates the entire series of degrees and each degree emanates the next degree in the series. The Simulation Argument supports this general Neoplatonic picture. More specifically, the theological implications of the Simulation Argument overlap at many places with the more modern Neoplatonism developed by John Leslie (2007).

5. Naturalistic Theogony

An afterlife is possible in a world of nested simulators. Bostrom writes that "if nobody can be sure that they are at the basement-level, then everybody would have to consider the possibility that their actions would be rewarded or punished, perhaps using moral criteria, by their simulators. An afterlife would be a real possibility." (Bostrom, 2003: 254). How would this work? One possibility is that, while you are living, your entire life is being recorded by the computer that is running our universe. Your biography is stored in the memory of this computer. After you die, your simulators can use this record to re-create you. After you die, your simulators might re-create you in another simulation. Alternatively, they might equip you with an artificial body, so that you can interact with them in their civilization. The theory of computational re-creation closely parallels the *computational resurrection* theories proposed by many recent writers (e.g. Hick, 1976; Polkinghorne, 1985: 180-181; and Mackay, 1997: 248 - 249). For example, Reichenbach describes computational resurrection like this:

> Viewed monistically, man is nothing more than a physical organism constructed and programmed in a certain fashion. . . . Some have likened man to an extremely complex computer with a physical body. If one adopts this analogy, and applies it to the issue of life after death, the following would be the monistic re-creationist's thesis: just as one can construct two computers to look identical, program them identically, and feed them precisely the same program data, so it would not seem to be self-contradictory that an individual could be physically re-created to possess all the physical characteristics of the deceased in identical proportions and correlations, such that he would look identical to the person who died, and since consciousness is a brain process, that his brain could be re-created and programmed as to have identical neural and chemical components and structures, such that he would possess the same memories, ideas, perspectives, and personality traits as the individual who died. In short, a person precisely identical to the one who died could be re-created, with the result that the re-created person would be the same person as the deceased; he would begin to live where the deceased left off. (Reichenbach, 1978: 27)

Since there are many levels in the hierarchy of simulators, you can be resurrected many times. On each resurrection, you move to the next deeper (and more real) level. You move closer and closer to God. This parallels the *pareschatology* of John Hick. Hick

posits a series of resurrections. He argues that the purpose of human life is to move to divine perfection. But the path from human imperfection to divine perfection is too long to travel in a single step. Hence human life must move towards divine perfection in stages. Hick says that the post-mortem career of every human "occurs in successive sections rather than as one continuous unit. . . . periodic death (like periodic sleep) divides up an existence which, as finite creatures, we can only live in limited phases" (1976: 413 - 414). He posits "a plurality of lives in a plurality of worlds; . . . each stage will have the relative autonomy which makes it a 'real life', with its own exigencies and tasks and its own possibilities of success and failure" (1976: 419). A human career consists of "a series of lives, each bounded by something analogous to birth and death, lived in other worlds in spaces other than that in which we now live" (1976: 456).

Although Hick's theory of serial resurrection is motivated by the traditional Christian doctrine of resurrection, it departs from it in many ways. It is more similar to the classical Neoplatonic idea of the return of the self to God. So if the Simulation Argument supports something like Hick's theory of serial resurrection, then it supports something more like classical Neoplatonism. Once again, the theological picture painted by the Simulation Argument is more Neoplatonic than Christian.

6. Aesthetic Theodicy

If we are being simulated, then why are we being simulated? There are two ways to try to answer this question. The first way is to treat our universe as an artifact and to see if it has any features that point to some specific functionality. The second way is to reason backwards analogically from our own simulations.

We start with the first way. Is there any purpose for which our universe appears to have been designed? Say a universe U is *finely tuned for* F iff the basic features of U mean that F is common in U, while any slight variation of the basic features of U would mean that F is rare in U. If our universe is finely tuned for some F, then we may infer that it has been designed for the production of F. The purpose of our universe is to produce F. Many writers say our universe is finely tuned for *life* (see, for example, Barrow & Tipler, 1986; Leslie, 1989). However, this does not seem right. We don't have much evidence that life is common. And if the basic features of our universe were even slightly varied, then it is likely that more than just life would become rare. All complexity, living or not, would become rare. It is therefore more reasonable to think that our universe is finely tuned for *the evolution of complexity* (Chaisson, 2001).

