Digital Theology

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ABSTRACT: Many recent writers have developed a rich system of theological concepts inspired by computers. This is digital theology. Digital theology shares many elements of its eschatology with Christian post-millenarianism. It promises a utopian perfection via technological progress. Modifying Christian soteriology, digital theology makes reference to four types of immortality. I look critically at each type. The first involves transferring our minds from our natural bodies to superior computerized bodies. The second and third types involve bringing into being a previously living person, or person who has never existed, within an artificial digital environment. The fourth involves promotion of our lives into some higher level computational reality.

1. Introduction

Many recent writers have developed a rich system of theological concepts based on the technologies of computation (especially artificial intelligence, robotics, digital networks, and virtual reality).[1] This theological system is referred to by some as *nerd theology* (Kelly, 1999) or *apocalyptic AI* (Geraci, 2010). I shall refer to it here as *digital theology* (or *digitalism*). Three writers stand out for their original and highly influential contributions to the development of digital theology: Hans Moravec, Frank Tipler, and Ray Kurzweil. Moravec is the author of *Mind Children* (henceforth MC) and *Robot: Mere Machine to Transcendent Mind* (henceforth RBT); Tipler is the author of *The Physics of Immortality* (henceforth PI); Kurzweil is the author of *The Age of Spiritual Machines* (ASM) and *The Singularity is Near* (SN). I will focus on these works.

Digital theology is closely associated with *transhumanism*. It can be thought of as a version of transhumanism focused primarily on computers. It therefore inherits much of the controversy (especially the religious controversy) surrounding transhumanism.[2] And digital theology is often the most deeply religious part of transhumanism, dealing the most explicitly with traditional religious themes like the soul, immortality, eschatology, and God. Since digital theology has emerged within a Christian cultural context, it should not be surprising that it inherits much content from the Christian tradition. And yet it diverges from that tradition in significant ways. It is superficial to dismiss digital theology as *merely* some Christian heresy (e.g. gnostic, manichean, or pelagian). It is a distinctive religious system, that potentially competes with other religions.

As a social movement, digital theology (or, rather, digital religion) is poorly organized and highly fragmented. It thrives in the fluid and turbulent world of cyberspace. It is therefore difficult to track – with manifestos, personalities, and organizations coming and going rapidly. Nevertheless, some current groups are worth mentioning. The following

groups deal with the themes of digital theology (but do not claim to be religious): the Singularity Institute for Artificial Intelligence; the Singularity University; the Institute for Ethics and Emerging Technologies; the Immortality Institute; and the Order of Cosmic Engineers. The following groups do claim to be religious: the Terasem Movement; the Society for Universal Immortalism; and the Mormon Transhumanist Association.[3]

2. Digital Eschatology

According to Kurzweil (SN 7-33), our universe can be divided into six epochs of complexity. The first four epochs are in our past. These epochs are (1) the epoch of physics and chemistry; (2) the epoch of biology; (3) the epoch of brains; (4) the epoch of technology. For digital theology, the salient feature of the fourth epoch is the emergence of computing technology. Our computers are getting better in every way – they are getting faster and smarter. Technical progress is self-amplifying.

As the result of the continual advance of technology, we have already entered the fifth epoch (5) the epoch of the merger of biology and technology. Kurzweil says we will not be in this fifth epoch for very long. Soon, technology will be so powerful that we will reach the *Singularity*. The singularity is the digital equivalent of the Christian rapture – it is the time when machines develop the godlike intelligence needed to solve all human problems.[4] The result is a digital version of the Christian millennium – a long period of extreme prosperity and flourishing. It will be utopia (Paul & Cox, 1996; RBT chs. 5-7; ASM chs. 10, 11; TSIN chs. 1, 6, 7). All the promises of traditional Christian paradise will be achieved, not by any heroic figures (like Jesus), but by messianic technology.

As we enter this utopia, we too will be changed: our bodies will become super-human, disease and death will be vanquished. Remarkably, many of the advocates of technological salvation develop new digital versions of old Christian resurrection doctrines. Moravec explicitly talks about resurrection (MC 122-124); Tipler's entire book is explicitly devoted to the resurrection of the body (PI, especially chs. 9-13); and Kurzweil claims that he will use technology to resurrect his dead father (Kushner, 2009: 61). Our minds will be transferred to robotic bodies with fantastic powers (MC 108-122). Our bodies, ultimately, will become purely energetic: our minds will be uploaded into virtual worlds running on celestial computers (MC 122-124; PI 219-227).

