Perspectives on Techno-science and Human Nature

A BETTER LIFE THROUGH INFORMATION TECHNOLOGY? THE TECHNO-THEOLOGICAL ESCHATOLOGY OF POSTHUMAN SPECULATIVE SCIENCE

by Michael W. DeLashmutt

Abstract. The depiction of human identity in the pop-science futurology of engineer/inventor Ray Kurzweil, the speculative robotics of Carnegie Mellon roboticist Hans Moravec, and the physics of Tulane University mathematics professor Frank Tipler elevate technology, especially information technology, to a point of ultimate significance. For these three figures, information technology offers the potential means by which the problem of human and cosmic finitude can be rectified. Although Moravec's vision of intelligent robots, Kurzweil's hope for immanent human immorality, and Tipler's description of humanlike von Neumann machines colonizing the very material fabric of the universe all may appear to be nothing more than science fictional musings, they raise genuine questions as to the relationship between science, technology, and religion as regards issues of personal and cosmic eschatology. In an attempt to correct what I see as the cybernetic totalism inherent in these techno-theologies, I argue for a theology of technology that seeks to interpret technology hermeneutically and grounds human creativity in the broader context of divine creative activity.

Keywords: artificial intelligence; cybernetics; cybernetic totalism; cyborgs; futurology; imagination; information technology; Ray Kurzweil; life extension; Hans Moravec; myth; posthumanism; robotics; science fiction; speculative science; symbols; technology; techno-theology; Frank Tipler; Norbert Wiener.

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In this article I analyze the posthuman future described within speculative science. I examine how information technology has become a conveyance for ultimate concern inasmuch as it contributes to a techno-theology in which human material culture serves as the foundation for eschatological hope. Whereas a theology of technology seeks to situate one's interaction with technology within ecclesially embodied and historically mediated theological narratives, *techno-theology* grounds theological aspirations (hope for a better life, concern over human destiny, notions of the good) in technological realities. I analyze the pop-science futurology of engineer/inventor Ray Kurzweil, the speculative robotics of Carnegie Mellon roboticist Hans Moravec, and the physics of Tulane University mathematics professor Frank Tipler with regard to their techno-theological eschatology. I argue that within their posthuman speculative science, present and future technologies are viewed as the means of achieving ultimate salvation for both the cosmos and the individual person. Despite the prominence of these themes, and despite their frequent mention within contemporary posthuman literature, their work has received surprisingly little critical reflection within academic theology. I want to rectify this abeyance by exploring their work with specific interest in engaging with the latent theological implications of their thought.

Posthuman speculative science reflects an implied reductionistic philosophical anthropology. The complexity of the human subject—one's spirituality, materiality, and sociality—is perceived as being reducible to a collection of patterns that can be decoded and reembodied in whatever substrate a given future technology provides. Although Moravec's vision of intelligent robots, Kurzweil's hope for immanent human immortality, and Tipler's description of humanlike von Neumann machines colonizing the very material fabric of the universe all may appear to be nothing more than science-fictional musings, they raise genuine questions as to the relationship between scientific aspirations, technology, and theology.

I originally had assumed that the problem of posthuman speculative science was primarily its implicit acceptance of a reductionistic philosophical anthropology, but in pursuing my research further I realized that, although posthuman speculative science does promote radical reductionism, the more pertinent theological issue surfaces when one examines the role played by technology within posthuman thought as a means of conveying ultimate concern.

Definitions: Technology, Speculative Science, and Posthumanism

In light of the admittedly obscure nature of this topic, before proceeding with my analysis of Kurzweil, Moravec, and Tipler three concepts must first be defined: *technology*, *speculative science*, and *posthumanism*. We also

must briefly discuss the relationship between posthuman speculative science and the recent history of information technology, cybernetics, and artificial intelligence (AI) research.

Technology. Technologies are tools that extend human agency and will while remaining ontologically differentiated from human being. I argue that the meaning of technology can be found only at the nexus of a given technology's invention and application. There is therefore no "essence of Technology" or "essence of technologies," because talk of essences implies an immutability that is foreign to the ever-changing forms of technological development.[1] Technologies operate within prescribed notions of causality that are imposed upon them by their makers or users. They are intended for particular tasks and do these tasks in service to human will. Technologies are neither good nor evil, although the systems within which they operate—and the individuals who establish and work within such systems and technologies—can be. My definition of technology seeks to wrestle responsibility and control away from the objects of technology and to place the onus of ethical liability firmly in the hands of a given technology's human users and designers. I advocate approaching technology hermeneutically, where the meaning of a technology is discovered within an analysis of its situation. Likewise, its ethical weight is determined by one's self-reflexive examination of one's technology use.

Given the above definition, how can something as straightforward as technology ever give rise to something as symbol-laden as discourse regarding ultimate concern? Given the transparent and predictable nature of technology and the polyvalence and contextual nature of symbols, it would appear that technology and symbolic discourse share a natural antinomy. The contemporary situation is characterized by a gradual decrease in the value of symbolic systems of discourse corresponding to increased technical literacy in culture (Dillistone 1973, 6). F. W. Dillistone argues that symbols in a technological world lose their power for two reasons: (1) shifts in the role of religion in explaining the meaning and origin of the cosmos, and (2) the move away from a Platonic metaphysic where earthly phenomena can be traced back to a perfect transcendental form (1973, 6). In contrast to symbols, technologies for Dillistone appear to operate as unambiguous signs pointing to "direct correspondence" between the thing being represented and its representation (p. 163). Whereas symbols retain a high degree of ambiguity and rely on interpretation in order for their underlying meaning to emerge, "Signs do not require anything transcendent or ultimate to undergird them" (p. 168). The symbol is open to interpretation, but the sign closes off possible future discourse by unambiguously pointing to the reality it represents (p. 163).