We now run a *Fine Tuning Argument:* (1) Our universe is finely tuned for the evolution of complexity. (2) The best explanation for this fine tuning is that our universe was designed by an intelligence that values the evolution of complexity. So, by inference to the best explanation, (3) our universe is being simulated because the designers value the evolution of complexity. Clearly, this Fine Tuning Argument reinforces our earlier version of the Design Argument. It can be applied at every level. And it can be applied to the entire hierarchy of levels. Why is there something rather than nothing? Why is

there a hierarchy of simulators, rather than none at all? The simulationist answer is that the evolution of complexity is intrinsically valuable.

We now turn to the second way. Why are we being simulated? According to the second way, we reason backwards analogically from our own simulations. We typically make simulations for two purposes: science and entertainment. By analogy, it is likely that our designers have made our universe either for science, or for entertainment, or for both. If they have made it for science, then everything that goes on in our universe has *epistemic value*. If they have made it for entertainment, then everything that goes on in our universe has *dramatic value*. It has aesthetic value.

If the simulationist needs a theodicy, he or she will turn to *aesthetic theodicy*. Aesthetic theodicy seems to originate with Plotinus (*Enneads*, 2.3.18, 3.2.15-18, 3.6.2). So here is another point where simulationist theology is Neoplatonic. And from Plotinus to the modern age, aesthetic theodicy has a rich history. Notable examples of aesthetic theodicies include the theodicies of Augustine and Leibniz. It is most recently developed by Nietzsche: "it is only as an aesthetic phenomenon that existence and the world are eternally justified" (*The Birth of Tragedy,* 5). For Nietzsche, aesthetic theodicy is *Dionysian affirmation;* it is the love of fate – *amor fati*.[10]

Why are we being simulated? And why are there any simulations rather than none? We have three answers: at every level, the designers are interested in the evolution of complexity; in knowledge; and in dramatic beauty. Obviously, these three concepts overlap. They share a common core. It's reasonable to refer to this common core as *interestingness*. It's not likely that a creative intelligence would be interested in simple systems; nor in systems that are easy to understand; nor in systems that are dull or ugly. As creative intelligence of an agent increases, so does the interest of that agent in complexity, in epistemic richness, and dramatic beauty.

At the risk of sounding circular, the simulationist can say that we are being simulated because every creative intelligence is *interested in interestingness*. But this circularity is virtuous: why are there any simulations at all? Because interestingness is interesting. We are close here to an axiological version of the principle of sufficient reason. Why is there something rather than nothing? John Leslie has argued that the best explanation is that some axiological principles are intrinsically and necessarily creatively effective (see Leslie, 1970, 1979, 1980, 1989). A simulationist version of Leslie's axiarchism says that interestingness is both sufficient for itself and for all other things. Here is the simulationist version of the classical thesis that God is self-explaining. Of course, this self-justification risks collapse into triviality; but on that point it is surely no worse than any other theory that posits a self-justifying God.

It is easy to link simulationist theodicy with *simulationist soteriology*. Just as we are more likely to make and preserve the records of the lives of those who are interesting (of those who are exceptional), so also our designers are more likely to make and preserve records of the lives of those who are interesting. This leads to a kind of Nietzschean aesthetic imperative: "Lead an interesting life!" (see Hanson, 2001). This isn't quite the

same as live fast, die young, stay pretty. Nietzsche famously urges us to "Live dangerously!" (*The Gay Science,* 283). He doesn't urge us to live stupidly. Nor does he urge us to live without compassion.

7. Generalization to Higher Infinities

According to our reasoning so far, God is at the level indexed by the first infinite number. Technically, God is at level ω. God is the computer H_ω. We suggested that H_ω is an accelerating universal Turing machine. You might object that this isn't a very big infinity. After all, modern mathematics defines a wonderfully rich sequence of increasingly large infinities. So, if God is H_ω, then God is rather weak. We reply that it is easy to extend our reasoning to the higher infinities. For the sake of completeness, we briefly sketch this extension. But we won't go into detail. The details are highly technical and contribute little to the philosophical or theological theory.

To extend our reasoning to the higher infinities, we need to assume some *class theory*. We use *VNB* to denote the Von Neumann - Godel - Bernays class theory plus axioms for all consistently definable large cardinals (see Hamilton, 1982; Devlin, 1991; Drake, 1974). VNB defines a transfinite ordinal number line. We refer to this as the *Long Line*. There are three kinds of ordinals on the Long Line. These are the initial ordinal; the successor ordinals; and the limit ordinals. Beyond the Long Line, there is the proper class of all ordinals Ω. Ω is not an ordinal, but it acts like one. So we have four rules: one for each type of ordinal and one for the proper class of all ordinals. Thus:

7.1 *Initial Rule*. For the initial ordinal 0 on the Long Line, there is an initial civilization C_0. It is our civilization. It is the latest and the least intelligent of all civilizations. Our civilization is part of a software process running on a computer. This computer was built and programmed by a deeper civilization C_1. This deeper civilization is more intelligent and more powerful than our civilization.