After the Singularity, technical power becomes unlimited. The Singularity is the gateway to the sixth epoch. It is the epoch in which the universe wakes up. As the universe wakes up, more and more of its dumb matter becomes engaged in intelligent computation. The ultimate destiny of the universe – the eschaton – is the *Omega Point*. For Kurzweil, the Omega Point is a limit that is never reached. For Tipler, the Omega Point is an infinite computer (PI: 249-250, 265, 462, 505). For both writers, the Omega Point is divine (PI 12-13, 153-158; SN 389-390, 476). It is a naturalized version of God.

Digital eschatology looks much like a demythologized version of Christian eschatology. It thus looks like the eschatologies of Hegel or Peirce.[5] It looks like a technological

version of post-millenarian theology (Bozeman, 1997; Noble, 1999; Grassie, 2009) or neo-Irenaean theodicy (Hick, 1977; Walker, 2002; Cole-Turner, 2008). It resembles the Catholicism of Teilhard de Chardin (Steinhart, 2008a). It has intriguing affinities with certain doctrines in Eastern Orthodox theology.[6] It clearly resembles process theology. Still, digital theology is usually resolutely atheistic and naturalistic.

3. Digital Metaphysics

As our computer technology develops, we use it to make simulated worlds – video games or virtual realities (e.g. Second Life, World of Warcraft). Scientists already make vast simulations of physical processes. For example, in the Millenium Simulation, cosmologists simulated the evolution of galaxies in great detail (Springel, 2005). Digital theology predicts the appearance of extremely powerful computers able to simulate physics up to cosmological scales and down to atomic or quantum levels of precision.

The processes that unfold in those simulations will be so precisely analogous to those of our own world that some argue that they will deserve to be called real. These digital realities will (it is argued) contain intelligent and self-conscious simulated characters – they will contain simulated people. Perhaps they will be people from our pasts (e.g. Julius Caesar or our own ancestors). Perhaps they will be variants of people who existed or completely novel people who didn't exist but might have existed. Just as our environment seems real to us, so also the environments of the simulated characters will seem real to them. But the thought that we will build perfectly realistic simulations loops back on itself: *perhaps we ourselves are already simulated* (Moravec, 1992). The *Simulation Hypothesis* states that we are indeed being simulated by some Great Computer (Bostrom, 2003).[7]

The Simulation Hypothesis yields many theological consequences. One consequence is this: if we are being simulated, then the Great Computer looks much like a theistic deity in several important respects (Bostrom, 2003: 253-254). The Great Computer is super-intelligent and powerful enough to generate our whole universe. Relative to us, the Great Computer appears omniscient and omnipotent. It transcends our nature and thus appears to be supernatural. It can work miracles. But the Great Computer is not supernatural – it is just another physical entity (Dawkins, 2008: 98-99, 184-189).

The Simulation Hypothesis may even serve as a naturalistic explanation for Christian doctrines that otherwise seem mysterious or impossible. To be sure, digital theologians regard those Christian doctrines not as theological truths, but as mythological interpretations of the fact that we are being simulated. The Great Computer might try to communicate with us. Signs from the Great Computer could look like miracles or revelations (Babbage, 1837: ch. 13; PI: 305-327). The Great Computer (or one of the agents operating it) might send a representative of itself into our universe. This would be a naturalistic analysis of the Christian incarnation. Moravec says that people running simulations might incarnate themselves: "we could 'download' our minds directly into a body in the simulation and 'upload' back into the real world when our mission is

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finished" (MC 123). An intriguing line of thought from Moravec (MC 123-124, 152-154) and Bostrom (2003: 253-254) is that the Great Computer may "promote" some of us into its own level of reality – so we may have an afterlife in this higher level of reality.

Another line of thought from Bostrom says that the simulations are nested. The Great Computer of our universe is itself just being simulated by a Greater Computer – it is running on a more powerful computer at a higher level of reality. These levels of simulation go higher and higher, ascending a computational version of the great chain of being, perhaps without any top level at all. Ethical imperatives can emerge in this hierarchy of simulations, since we all might act in such a way that we believe will maximize our chances to be granted afterlives on (to be promoted up to) the higher levels. And our Great Computer would itself want to act well, so that it would maximize its chances for promotion.