Technologies-*cum*-signs point to no reality other than the causal effect to which a technology has been designed or applied. However, and perhaps

paradoxically, both signs and technologies can become conveyances for the symbolic when their unambiguous meanings become obscured by their ambiguous applications. The clarity of a sign's message depends entirely on the context within which the sign is read. As the messianic secret in the Gospel of Mark indicates, the symbolic significance of the "signs" indicating the coming of the kingdom of God can be accurately read only by those in possession of the right hermeneutic.[2] Likewise, the native unambiguity of technology becomes obfuscated when the *effect* of technology on its object is confused with the *affect* of technology on the subject. Technology itself may be both neutral and unambiguous, but its application is neither. Thus, to understand the cultural ambiguities of technology's use, one must differentiate between the *effect* of a technology (as regards its causality) and the *affect* of a technology (as regards its significance).

The effect of technology is caused by the design and operation of technologies imposed on material objects by technology's creators and/or operators. The affect of technology is caused by the subjective appraisal of such technologies, where the awe and wonder of a technology's abilities eclipses the brilliance of a technology's creator or user. To use an example borrowed from Paul Tillich, it is entirely appropriate for one to experience a sense of awe in the presence of great seafaring ships, airplanes, or other objects of technological production, but it is inappropriate when the "*eros*" directed toward the "technical gestalt" becomes fixated on the technical object rather than on the combination of subject and object within the whole of a technology (Tillich 1964, 274). To focus on the affect of technology is to merely praise the creation, to make the object itself the entity that is the source of one's admiration.

It is precisely this problem of misappropriated affection, or a technologically influenced concupiscence, that plagues the examples of the speculative sciences that follow. If regarded hermeneutically, with a concern for their place within the human situation, the information technologies at play within speculative science would reflect a humanitarian orientation that is akin to the work of early cyberneticists who sought to use technologies, marshalled by culturally determined strong-values, to better society (Wiener 1948, 37–39, 187–88). Uncoupled from either governance or situated human need, the technologies speculated upon below give rise to symbols and myths that offer immanently realizable solutions to existential hopes. Hence, the relatively straightforward signlike behavior of technology becomes obscured by the symbols that arise from a primarily affective reading of technology. In the speculative sciences, this mythological significance leads to an inauthentic expression of ultimate concern, where technologies themselves point to what is mistakenly perceived to be a more authentic form of subjectivity.

Excursus: Information Technology and Cybernetics. As early as 1964, Norbert Wiener, one of the foremost twentieth-century cyberneticists, argued that cybernetics "impinged" upon religion. The issue for Wiener was the creation of machines that could (1) learn, (2) reproduce themselves, and (3) engage in mixed-use applications—that were integrated into social, cultural, and biological life (Wiener 1964, 11). Despite his assertions, the impingement to which Wiener refers is not on religion or theology per se; nowhere does he argue that computers could themselves become or replace God or posit that they can or should become objects of veneration. Rather, Wiener describes "religious" impingement in terms of technology's potential ability to destabilize or challenge how subjectivity is traditionally understood within religion (in the case of Wiener's definition of religion, the Judeo-Christian tradition). Wiener would argue that by destabilizing traditional views of the subject, cybernetics or information technologies undermine many of the assumptions about self, world, and society that directly relate to the creation of a theological system of belief. For Wiener, inasmuch as the doctrine of the image of God preserved the unique creative purview of the Divine (in relationship to humanity), by undermining human uniqueness cybernetic technologies also undermine divine creative sovereignty. If humans are neither functionally unique (points 1 and 2) nor ontologically unique (point 3), for Wiener, the Divine ceases to be magisterially unique in its creativity. This argument may seem somewhat crass, but Wiener's *God & Golem, Inc.* (1964) represents an important step in the religious critique of contemporary information technologies. Namely, it points to the common ground shared by theological self-knowledge and the self-knowledge derived from one's encounter with culture, specifically the culture made possible by human technology. He argued that unless the study of cybernetics was carried out with humility and a concern for preserving the priority of the human within its study of systems and organisms, cybernetics would become the sole purveyor of knowledge about world, God, and self.

Concurrent with the publication of Wiener's admonition for a humanist caution within his discipline, computer scientist Marvin Minsky began working toward an understanding of neural networks, electronic correlates to the human brain, and the pursuit of artificial intelligence. Whereas cybernetics in Wiener tended toward a realistic interpretation of computer technologies and pursued interdisciplinary dialogues between cybernetics as the so-called command-and-control science and other soft sciences, AI research, typified by Minsky's *Computation: Finite and Infinite Machines* (1967), has promoted an idealized vision of technology that contributes to an ethos, if not a culture, that seeks to use computer science as a way of addressing topics ranging from the nature of cognition to the future of humanity and the destiny of the cosmos. Although cybernetics still exists as an actively pursued scientific discipline, the ethos surrounding AI has

prevailed as the cultural appropriation of information technology, as typified by posthuman speculative science.

Though often misunderstood as synonymous terms, research in the field of artificial intelligence differs drastically from cybernetics. Cybernetics, as envisioned by Wiener, is a descriptive discipline that seeks to uncover how feedback systems, natural or otherwise, work within the world. It is a discipline that is keenly aware of the place of the subjective observer within the system being observed. By contrast, AI is a prescriptive discipline that seeks to employ computational models as the basis for cognition—to remove the subjective observer from the task of discovery by replacing the subject through the implementation of computational abstractions.[3]

Today, despite the presence of cybernetics, cyberspace, cyborgs, and cybersex within our collective vocabularies, we live in an age dominated by the inherent philosophies of cybernetics' close relative, artificial intelligence. Thus, rather than using cybernetic methodologies to better understand feedback systems, AI research has sought to use information technology to better understand a contrived and technologically mediated model of human intelligence. In sum, the ethos surrounding AI research promotes a kind of cybernetic totalism whereby objects in the world are made to seem more real when they receive mediation through, or representation by, computer systems (Lanier 2000). It is precisely this disposition toward IT that promotes the posthuman subjectivities in Kurzweil, Moravec, and Tipler, leading ultimately toward their techno-theological eschatology.