7.2 *Successor Rule*. For every successor ordinal n+1 on the Long Line, there is a civilization C_{n+1}. The deeper civilization C_{n+1} is earlier and later than, more powerful than, and more intelligent than the shallower civilization C_n. The deeper civilization C_{n+1} is an intelligent designer that guides the activity of C_n.

7.3 *Limit Rule*. For every limit ordinal L on the Long Line, there exists a limit civilization C_L. Any limit civilization is earlier and later than, more powerful than, and more intelligent than every civilization in the series of which it is a limit. Any limit civilization guides the activity of every civilization in the series of which it is the limit. Any limit civilization is infinitely intelligent. It is an infinitely powerful mind – a super-mind (see Steinhart, 2003).

7.4 *Final Rule*. For the proper class Ω, there exists an absolute creator C_Ω. This creator is an absolutely powerful and intelligent mind. It is God.

8. Conclusion

We started with Bostrom's Simulation Argument. On the basis of this argument, we developed novel versions of the Cosmological and Design Arguments. We then turned to soteriology, and developed a theory of the afterlife. At several crucial points, the theology that follows from the Simulation Argument is closer to Neoplatonism than to Christian theism. *Simulationist theology* is highly Neoplatonic.

Neoplatonists can happily embrace the hierarchy of computers. This is just the old *great chain of being* (Lovejoy, 1936). It has clear parallels in the *Enneads* of Plotinus and in *The Elements of Theology* of Proclus (1992). The series of degrees of computation clearly resembles the old Neoplatonic hierarchies. Deeper computers stand to shallower computers as hardware to software. And hardware stands to software as real to virtual. The numbers that index the degrees in the hierarchy are thus like Neoplatonic *degrees of being*. Lesser degrees are less real. But we don't think of degree 0 as non-being. After all, we do exist. On the contrary, the indexes of degrees measure creativity. The intellect in the deepest degree is maximally creative. It emanates all other intellects. An intellect on any positive degree has some remaining creative power and thus emanates intellects in lesser degrees. At degree 0, creative power is exhausted. (Of course, we might not be in degree 0 – we may yet simulate other universes.)

Neoplatonism is closely connected with mysticism. For example, the Plotinian One is beyond being and beyond cognition. It is experienced only through an intimate union. Our computational analysis parallels this Neoplatonic mysticism. Since C_ω is at the level of a proper class, it is transcendental. Proper classes are, in a very precise sense, beyond logic. They are beyond mathematical comprehension. They are transcendental objects. We can say that they exist, but we can say very little else about them. And our understanding of them is always partial and approximate – we can never totally grasp them by any reasoning. So there is some justification for mysticism about C_ω. Even the most cold-blooded logician can recognize that with objects at the level of proper classes, we have reached the absolute edge of reason. We have likewise reached the absolute edge of *predication*. When we defined Ω, we pointed out both that it is analogous to a number but that it is not a number. Likewise, it would be better to say that for any predicate F, God is analogous to an F but God is not an F. For example, God is analogous to a mind but God is not a mind. This is also Neoplatonic. Of course, this mysticism may seem too negative. On a more positive note, we might employ some sort of *reflection principle* to characterize God.[11] For instance, we might say that for any computational power P, if God has P, then there is some les powerful computer that is simulated by God that has P.

Finally, we want to end with some critical remarks on the methods we have used to define God. Our extensions of the Cosmological and Design Arguments involved infinite regressions. Cantorian principles were employed to tame these regressions. For example, an infinite depth is below every finite depth. They are no longer vicious in any old-fashioned, pre-Cantorian sense. Nevertheless, we remain suspicious about infinite regressions. Working backwards does not easily allow us to work forwards. And much

of the most interesting modern theology involves the centrality of *progress*. Consider, for example, process theology. It would be nice to have arguments for the existence of God that make progress along the positive number line. There are many opportunities here for deep suspicion and skepticism. Still, the Simulation Argument has many theological implications that are worthy of serious investigation.

Notes

[1]Bostrom quotes David Pearce as saying that "The Simulation Argument is perhaps the first interesting argument for the existence of a Creator in 2000 years." See <www.simulation-argument.com>. Accessed 11 January 2009.