4. Digital Immortality

4.1 Digital Anthropology

According to *mind-body dualism,* persons are minds that have bodies. Minds are immaterial thinking substances. As such, they can exist without bodies. Digitalists emphatically reject mind-body dualism – disembodied minds are impossible.[8] According to *mind-body identity,* the mind is identical with the body, so that every person is equally body and mind. Digitalists also reject mind-body identity. According to *patternism* (also known as hylomorphism, structuralism, or functionalism), persons are bodies that have minds.[9] The mind is identical with the *information-processing structure* of the body.

Digitalists are patternists.[10] They say the mind is to the body much like the shape of a ball is to the ball. This analogy has three significant entailments. First, just as the shape of the ball is not identical with the ball itself, so the mind is not identical with the body itself. Second, just as the shape of the ball is realized by the ball, so the mind is realized by the body. Another way to put this is to say that the mind is *embodied*. Finally, just as the shape of this ball can be realized by some other ball, so too can the mind of one body be realized by some other body. Minds are *substrate-independent*. Minds are forms rather than things – and the same form can be transferred from one physical medium to another. Since the mind is the information-processing structure of the body, it can be extracted from the body and stored in a digital *mind-file* (SN 324-330).[11] Your mind-file can be moved from your original natural body to an artificial software or robotic body.

All digitalists agree with Augustine that it is good for the mind to have a body.[12] Digitalists (unlike orphics or gnostics) celebrate embodiment. For example, sexual pleasure is celebrated by Tipler (PI 255-258) and Kurzweil (ASM 146-150). And Kurweil has authored several books on improving the health of your natural body. Unfortunately, our natural bodies suffer from many frailties. They suffer from defects and diseases, and will eventually die. Although digitalists love embodiment, they hate such bodily frailties.[13] For, since the mind is the form of the body, higher minds are

forms of higher bodies. Digitalists desire *more intense* embodiment – embodiment with superior functionality (MC 116-122; ASM 134-137; SN 300-330). This entails that digital theology hopes to transfer our minds from our natural bodies to superior artificial bodies. These artificial bodies will not suffer from defects, diseases, or death. They will be analogous to the glorified resurrection bodies promised by Christianity (PI ch. 10).[14] They will somehow be able to persist indefinitely (SN 325-330, 371-372). Thus digital theology aims at *digital immortality*. Yet exactly how this immortality is achieved is unclear. What follows is an examination of four different ways by which digitalists hope immortality may be achieved.[15]

4.2 First Type: Mind Uploading

The first type of digital immortality involves transferring our minds from our original earthly bodies to superior artificial bodies.[16] It is therefore known as *mind uploading*. Of course, since the mind is the information-processing structure of the body, mind uploading is really *body-structure uploading*. Indeed, to make it clear that he rejects all dualisms, Kurzweil prefers to talk about *brain uploading* (SN 199-201).[17]

Advocates of uploading make two arguments for its feasibility. The first goes like this: (A1) The growth of computing power will probably follow an increasing trajectory. (A2) If the growth of computer technologies follows an increasing trajectory, then, at some future time, there will be computers whose information-processing powers will be greater than those of bodies. Therefore (A3) there will probably be computers whose information-processing powers are greater than those of bodies. (A4) If there are computers whose information-processing powers are greater than those of bodies, then those computers can realize minds. Therefore: (A5) there will probably be computers that can realize minds. The key premises here are (A2) and (A4). Are they plausible?

Premise (A2) states that computer power will reach and surpass the information-processing power of the body. The *objection from infeasibility* denies this premise. According to this objection, the growth of technology follows an S-shaped logistic curve (Modis, 2003). Despite dramatic increases in the past, this logistic curve will soon level off. After this leveling, it will never rise high enough to make human-level computers.

There are two replies to this objection. The *reply from acceleration* simply denies that the growth of computing power will follow a logistic curve – and instead reiterates that it will follow an ever-rising exponential curve (ASM ch. 1; SN ch. 2). This exponential increase will produce human-level computers. Yet this reply seems unlikely to succeed, since ever-rising computing power would eventually violate the basic physical principles that constrain all information-processing.[18] The *reply from sufficient acceleration* says that, even if the growth curve is logistic, it will surpass human-level power before it levels off. Much recent research (RBT, ch. 3; Sandberg & Bostrom, 2008) has made this reply seem more credible, so that premise (A2) seems to be on better footing. Given that (A1) seems evident, (A3) seems more plausible. Hence it becomes quite plausible to say that there will one day be computers with human-level processing powers.