Speculative Science. The term *speculative science* is used in this article to refer to a form of scientific reflection in which the future of scientific discovery is the primary object. This may sound like science fiction, and I want to carefully differentiate between the role played by imagination within science fiction and the role played by speculation within speculative science. The imagination in science fiction is patently fictive and employed primarily for the purpose of entertainment, although it can be regarded as a form of social critique (Broderick 1995). The fictive imagination is not made dependent upon technology, real or otherwise, for the communication of its story. Technology, unencumbered by history or fact within the fictive world, forms a connection to the reader's present as established from the perspective of the fictive future (as if looking back onto the present from afar) rather than from the perspective of the present (as if looking ahead to the future). Thus, the imagination of posthuman science fiction is an imagination of the future that reaches back into the present, in so doing confronting the present with a picture of otherness that encourages reflective critique. By contrast, speculation, at least in the way in which the term is employed in posthuman speculative science, is grounded in a familiarity with the present that projects onto the future an informed guess of what *could* be in light of what *is*.

Perhaps speculative science would be better understood if juxtaposed with the well-established scientific practice of the thought experiment, in which a line of questioning is pursued in lieu of empirical observation. The well-known example of Schrödinger's cat is a thought experiment that describes the problem of simultaneity in quantum states. No one would ever argue that Schrödinger's cat actually existed as simultaneously alive and dead,[4] yet in the context of speculative science an outlandish claim of this ilk could be made. Speculative science could argue that our knowledge of quantum mechanics is presently incomplete, but perhaps in the future simultaneity will be more fully understood, whereby there could be such things as alive-dead cats. Although crippled by the possibilities of science and technology in the present, speculative science holds out hope for the future as the place where the mysteries of science can be resolved and the limits of technology exceeded.

Unlike the role played by imagination in posthuman science fiction, speculative science grounds its future on a trajectory that is set by the present. It represents unwavering faith in the myth of progress (in this case, scientific and technological progress) that prompts the speculative scientists described below to read, through their formidable scientific expertise, a hope for a technologically improved future. Whereas thought experiments can usefully produce theories that may later be proven or disproved, it would seem that speculative science only promotes a futurological outlook that invests the future, as an extension of the present, with utmost significance. Speculative science looks to the future for its ultimate goal and views the present only in terms of its ability to procure this goal.

Posthumanism. Posthumanism follows speculative science into the future and regards the future destiny of human being as the ground for present-day human identity. It is the belief that, through a union of human technical ability and human will, human beings will progress toward (or be the progenitors of) the next stage of human evolution, resulting in the posthuman. Although for the purpose of this article my concern with posthumanism is primarily centered on the theological dimension of posthuman discourse, the term also connotes post-*Humanism* in the sense of a critique of Humanist philosophy. The posthuman, cyborg, or so-called nonmodern critique of Humanism cites the historical use of technology and its ubiquitous presence in contemporary life to argue that human goals, the "good life," society, and value can be understood only in terms of the human use and creation of technology (Feenberg 2002, 28–30). To this end, posthumanism as antihumanism argues that human being can be understood only in terms of hybridization rather than in terms of the "purely" human. Whereas humanism tends to advance the cause of the individual and his or her place within the community, posthumanism is characteristically oriented toward the dissolution of the individual in favor

of a networked vision of society (Latour 1987, 258). Despite the antihumanism of posthuman *theory*, I argue that posthuman discourse—whether posthumanism *as* antihumanism or posthumanism *as* futurology— is simply an extension of the broader posthuman condition, identified as a striving after that which is beyond the human (as in *Homo sapiens*) and not simply that which is beyond Humanism as a philosophy.

In practice, posthumanism is facilitated by a desire to improve on the human condition by implementing advanced technologies that generally fall under the category of cybernetic or information technologies. In science fiction novels such as Philip K. Dick's *Do Androids Dream of Electric Sheep?* (1999), or William Gibson's *Neuromancer* (1984), information technology is used to confuse human subjectivity by contrasting present-day images of the human with posthuman scenarios. In films such as *The Matrix* trilogy, *eXistenZ*, or *Lawnmower Man*, information technology mediates reality to such an extent that the fusion of humans and their technologies represents a next step in human evolution. In critical theory and feminism, the image of the posthuman as cyborg is employed to destabilize assumptions regarding gender, sexuality, and control, as set within what is regarded to be a technological age. In terms of speculative science, robotics, strong-AI, von Neumann machines, and computer simulations of consciousness all figure in the posthuman vision of a postbiological future.

A common theme in the myth of posthuman speculative science is the belief that advanced forms of information technology will in the future be able to accommodate radical forms of life extension. The ability to employ technology to stave off death as long as possible has given the posthuman speculative scientists mentioned below a sense of confidence in their craft's ability to bring an ultimate solution to the problem of finitude, especially when cast in terms of personal mortality. As we shall see, however, the possibility of eliminating death is rather different from the possibility of systemic redemption or salvation (Fukuyama 2003, 67, 71).

We have now defined technology as an nonessential cultural entity that must be approached hermeneutically, explored the history of twentieth-century information technologies, defined speculative science as a future-oriented form of scientific reflection, and described posthumanism as an unwavering faith in future human-technology coemergence. We now engage with specific examples of posthuman speculative science in Moravec, Tipler, and Kurzweil and note the techno-theological eschatology revealed by each.