[2]We already have computers that approximately simulate our whole universe. For example, the *Millennium Simulation* simulated the evolution of our whole universe from the Big Bang to the far future at the level of galactic detail (Springel et al., 2005). It is easy to imagine more precise simulations – simulations that run our whole universe at the level of stars; molecules; atoms; particles. Many writers have argued that our universe is only finitely complex (see Fredkin, 1991; Finkelstein, 1995; Zeilinger, 1999). Specifically, Lloyd (2002) calculates that our universe so far has run only 10^{120} operations involving 10^{120} bits. These are finite numbers. If our universe is only finitely complex, then it can easily be running as a virtual machine on some deeper computer.

[3]We say that something is *ultimate* iff it does not depend for its continuing existence on any other thing; we say something is *virtual* iff it is not ultimate. If something is virtual, then it is *virtual with respect to* something on which it depends. If x is virtual with respect to y, then y is the sustaining or supporting cause of the existence of x. That is, y continuously creates x. Conversely, x emerges from and thus supervenes on the activity of y. For example, an electromagnetic field is virtual relative to its generator. The motion of the generator is a sustaining or supporting cause of the field. The field is not identical with the motion of the generator; on the contrary, the field emerges from and thus supervenes on that activity. For an epiphenomenalist, the mind is virtual with respect to the brain. In the context of computing, software is virtual with respect to hardware.

[4]The Simulation Argument shows that at least one of these is true: "(1) the fraction of human level civilizations that reach a post human stage is very close to zero; (2) the fraction of posthuman civilizations that are interested in running ancestor-simulations is very close to zero; (3) the fraction of all people with our kind of experiences who are living in a simulation is very close to one." (Bostrom, 2003: 255). The Argument does not intend to show that option (3) is true, and Bostrom suggests that, given our current ignorance, we assign roughly equal probabilities to all three options.

[5]We said that our universe is on level 0. But if we run universe simulations in our universe, then our universe won't be on level 0. This is not an issue. Our universe would just move down in the hierarchy and we would remap all the relevant numbers.

[6]One might wonder why each deeper universe is longer lasting both into the past and the future. Since it takes at least one computational step to initiate a simulation, each deeper universe must exist at least one moment earlier than any universe it simulates. And since it takes at least one computational step to terminate a simulation, each deeper universe must exist at least one moment later than any universe it simulates. Hence each deeper universe is longer lasting both into the past and into the future.

[7]The medievals (including Aquinas) distinguished between accidentally ordered causes and essentially ordered causes. See Wengert (1971) and Harrison (1974). Accidentally ordered causes are sequentially operative (e.g. Abraham begets Isaac, Isaac begets Jacob). Accidentally ordered causes can regress to infinity. Essentially ordered causes are simultaneously operative (e.g. a man pushes a stick that pushes a stone). Essentially

ordered causes are sustaining causes: if *x* is an essentially ordered cause of *y*, then the activity of *x* is moment by moment supportive of the activity of *y*. Essentially ordered causes cannot regress to infinity. When it comes to the Second Way, Aquinas is talking about essentially ordered causes. Hence he does not rule out an infinite temporal regress of accidentally ordered causes. It follows that Aquinas can allow the universe to be temporally infinite into the past. According to our generalized version of the Simulation Argument, the nested computers are both accidentally and essentially ordered causes.

[8]God is causally responsible for every finite universe at every moment of its existence. This is a doctrine of continuous creation. See Descartes, *Principles of Philosophy*, part 1, sec. 21; *Meditations*, 3, para. 31. On our interpretation, continuous creation supports 4-dimensionalist theories of physical persistence.

[9]Others have said that God is an Accelerating Turing Machine. Tipler identifies God with his Omega Point. He says that the Omega Point is a "self-programming universal Turing machine, with a literal infinity of memory" (1995: 249 – 250). Tipler also says that the Omega Point is an accelerating machine (1995: 265, 462, 505). Hence the Omega Point is an Accelerating Turing Machine.

[10]Nietzsche advocates an aesthetic theodicy. He says existence is justified aesthetically (*The Birth of Tragedy,* 5, 24; *The Gay Science,* 54; *The Will to Power,* 416, 1019). The celebration of the dramatic beauty of existence is the love of fate (*amor fati;* see *Ecce Homo,* 3:10; *The Gay Science,* 276). It is absolute or Dionysian affirmation (*Twilight of the Idols,* 9:49; *The Will to Power,* 1041, 1032).

[11]Reflection principles have an illustrious history in mathematics. For a non-technical introduction, see Rucker (1995). For a more technical introduction, see Reinhardt (1974). Rucker talks explicitly about the theological uses of reflection principles.

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