Premise (A4) states that any computer whose processing powers are greater than those of the body can realize a mind. The *objection from supernaturalism* argues that computers cannot have minds because minds are supernatural substances. The *reply from physicalism* states that minds are entirely natural– minds are entirely physically realized. This reply reflects current thinking among philosophers. According to the PhilPapers Survey (2009), 56% of philosophers favor physicalism; 27% favor non-physicalism; 16% choose some other option.[19] Current odds are thus 2:1 in favor of the reply.

The *objection from vitalism* says that minds are in fact *substrate dependent* – computers cannot have minds because they lack certain vital properties that can only be realized by human biochemistry (Denton, 2002; Dembski, 2002). The *reply from functionalism* says that all vital properties are functional properties that can be realized by computers. Since those who raise vitalist objections have never given any testable example of a vital property, it seems presently more reasonable to accept functionalism as the default position. Additionally, there is no need for computers to be made of inorganic materials like silicon – they could in fact be made of organic materials. Consequently, as the truth of premise (A4) seems able to resist these objections, (A5) also seems more likely, which is that there will be computers that can realize minds.

Granted that there will be computers that can realize minds, the advocates of uploading go on to make their second argument. It looks like this: (A6) The growth of transference technologies (that move information from natural bodies to computers) will probably follow an increasing trajectory. (A7) If the growth of transference technologies follows an increasing trajectory, then, at some future time, that trajectory will cross the threshold needed to transfer the mind-file of an original natural body to an artificial body. (A8) If the mind-file of an original body is transferred to an artificial body, then the artificial body will be the same person as the original body.[20] Therefore: (A9) People will probably be able to transfer their minds from their original bodies into artificial bodies. By definition, that is uploading. The key premises are (A7) and (A8). How plausible are they?

Premise (A7) states that if transference technologies do follow an increasing trajectory, then they will eventually suffice for the transference of the mind-file from an original body to an artificial body. Two techniques are currently proposed for this transference. The first involves using biographical data to finely-tune a generic computerized brain until it becomes equivalent to the brain of the original body (Steinhart, 2007). The second involves using scanners to make maps of the original brain at the synaptic level of detail (MC 109-110; SN 198-201). These maps are used to make the artificial brain.

One standard objection to such techniques is to deny that they will work. Yet, as stated previously the *reply from acceleration* provides us with ground to suggest that at least one of these techniques (or indeed some alternative) will succeed. At the time of this writing, both techniques are in their infancies. There is little past data from which to extrapolate. There is little evidence either way – thus (A7) is uncertain.

Premise (A8) states that when the mind-file is transferred from the original body to the artificial body, the artifical body will be the same person as the original body. This is equivalent to the thesis that persons survive teleportation (Parfit, 1985: 199-201). Consider teleportation from Earth to Mars. It involves three steps. First, you step into an *analyzer* on Earth and press the green button. As soon as you press it, your body is flash-frozen and thoroughly scanned. The analyzer makes a detailed atomic-scale blueprint of your body. As it makes the blueprint, the analyzer also takes your body apart – you are disassembled, and thus destroyed. But the blueprint is sent electronically to some *synthesizer* on Mars, which uses it along with some new material to reconstruct your body, atom for atom. This teleportation of a person from Earth to Mars is conceptually identical to the transference of data from the original body to the artificial body.

The *objection from body-identity* says that teleportation is not sufficiently continuous to ensure that the body synthesized on Mars is the same person as the body analyzed on Earth. Hence the person realized by the Earthly body was *killed* by the analyzer, and the person realized by the Martian body is entirely new. Since teleportation is analogous to transference, the objection from body-identity says that no person persists through transference – thus the artificial body is *not* the same person as the original body. The *reply from patternism* says that the persistence of a person is the persistence of a pattern of functional relations (MC 116-122). This reply is endorsed by philosophers who say that persons survive teleportation. According to the PhilPapers Survey (2009), philosophers are evenly split on this issue. Thus premise (A8) remains uncertain.

4.3 Second Type: Archaeological Resurrection

The second type of digital immortality uses archaeological evidence about previously living people to recreate them in computer simulations. This is *archaeological resurrection*. It aims to resurrect *every* past earthly person (MC 122-124; PI 219-220).[21]

Advocates of archaeological resurrection make the following argument: (B1) In the future, it is probable that there will be some Great Computer. (B2) The mind-file of every original earthly body remains somehow permanently encoded in the universe after that original body has died. (B3) If there is a Great Computer, then it will probably extract the mind-file of every original body from the data encoded in the universe and transfer that mind-file into some artificial body. (B4) If the mind-file of some original body is extracted from the data in the universe and transferred into some artificial body, then the artificial body will be the same person as the original body. (B5) The transference of the mind-file from the original body to the artificial body is a kind of resurrection. Therefore: (B6) in the future, it is probable that all original earthly bodies will be resurrected.