Moravec: Mind Children—Future of Human Evolution

Moravec, a research professor at the Robotics Institute of Carnegie Mellon University, specializes in autonomous robot mobility. An established and highly regarded robotics engineer with an extensive list of patents and academic publications to his name, Moravec's work is driven by a desire to see

autonomous self-mobile robots commercially available by the end of the decade.[5] Despite the highly pragmatic nature of his primary area of research, Moravec's more speculative work centers on the broadly sweeping implications of evolving robotic intelligence and dexterity. In his principal writings on speculative science, *Mind Children* (1988) and *Robot* (1999), Moravec describes the technical obstacles that must be overcome in order for the posthuman evolution of robots to occur. He describes with great clarity the trajectory of developments within information technology that he believes will lead to the creation of artificially intelligent robots. In addition to creating autonomous forms of artificial life, Moravec believes that robot evolution eventually will provide the technology for the reinstantiation of human consciousness into a computerized and robotic medium.

Consistent with other contemporary applications of robot technology, from the Mars Rover to industrial manufacture, the robots currently being developed by Moravec are intended to be put to use in environments where humans traditionally have been unable to thrive. Such robots liberate their human users and designers from the lethal repercussions of fate or bad judgment. Moravec views robots as more than tools for the manipulation of the physical world. They are devices that enable their human operators (or programmers) to skirt around the basic limits of human finitude and extend the horizon of human action. By plunging robots into outer space, distant planets, or even in the forges and assembly lines of contemporary industry, he argues, human will and agency are extended into domains knowable only through their technological mediations. Seen as extensions of human being, robots in the present are only quantitatively distinct from what Moravec describes as a postbiological future.

Moravec's vision of future robotic technology sees even more than the extension of agency and will; he envisions a time when robotic "life" will surpass human life as the more durable and malleable incarnation of human evolution. "What awaits is not oblivion but rather a future which, from our present vantage point, is best described by the words 'postbiological' or even 'supernatural.' It is a world in which the human race has been swept away by the tide of cultural change, usurped by its own artificial potency" (Moravec 1988, 1).

Moravec views this future as the consummation of humanity's historical courtship with technology. From the first stone tools to the most advanced forms of robotics and artificial intelligence, humanity has lived as a hybrid species whose will and agency have been instantiated partly within a biological body and partly within an ever-developing technological body. Moravec tersely describes present-day humanity as "uncomfortable halfbreeds" (1988, 2). Thus, in the future, faced with an increasingly inhospitable environment and an unquenchable desire for longevity, humanity will divest itself of its natural situation in the world and surrender completely to a purely technological mode of being created by humanity for humanity.

Moravec's primary reason for pursuing robotic technology and artificial intelligence as the ultimate solution to the problem of human finitude reflects what he sees as the inherently inhospitable nature of contemporary technological life. Humans live in a world that outpaces the finite limitations of human physiology and psychology. Moravec writes: "We have a Stone Age brain, but we don't live in the Stone Age anymore. We were fitted by evolution to live in tribal villages of up to 200 relatives and friends, finding and hunting our food. We now live in cities of millions of strangers, supporting ourselves with unnatural tasks we have to be trained to accomplish, like animals who have been forced to learn circus tricks" (Moravec 1995).

The only way for humanity to endure the speed and the depth of contemporary existence is to increasingly rely on technologies to mediate the world in a way that compensates for the limitations of our "Stone Age brain." For Moravec, the externalizing of cognitive function in the use of computers to think with and for humans, coupled with the extension of human activity through the use of robots, prosthetics, and other tools, is the first step toward eventual abandonment of the physical biological body for a new body crafted with the needs of the technological world in mind. Despite the many changes in temporality, spatiality, sociality, and interiority that would accompany a radical reinstantiation of human being into posthuman physiology (Moravec 1988, 110, 114), he would argue that posthuman beings are our "mind children," descended from the human drive to self-perfection and related to us by the sharing of our basic intelligence. The space between the human and the posthuman is for Moravec a continuum of human evolution coupled with technological development.

Moravec has developed a theme that is echoed in the other two posthuman speculative scientists discussed below. It is an image of a technologically mediated eternal kingdom. Like the Christian kingdom of God, which exists as a partial reality in the present and a full reality in the future, the techno-kingdom of posthuman speculative science is read as an emerging reality that will be consummated in a not-too-distant future. Though a posthuman eschatology wrestles with similar themes present within Christian eschatology, a Christian eschatology is ever aware that the fulfillment of its hope lies in the hands of the God who is in control of history, in contrast to a posthuman eschatology that places the onus of control upon human technologies.

Furthermore, Moravec's posthuman future raises a serious question regarding one's persisting identity after having been resurrected into a cybernetic body. Like so much Christian theology that has appealed to a dualism between body and soul to argue reasonably for the persistence of identity following death, posthuman speculative science appeals to a notion of dualism that sees the body and the mind as two distinct entities. For Moravec, the "essence" of humanity is the human mind, an epiphenomenon pro-

duced by the brain to function as the body's software. As software, mind is as transferable (portable and interoperable) as any other piece of software that I might load onto a disk and move from one medium to the next. For Moravec, neither the body nor the world nor community affects the subjective experience of mind. Indeed, any subjective experience is merely "an abstract property shared by all patterns," meaning that, whether instantiated in a computer or in my own body, "a person would feel the same" (1988, 178). In order for him to advocate a posthuman future with some form of continuity between one's old embodiment in the flesh and one's new embodiment in a technological body he must reject any notion that the physical body is somehow required for human consciousness. He asserts that, if the patterns and processes of the mind are preserved, "I am preserved. The rest is mere jelly" (1988, 117). Rather than the body, it is patterns that constitute identity and codes that define persons; thus humanity is ultimately reducible to a collection of bits and bytes.

Moravec's blind belief in information technology as the means by which future humanity will experience radical life extension confirms him as a cybernetic totalist who believes that reality is better understood through cybernetic mediation. Although philosophically we can dismiss Moravec's optimism, and perhaps technologically we could undermine the feasibility of his plans, a more pressing question is one that explores the intent behind such a blatantly eschatological reading of future information technologies. Indeed, Moravec signals a trend, followed by the other posthuman speculative scientists discussed here, of investing present-day technologies with eschatological significance. In so doing they aim to fulfill existential concerns with immanently realizable solutions.

TIPLER: IMMORTALITY AS THE COLONIZATION OF THE COSMOS

The technological landscape of the posthuman future described in Moravec (above) and Kurzweil (below) finds an interesting complement in Tipler's *The Physics of Immortality* (1994). Like Kurzweil and Moravec, Tipler takes up the possibility of a posthuman future through the rubric of technology-enabled life extension. Human finitude—and, for Tipler, cosmic finitude—is an existential concern to which information technology may provide an ultimate solution. He begins his study rather brashly, arguing that "theology is a branch of physics and that physicists can infer by calculation the existence of God and the likelihood of the resurrection of the dead to eternal life . . ." (1994, iv). Attempting to arrive at a "universal" theological language, he appeals to what he sees as a sense of universal eschatological hopes that are reflected in all the "great world religions" (p. 337). This is the starting point for his physical theology. Yet, rather than turning to transcendental symbols or religious discourse, he seeks to ground his eschatology in scientifically verifiable and technologically feasible realities.

As was the case with Moravec, in order to promote a form of life extension where one's subjective experiences and consciousness can be instantiated in a substrate different from one's own physical body, Tipler appeals to a pattern-based understanding of identity. Accordingly, one's mind is understood as a composite of one's neuropathology. Echoing Moravec, he writes that "the pattern is what's important, not the substrate" (p. 127). Human mind can exist forever, assuming that the machines that house and embody the human mind can last forever (p. 125). Again like Moravec, embodiment—which is contingent upon ever-changing biological and technological realities—is not constitutive of the individual. Tipler defines sentient life as follows: "I claim that a 'living being' is any entity which codes information (in the physics sense of this word) with the information coded being preserved by natural selection. Thus, 'life' is a form of information processing, and the human mind—and the human soul—is a very complex computer program. Specifically a 'person' is defined to be a computer program which can pass the Turing test" (p. 125).

Making "life" synonymous with information processing allows Tipler to reduce the complexities of subjectivity to a form that can be readily modeled by computers and therefore easily replicated within other information technology devices, of which the human mind is but a simple form. The posthuman future for Tipler is filled with Voyager-like space probes that contain and process living posthuman human intelligences. These devices, which in the future will be launched from our planet as our Sun comes to its natural end, will seek to transform the material fabric of the universe into a cosmic posthuman information-processing device. For Tipler, it is only natural that the "next stage of intelligent life would be quite literally information processing machines" (p. 218).

His eschatological speculations are grounded in a technological myth that resists any appeal to a transcendent divinity (p. 125). He seeks to make "heaven as real as the electron" (p. xv) by appealing to the most "up-to-date knowledge of modern mathematics and physics" (p. xvi). This approach differentiates Tipler from Moravec or Kurzweil, inasmuch as Tipler aims at exploring the long-range implications of posthuman life extension by casting a technological eschatology as both individual and cosmic destiny. He argues that in order for humanity to fully embrace its own self-made immortality the cosmos must be implicated in this pursuit (p. xiii).

To achieve immortality in the face of certain cosmic finality—for Tipler the real challenge of posthuman speculative science—requires the devising of a way to install the "computer program" of the human soul in an incorruptible medium. But how can anything created in a finite cosmos be incorruptible? Even beyond the death of our own solar system, there exists a yet more problematic boundary, which in Tipler's physics is termed the Omega Point: the end of the cosmos itself. For Tipler, the greatest obstacle to immortality is the collapse of the universe and the return to singularity,

the moment wherein all matter and energy converge to a single infinitesimal point (p. 154). Tipler's Omega Point is strikingly different from the use of the same concept by early twentieth-century French theologian and paleontologist Pierre Teilhard de Chardin, who understood the Omega Point to be the end of cosmic history, in terms of both its completion/fulfillment and its ultimate goal (DeLashmutt 2005). The Omega Point was seen to be a term roughly synonymous with the being of Jesus Christ and not dissimilar to the role of Ultimate Concern in Paul Tillich's theology (as ground of being) or kingdom of God in Pannenberg's (as prolepsis of the cosmic end). Tipler's use of the term is divested of Teilhard's theological teleology, as for Tipler Omega Point is nothing more than the absolute boundary of space and time, the fixed horizon at the end of existence. For Teilhard, surviving the Omega Point meant the fusion of spirit and matter into Christ. For Tipler, there is no spiritual undercurrent, only a mathematical formula that seeks to prove that at the point of singularity one could subjectively experience eternal life.[6]

Tipler describes his so-called physics of immortality as a new kind of natural theology, which resists metaphysical or transcendental claims in lieu of what he regards as a thoroughly materialistic and scientifically verifiable system. He is aware that his physical theology seriously affects confessional theological belief, but he argues that his thesis resonates deeply with contemporary Protestant theology. In particular he cites the work of Wolfhart Pannenberg, noting that Pannenberg believes that the identity of the "present-day person is coded not only in the present-day spatio-temporal structure, but also in God" (Tipler 1994, 293). Tipler sees Pannenberg's understanding of eschatological personhood to be the same as his own Omega Point theory, where information about the person will be reconstructed at the Omega Point (end of the universe).