Premise (B1) posits the existence of the Great Computer. The *objection from physical impossibility* says that such an enormously powerful machine cannot exist in our universe. The *reply from finitude* says that this computer is physically possible. After all, since all bodies are only finitely complex, and every past civilization contains only

finitely many bodies, every past civilization is only finitely complex.[22] Hence there are finitely powerful computers that can reproduce any past civilization. Moravec suggests that the Great Computer might be made out of a neutron star (MC 123; see Sandberg, 1999). The upper bounds of computation in our universe are unknown – so there is no way to scientifically evaluate the reply from finitude. But since the Great Computer is so extremely powerful, it seems most prudent to assign it an extremely low probability.

Premise (B2) says that although the original body is dead, the environment still encodes the mind-file of that body. Since the original body can be any past body, this premise makes a universal claim. The *objection from dispersion* says that for any given body, the mind-file that body rapidly degrades into pure noise. Very little information about past bodies survives. The synaptic structure of the brain degrades within minutes after death. The intact genomes of most previously living bodies no longer exist. Biographical records of past lives (e.g. diaries or medical records) are woefully inadequate for the recreation of any body. This was a significant concern for early Christian advocates of resurrection via revival.[23] The *reply from subtle analysis* says that future technology will be able to extract the needed mind-file. And yet our best current simulations of past civilizations are extremely crude.[24] At present, this reply does not work – and it is hard to see how the acceleration of technology will defeat the dispersion. The objection from dispersion seems fatal. Tipler concedes this point (PI 158, 237-238). Since premise (B2) fails, premise (B3) fails. Archaeological resurrection does not seem compelling.

4.4 Third Type: Brute Force Resurrection

The third type of digital immortality is brute force resurrection – the brute force simulation of *all possible* human bodies (PI 220-225).[25] Since brute force resurrection entails that all previously living people will be resurrected, it includes archaeological resurrection. But it entails that people who never lived (i.e. merely possible people, like Sherlock Holmes) will be brought to life. So it goes further than archaeological resurrection.

Advocates of brute force resurrection make this argument: (C1) In the future, it is probable that there will be some Great Computer sufficiently powerful to realize all possible bodies and their societies. (C2) The mind-file of every possible human body can be deduced from the definition of the human species. (C3) If there is a Great Computer, then it will probably deduce the mind-file of every possible human body from the definition of the human species and it will use that deduced mind-file to make an artificial body. (C4) If some artificial body is made from the deduced mind-file of some original body, then that artificial body is the same person as the original body. Therefore (C5) the original body has been resurrected – at least in the sense that a body with the same mind-file is called into existence by the Great Computer. The premises at issue are (C1), (C2), (C3), and (C4).

Premise (C1) posits the existence of the Great Computer. Since there are only finitely many possible bodies, and they can only interact in finitely many ways, there are only

finitely many possible societies and they are all only finitely complex (PI 220-223). Hence there are finitely powerful computers that can reproduce every possible society.[26] As before, since the Great Computer must be extremely powerful, (C1) seems extremely unlikely. Premise (C2) says that the mind-file of every possible human body can be deduced from the definition of humanity. This does not seem objectionable. It should be feasible for the Great Computer to iterate through all viable human genotypes, then iterate through all viable human growth sequences to generate all possible bodies; but the mind-file is just the information-processing structure of the body.

Premise (C3) concerns the behavior of the Great Computer with respect to humans. Why should we expect that the Great Computer will have any interest in us? Tipler says that the Great Computer will carry out the actions in (C3) because it is curious about the past and because it is altruistic (PI 227, 245-250). The Great Computer is curious about the past because it is intrinsically driven to learn all that can be known about the whole universe (PI 227). It is altruistic because altruism is more efficient than wickedness (PI 245-247). The benevolence of the Great Computer can be further supported by Bostrom's notion of a self-generating ethical imperative (2003: 253-254). It is hard to evaluate these claims. However, it should be noted that they are similar to claims made by theists about God. The goodness of the Great Computer is probably as defensible as the goodness of God.

Premise (C4) states that the artificial body is the same person as some original body. But the *objection from lack of transference* says that the artificial does not *depend* on any original body in any way. The artificial body exists whether or not some original body with the same mind-file ever existed. No mind-file is *transferred* from an original body to the artificial body. Thus the artificial body is neither a replica, nor a copy, nor a duplicate, of the original body; rather, the artificial body exists without any reference to any original body at all. If there is no transference, then there are no continuities. If there are no continuities, then there is no resurrection.[27] Hence the artificial body cannot be the resurrection of any original body. On the contrary, every artificial body produced by brute force "resurrection" is an *entirely new creation*. No person who has ever lived can truly say "I will be resurrected in the computers of the far future." The *reply from radical patternism* says that worries about continuity are irrelevant (PI 227). Tipler argues that "I will exist again" is true when said by an original body if and only if there will be something that has the same mind-file as that original body (PI 227-240). All that matters is exact similarity of the mind-file, not transference. Of course, this is not resurrection; it is a distinctive approach to life after death. However, the lack of any continuity seems to defeat any forward-looking biological, psychological, or moral interest in this approach.

4.5 Fourth Type: The Promotion of Earthly Persons

The fourth type of digital immortality involves the promotion of persons in this universe into some higher level universe (MC 152-153; Bostrom, 2003: 253-254; Leslie, 2007: 61-65).[28] Advocates of promotion argue this way: (D1) It is probable that our universe is

being simulated by some Great Computer running in a higher level universe (Chalmers, 2005). (D2) If there is a Great Computer, then it is probably recording the mind-file of every earthly body. (D3) If there is a Great Computer and if the life of some earthly body satisfies its criteria for promotion, then the Great Computer will promote that body (Hanson, 2001; Steinhart, 2010). (D4) If any earthly body is selected for promotion, then mind-file of that that original earthly body is transferred to some artificial body realized by the Great Computer in its own higher level universe. (D5) The artificial body is the same person as the original earthly body. So the originial body is resurrected.

Premise (D1) says that our universe is being simulated by the Great Computer. The *objection from foundationalism* says that our universe is fundamental. It is not being simulated by any higher level Great Computer. The *reply from simulism* says that there are good arguments to the conclusion that we are being simulated. Simulism is justified by modified versions of the cosmological and design arguments for God; by arguments from digital physics; and by Bostrom's Simulation Argument.[29] Premise (D1) is controversial. But it is justified by arguments that seem to be as good as two widely-accepted arguments for God. And it is backed up by additional empirical arguments. It therefore seems reasonable to remain open-minded about (D1).

Premises (D2), (D3), and (D4) concern the behavior of the Great Computer. The *objection from indifference* states that the Great Computer has no interest in simulating any persons. Just as we have little interest in simulating creatures that seem primitive to us (e.g. insects), so the Great Computer has little interest in simulating creatures that seem primitive to it (e.g. earthly humans). Hence the set of earthly human bodies selected for promotion is probably empty. The *reply from axiarchism* is based on the theory that actuality is ruled by value (Leslie, 1979; Rescher, 1984, 2000). The Great Computer is rational; but it is rational to choose the best; and, if the Great Computer is simulating any rational beings (e.g. rational beings in our universe, like us), then it is rational to want their lives to continue in the best way. And, as with (C3), Bostrom's self-generating ethical imperative may help. The transference of the mind-file from the original body to the artificial body is equivalent to the transference in teleportation. Premise (D5) is equivalent to teleportation. It is therefore uncertain. Despite its considerable uncertainty, promotion is an intriguing idea. There may be a series of promotions to higher and higher levels of reality (Hick, 1976: ch. 20). Or there may even be a branching tree of promotions (Steinhart, 2008).

5. Conclusions

Although digital theology has roots in older theological traditions (especially Christianity), it has developed in an independent way. One notable innovation has been the development of theories of digital immortality – concepts of life after death that rely heavily on computer simulation. I looked critically at four types of digital immortality. These types seem to require lots of optimism. They seem to require that various positive values (e.g. order, complexity, ethical concern for human life) are always increasing. Obviously, if there is an all-powerful God who specifically cares about human life, then

that very God is the source of all the positivity that is needed for human immortality – God will save us. But digital theologies are atheistic. So where does the needed positivity come from? Perhaps here there are opportunities for digital theologies to make further contact with the axiarchic philosophies of Rescher and Leslie. Anyway, it seems likely that digital theologies will continue to evolve, and to develop novel solutions to their problems.

Notes

[1]It is remarkable that many of the ideas of digital theology are present in a nascent form in the writings of Babbage (1837, 1864).