One may bristle at what appears to be the co-opting of Pannenberg's theology for the purposes of Tipler's posthuman speculative science, but it would appear that Tipler's interpretation of Pannenberg may not be that far from the truth; on his Web site he refers to personal correspondence with Pannenberg in which Pannenberg offers the following veiled endorsement of Tipler's theories:

> Christian believers and their resurrection hope need not the difficult path towards resurrection via a change of the basis of intellectual life from old-fashioned organic life to a computer based life that might finally dominate in the universe. Communion with the crucified and risen Christ, who according to the Christian faith at present already participates in God's rule of the universe, is sufficient for the Christian as basis of the hope in their future participation in the resurrection of the dead. That does not exclude that the development of life in the universe may indeed take the course which Tipler describes. (Pannenberg 1997)

Despite Pannenberg's guarded approval of Tipler's work, there are serious issues that prohibit confessional theology from closely aligning itself

with this approach, the least of which is the apparent elevation of human technique to the point of ultimacy. This tendency seems endemic to Tipler's theology.

Like Moravec and Kurzweil, who regard the digital transformation of human being as the inevitable next step in human evolution, Tipler posits that "the creation of such intelligent machines will be a matter not of 'man playing God,' but rather, of humanity ensuring a union with God" (Tipler 1994, 21). That is, upon enveloping the whole of the cosmos with intelligent life, humanity will become omnipresent, omniscient, omnitemporal, and, as far as it is allowed for within the Omega Point, omnipotent (Tipler 1994, 153f.). Thus, humanity itself, by using its technology to seed intelligence into the cosmos, becomes God. Tipler's God is no monolithic divinity but rather an emergent characteristic that develops within the evolving life forms of the cosmos. For Tipler, God exists only inasmuch as humanity possesses the potential to become God.

In a critique of Pannenberg's acceptance of Tipler, Sjoerd L. Bonting notes that the theology argued for by Tipler is inherently inauthentic, because it confuses the roles of science and theology. Theology, according to Bonting, is concerned only with transcendental ideas, whereas science is "by definition limited to this world" (Bonting 2005). Bonting goes on to argue that Tipler is unable to construct a valid theology because his scientific language is unable to discuss the transcendental object of theology. Pannenberg rightly sees the limits of Bonting's critique: If science is the language of the world and cannot speak of the divine, it follows that theology, the language of the divine, is limited in its ability to speak to the world. Such an impotent theology contradicts the cosmic implications of Christian eschatological hope, which demands universal import (Pannenberg 2005). Though I agree with Pannenberg's assessment of Bonting, I cannot follow his endorsement of Tipler, no matter how caged it may appear. Principally, I believe that Tipler's "science" is merely a capitulation to an essentialist philosophy of technology that has led Tipler into a form of cybernetic totalism. As such, his work, though clearly a significant intellectual exercise, is more a reflection of an uncritical reading of technology than a lasting bridge between science and theology.

By making the human or posthuman subject a potentially infinite entity and by making the means of this transformation human technical aptitude, posthuman speculative science advocates a purely immanentist theology that grounds hope (theological or otherwise) on speculated technological mythologies rather than hoped-for transcendental symbols. A biblical cosmic eschatology places as a mark over future human history the ultimate power of God as the source and sustainer of life and the determined yet unknowable plan of God to control the ends of history. It is, to echo the words of Hans Schwarz (2000, 2), a countermeasure against the contemporary obsession with the present. The techno-theological escha-

tology of posthuman speculative science transforms eschatology itself into a technology that is controllable, controlling, and demystified.

KURZWEIL: SPIRITUAL MACHINES AND THE SINGULARITY

I conclude this investigation of posthuman speculative science by briefly looking at the work of Kurzweil. Like Moravec and Tipler, Kurzweil approaches the inevitability of the posthuman union of technology and humanity as the next step in human evolution and, significantly, as the solution to the problem of personal human death. Also, despite his extreme faith in the future capacity of technology, Kurzweil is no crackpot futurologist but an established and highly respected engineer, entrepreneur, and inventor.[7] As attested by his early work, the majority of Kurzweil's life has been spent imagining and developing technologies aimed directly at improving deficiencies in human physiology. His work in recent years has transitioned from research into the palliative application of cybernetic technologies to alleviate visual and auditory disabilities and to the more systematically curative application of technology enlisted to overcome personal death. The trajectory of his thinking can be traced in his three principal works: *The Age of Intelligent Machines* (1992), *The Age of Spiritual Machines* (1999), and the ambitiously titled *The Fantastic Voyage: Live Long Enough to Live Forever* (Kurzweil and Grossman 2004).

Technology for Kurzweil is an essential aspect of what it means to be human and is intimately connected with human evolution. Distinct from a tool—a device that according to Kurzweil is fashioned only to attend to the needs of a particular job—technologies are objects that are interwoven with human culture and destiny, persisting beyond the needs of the moment. They are the bearers of cultural information, inasmuch as the development of technology implies the progression and development of ideas from one generation to the next. He writes: "Technology goes beyond the mere fashioning and use of tools. It involves a record of tool making and a progression in the sophistication of tools. It requires invention and is itself a continuation of evolution by other means. The 'genetic code' of the evolutionary process of technology is the record maintained by the tool-making species" (Kurzweil 1999, 14).

Like Moravec, who considered humanity to be a "half-breed" species composed partially of a technological body and partially of a biological body, Kurzweil points to a twofold evolutionary process that, in creating humans and technology, anticipates the synergistic human-technology merger of the "technology-inventing species with the computational technology it initiated the creation of" (Kurzweil 1999, 255–56). This event is described by Kurzweil as the singularity, the point at which human-technology evolution will converge and accelerate to infinite progress.

For Kurzweil, this human-technology merger will result in the creation of two distinct types of mind: an artificial mind that will emerge from the

computer itself and a subjective mind that is transferred from the substrate of the human brain to the substrate of the computer. Thus, the book title *The Age of Spiritual Machines* reflects both the emergence of an independent machine-mind and the spiritual instantiation of the human mind in the computers of the future. Such machines, for Kurzweil, would consider themselves to be fully human, "although their brains are not based on carbon-based cellular processes, but rather electronic and photonic 'equivalents'" (1999, 234). More than simply artificial intelligence (an attribute that he believes can be ascribed to current computers), Kurzweil argues that his spiritual machines will possess a true self-awareness and consciousness, which he regards as being functionally equivalent to the human mind. Eventually into such machines human mind itself could be uploaded.

He couches his analysis of future technologies within a speculated trajectory of future computer developments that are based on his understanding of the past rate at which computer technology has advanced. Important to his argument is the constancy of what is referred to as Moore's Law, an informal rule of computer technology that predicts that the number of transistors per square inch of an integrated circuit will double every twenty-four months (Moore 1965). Graham Moore, cofounder of the microprocessor manufacturer Intel, made this prediction in 1965 based on the increased density of integrated circuits since their inception in 1959. Although Moore predicted that this trend would continue into the foreseeable future, most experts (including Moore himself) do not hold this law to be an eternal constant (see Dertouzos 2000, 26). Kurzweil, however, bases the entirety of his speculative science on the constancy of Moore's Law, which he believes will allow for development in technologies leading to the rise of spiritual machines.

Kurzweil promotes his argument by predicting a gradual internalization of computer technology into the human subject. For Kurzweil, as was the case with Moravec, the clunky material interfaces that separate one's consciousness from the activities going on within one's computer will continue to disappear as technologies develop. What began with the erasure of wires connecting computer peripherals and computer networks will, in Kurzweil's speculation, lead to the eventual disappearance of keyboards (Kurzweil 1999, 277). The present-day drive to develop increasingly unobtrusive computer displays will lead to immersive virtual environments made possible first by ocular implants and then by brain implants (p. 279). This will be accomplished as the division between flesh and blood and copper and silicon becomes ever confused, as one's experience of the "real" world slowly becomes indistinguishable from one's immersion within the virtual world. Subjectively it is then only a matter of making a final jump from the mind's instantiation within the physical body to the mind's instantiation within a machine (pp. 51–54). This, for Kurzweil, is "*when we become software*" (p. 150).

Kurzweil, like Tipler and Moravec, appeals to the problem of human finality as the impetus for his technological eschatology. He defends his radical hope by arguing that, in light of the general antipathy toward death evidenced by the contemporary anti-death industries of medicine and life extension, the pursuit of a final technical solution to death is simply inevitable. Thus, he arrives at something like a cosmological argument for the existence of spiritual machines: Because we need to overcome death, our technology must be able to facilitate our need. Kurzweil never doubts our ability to develop technology to a sufficiently robust state where it can accommodate and resolve this need. Indeed, he predicts that in the twenty-first century, with the help of strong AI and advanced computer technology, "the human species, along with the computational technology it created, will be able to offer succour to human needs and desires, and will be in a position to change the nature of mortality in a postbiological future" (p. 2).

Thus, salvation for present humanity is to be found not in some distant eschaton but in the move toward a posthuman and postbiological future. Whereas Tipler oriented his physical eschatology toward the Omega Point, Kurzweil's eternal kingdom fixes its gaze on the far more immanent goal of what he terms the singularity. For him, the postbiological age will reach its climax at a moment of rapid technological change that culminates in a vast dispersal of "immortal software-based humans, and ultra-high levels of intelligence" into the whole of the cosmos traveling "at the speed of light" (Kurzweil 2001b). This idea resonates with both Moravec and Tipler and signals not only the ultimate salvation of human consciousnesses but, more profoundly, the universal significance of human technology, which, when dispersed into the cosmos, will begin rectifying even the problem of cosmic finitude, à la Tipler. Kurzweil's Manichean vision, like that of the other posthuman scientists discussed here, seems to place its hope on the pure dispersal of human mind into the cosmos as the goal of evolution and the key to cosmic salvation (cf. Asimov [1956] 1990): "I regard the freeing of the human mind from its severe physical limitations of scope and duration as the necessary next step in evolution. Evolution, in my view, represents the purpose of life. That is, the purpose of life—and of our lives—is to evolve" (Kurzweil 2001a).

Unlike Christian eschatology, Kurzweil's immortal posthuman and postbiological future circumvents the need for the divine by giving the individual the ultimate degree of "power and depth" in shaping this future (Kurzweil 1999, 153). Human technology is for him the medium by which human mind can be liberated from its bondage within an ever-decaying body. Evolution is the means by which pure spirit is freed into the cosmos.

Although *The Age of Spiritual Machines* was written more than six years ago, Kurzweil still maintains his commitment to this vision of the postbiological future. In his recent work, *The Fantastic Voyage*, Kurzweil frames his futurological speculations within easily applicable common-sense health

practices aimed at assisting the living to survive until the day when spiritual machines are able to host human minds. The book lays out a holistic strategy of diet, weight loss, and smart lifestyle choices that can extend human life until "radical life-extension" technologies become available. For Kurzweil, wise "lifestyle choices will maximise" one's ability to live long enough to "take full advantage of the radical life-extending therapies that lie just ahead" (Kurzweil and Grossman 2004, 260).