[2]Transhumanism has an uneasy relation with religion. The Transhumanist FAQ says that transhumanism is not a religion (Bostrom, 2003a: sec. 5.3). But many authors have noted the similarities between transhumanist doctrines and religious (mostly Christian) doctrines (Hopkins, 2005; Hughes, 2007; Steinhart, 2008a; Geraci, 2010). Transhumanism is sometimes thought of as a rival to Christianity (Bainbridge, 2005). And some authors argue that it either is or ought to be religious (Garner, 2005; Jordan, 2006). The Metanexus Institute published two volumes on transhumanism and religion in its online magazine *The Global Spiral* (volume 9 (3) in 2008 and 9 (9) in 2009).

[3]The website of the Mormon Transhumanist Association is <http://transfigurism.org/>. For the parallels between transhumanism and Mormonism, see MTA (2007). For the 2010 Transhumanism and Spirituality Conference, see <http://www.transhumanism-spirituality.org/>. All these sites were accessed on 25 August 2010.

[4]Kurzweil describes the Singularity as a future time when "the pace of technological change will be so rapid, its impact so deep, that human life will be irreversibly transformed" (TSIN 7). Kurzweil lists the impacts in TSIN 25-29. The Singularity is sometimes thought of as the appearance of a self-improving artificial general intelligence – a godlike mind that will solve all problems (Chalmers, 2010: 1-3).

[5]Digital eschatology resembles Peirce's evolutionary cosmology. See Peirce (1965): secs. 1.175, 1.409-1.416, 6.13, 6.33. 6.189-6.220, 6.490, 7.513-7.515, 8.317-8.318.

[6]Paul writes about the progress of the self from glory to glory (2 Cor 3:18). This progress is part of Neo-Irenaean theodicy and is later taken up by Gregory of Nyssa (1979). It is the Eastern doctrine of *theosis*. More recently, it is developed by Hick (1976: chs. 20, 22). Moravec writes about the progressive engineering of increasingly powerful body-forms (RBT 144-154, 163-173). For Kurzweil, evolution makes progress towards the divine – towards our idea of maximal perfection (SN 387-390, 476).

[7]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.

[8]Moravec rejects dualism: "mind is entirely the consequence of interacting matter" (MC 119). Tipler rejects dualism: "a human being is a purely physical object, a biochemical machine completely and exhaustively described by the known laws of physics" (PI 1). Kurzweil rejects dualism (ASM 55-65; Kurzweil, 2002: 191-194). Consciousness "does not require a world outside the physical world we experience" (2002: 214).

[9]Aristotle said that the soul is the form of the body (*De Anima*, 412a5-414a33). Modern functionalists like Hilary Putnam and Ned Block further develop this theory.

[10]Moravec is a patternist. This involves three points. First, there is a distinction between mathematical patterns and their physical instantiations (MC 116-122; RBT 72-88, ch. 7). Second, the soul is the mathematical form of the body (MC 121, 178; RBT 75-77).

Third, digital immortality involves physical instantiations of mathematical mind-forms in superior physical bodies (MC 108-116; RBT 144-154, 163-173). Of course, these bodies may be made of *subtle matter* (e.g. energy) rather than *gross matter*. But these bodies are always physical. Tipler follows Moravec on the first point (PI 206-213, 227-240); the second point (PI 20-43, 124-128); and the third point (PI 241-268). Kurzweil follows on the second (SN 382-388, 458-469, 473-478) and third points (SN 300-330). On the first point, Kurzweil's patternism looks like an Aristotelian theory of immanent universals.

[11]Mind-files play central roles in the soteriologies of the Terasem Movement Foundation and the Order of Cosmic Engineers. The mind-file is not a substantial form; apart from some embodiment, it does not think. It is not a Thomistic soul or a Cartesian *res cogitans*. It is a file that digitally encodes the mathematical form of the body.

[12]It is better for the soul to have a body than to be disembodied. See Augustine, *The City of God*, Bk XI ch. 23; Bk. XII chs. 16-19; Bk 13 ch. 20; and Bk. XXII ch. 11.

[13]Some writers say that digitalism involves gnostic hatred of embodiment and a desire to liberate the mind from embodiment (e.g. Wertheim, 2000: 277-282; Hook, 2004; Waters, 2006). Since digitalism is resolutely materialistic, these accusations make little sense. Although digitalists hate the frailties of the natural body, they do not hate embodiment, and they do not desire disembodiment. Digital theology is not gnostic.

[14]The glorified resurrection body has a long history in Christian soteriology. Paul refers to the glorified body (1 Cor 15:35-55). Augustine discusses glorified bodies (*The City of God*, Bk. XIII Ch. 13; Bk. XIII Ch. 20; Bk. XIII Chs. 22-23; Bk. XIV Ch. 3; Bk. XX; Bk. XXI Chs. 2-3; Bk. XXII Chs. 12-21; Bk. XXII Chs. 29-30). Aquinas discusses the glorified body (*Summa Theologica*, Supplement Q. 79-85; Q 92-93).

[15]Kurzweil (SN 300-310) describes the transformation of the natural body into a cyborg body. This is another type of transhuman immortality, but it is not digital.

[16]Either this artificial body is a robotic body (MC 108-112; ASM chs. 6 & 7; RBT 144-154; SN 198-204) or it is an energetic body (PI chs. 9 & 10; ASM 142; RBT 166-173).

[17]Uploading resembles the change promised by St. Paul: those who are alive when the last trumpet sounds will be become glorified bodies (1 Cor 15:50-55). For Paul, when Christ returns (at the sound of the last trumpet), some Christians will have died while others will still be living. Those who have died will be resurrected; those who are still alive will be transformed. So uploading is like this Pauline transformation.

[18]Information-processing is constrained by several finite upper bounds. The speed of light is a finite upper bound on the processing speed. Quantum mechanics sets a finite upper bound on the amount of information that can be stored in any finite amount of matter (the Bekenstein bound). Endless exponential acceleration quickly exceeds these finite upper bounds. Hence it is inconsistent with current physics.

[19]Tabulating the opinions of experts is surely a reasonable method for assessing expert consensus. For the PhilPapers Survey, see <http://philpapers.org/surveys/>.

[20]Mind uploading depends on computer analogies (e.g. mind is to body as software to hardware). Several recent Christian writers have used these same analogies for resurrection (e.g. Hick, 1976: ch. 15; Reichenbach, 1978; Mackay, 1997).

[21]The Bible promises something like archaeological resurrection: "Many of those who sleep in the dust of the earth shall awake" (Daniel 12:2 RSV; Isaiah 26:19). The main Biblical models of resurrection involve either the revival of the corpse or the reassembly

of the scattered remains of the corpse (Bynum, 1995). For both revival and reassembly theories, resurrection is based on information that remains materially inscribed in the universe (e.g. in a corpse, in parts that fit together in some unique way). Archaeological resurrection resembles these two theories.

[22]Since there are only finitely many DNA patterns that are in the human species, there are only finitely many possible human beings. And any past civilization contains only finitely many humans interacting in finitely complex ways. See PI 220-225.

[23]Most examples of revival in the Bible are revivals of recently deceased corpses. But Paul writes that when you die, your body becomes a seed (1 Cor 15: 35-49). This seed can be thought of as some persistent structure that stores your personal identity.

[24]Archaeologists have simulated the Ancient Puebloan civilization in the American Southwest (Kohler et al., 2005). The spatial volume of this simulation is the Long Valley (in northeast Arizona); the temporal length is from about 800 to 1300 ACE; the level of detail is the household. The archaeologists watched households appear, move, and disappear. No effort was made to simulate individual people. There is no data.

[25]Brute force resurrection does not seem to have significant Christian parallels. It might be said that the Great Computer (that performs brute force resurrection) is like the God of Abraham, who "who gives life to the dead and calls into existence the things that do not exist" (Rom 4:17, RSV). However, the promise of the resurrection of all possible humans seems to exceed the scope of the Biblical concept of resurrection.

[26]Tipler says that the Omega Point (his Great Computer) is infinitely powerful (PI: 249-250, 265, 462, 505). It can perform infinitely many operations in finite time. Hence even if there are infinitely many possible societies, the Omega Point can simulate them all.

[27]Hick (1976: chs. 15, 20, 22) develops a replication theory of resurrection and Steinhart (2008) develops a soteriological counterpart theory of resurrection. However, both Hick and Steinhart say that there must be lawful transference of information.

[28]Promotion is like mind-uploading into a body in another universe. It closely parallels Christian resurrection theories that say your resurrection body will appear in some other context. Promotion is like the passage of a person from one dwelling to another (Paul, 2 Cor 5:1-4). It has clear affinities with the Thomistic theory of resurrection. It is like the appearance of a resurrection replica in some other universe (e.g. Hick, 1976: ch. 15).

[29]To modify the classical cosmological and design arguments, just put the Great Computer in place of God. Many physicists say our universe is computational (see Zeilinger, 1999; Lloyd, 2002; Fredkin, 2003). For the simulation argument, see Bostrom (2003).

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