Conclusion

The foregoing examples from posthuman speculative science can be criticized on a variety of grounds—technical, sociopolitical, psychological, biological, and philosophical (de Mul 2003, 247; Fukuyama 2003, 168). With regard to theology, we have noted three principal mistakes made by posthuman speculative science: (1) a positivistic certainty in the future abilities of information technology to facilitate a techno-theological eschatology; (2) an uncritical acceptance of the myth of technology and technological progress; and (3) the view that technology, as myth, can facilitate ultimate concern. The problem underlying these three principal errors is the elevation of the individual's life over the life of others. The belief in radical life extension within posthuman speculative science is an active denial of death, which reveals what is an ultimately self-centered enterprise. As Francis Fukuyama notes, "A person who has not confronted suffering or death has no depth. Our ability to experience these emotions is what connects us potentially to all other human beings, both living and dead" (2003, 173).

According to Elaine Graham, posthuman thinkers pursue through technology what can be characterized as the "technological sublime," which is rooted in a "fear of contingency and finitude." Although posthumanism may appear to seek after the transcendent in a manner that is akin to Christian eschatology, the posthuman agenda is always channelled through human materiality and never allowed to constructively emerge as an authentic source of hope. Rather than authentic transcendence, the futurological emphasis of posthuman speculative science is ultimately unable to escape the world within which it is situated. The attempt to engage technology in transcendental purposes fails to situate human technology or "human energies" in the productive "activity of world-building" (Graham 2002, 17).

A final question to be explored here is how the myth of this technological eschatology contrasts with Christian eschatology. The final written words of Dietrich Bonhoeffer, "This is the end—for me the beginning of life" (1967, 225), reflect the mysterious relationship of Christian eschatology to the reality of personal death. Death is not something to be scorned, rejected, or postponed for an indefinite amount of time. As Bonhoeffer intimates, the Christian reaction to death is one of victory over death. Pauline eschatology hails the mystery of imperishability for those in Christ for whom "Death has been swallowed up in victory" (1 Corinthians 15:55).

Posthuman eschatological hopes are at best for a radical extension of life. Yet the postponement of death is quite different from the idea of death being conquered, or vanquished, as a whole. Paul's language of victory over death is saturated with christological overtones. Death is made impotent because it has been conquered by Christ's own movement through death to resurrection. It is by following Christ's example that Paul admonishes his readers to be confident in their own fate through death. Indeed, for the Christian the avoidance of death is tantamount to an avoidance of salvation. At the end of posthuman life extension, death postponed still awaits its claim. Christian eschatology paradoxically calls death a defeated foe and embraces death as the transition into life eternal, as it is the symbolic means by which eternity is realized through the resurrection of the body. Unlike the Hebrew Bible, which lauds mythic longevity as a sign of divine blessing (such as Methuselah in Genesis 5, who is said to have lived for over nine hundred years), Christianity needs death for the transformation that is a transfiguration of the fleshly body. It is hubris and an obsession with the present that encourages posthuman speculative science to avoid death at all costs.

Technology, when allowed to become the normative force by which humanity understands itself and its destiny, distorts the humanist or religious pursuit of the good. Despite claims reflecting a hope for a future improved by technology, the posthuman ideology has more to do with a drive toward technological conversion—bespeaking the acceptance of a technological worldview—than it does with actual physical transformation. For theology, it represents a contradicting theological model that reinterprets the message of salvation that traditionally has been offered to humanity in other more explicitly mythological (or religious) forms. According to N. Katherine Hayles, "People become posthuman because they think they are posthuman" (1999, 6).

Rather than denying the technologies that make posthuman rhetoric possible, society must embrace "the possibilities of information technology without being seduced by the fantasies of unlimited power and disembodied immortality" (Hayles 1999, 5). As such, the place of technology must be grounded in life lived in community and governed by shared narratives and common values. The posthuman drive to undermine finitude as a defining characteristic of human life undermines present humanity for the sake of a distant posthumanity.

For theology, a productive engagement with technology starts with a move away from the blind faith in the posthuman myth of unceasing technological progress and toward a hermeneutics of technology that centers on a concern for a technology's appropriateness. This indicates a transition away from the techno-theology of IT culture and toward a theology of technology that roots technology in the symbols of faith, with a keen awareness of human fallenness.

NOTES

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1. Such technological essentialism can trace its postwar lineage back to Martin Heidegger's "The Question concerning Technology" (1993), Jacques Ellul's *The Technological Society* (1965), and even Albert Borgmann's *Technology and the Character of Contemporary Life* (1984). In these three examples, technology is characterized by a determining and dominating essence that controls the culture in which it is operated. An essentialist philosophy of technology curtails any hope for redemptive engagement with technologies, as the reified Technology is removed from particular representations in individual technologies, the very location from which one could constructively approach an ethics of technological practices.
2. Compare the demand for signs by the Pharisees in Mark 8:11–12 with the signs of false messiahs (Mark 13:22) and the sign of the betrayer (Mark 14:44). Contrast this with the signs of the kingdom given to the believers (Mark 16:17) and intelligible by believers (Mark 16:20).
3. Note the privileged place of computational models of information in Tom Stonier, *Beyond Information* (1992); the computational models of consciousness advocated by Marvin Minsky in *The Society of Mind* (1986); and, similarly, the component model of consciousness in Daniel C. Dennett's *Consciousness Explained* (1991).
4. Apart from Andrew Crumey's *Mobius Dick* (2004), which teases out the implications of such an outlandish claim.
5. See Moravec's work with the SEEGRID corporation at *http://www.seegrid.com/pages/about.html*. In particular, Moravec's efforts to develop three-dimensional navigation in automated mobile robotics has most recently explored the problems associated with color perception in the artificial eye (Moravec 2001).
6. Subjective immortality is distinct from objective immortality in Tipler, because he distinguishes between the real time of the cosmos and the subjective time experienced by the living. The former is bound by the cosmic horizon of the Omega Point, whereas the latter is bound only by the internal facilities of an information-processing device. Thus, cosmic subjective immortality exists when the mind is installed within a medium that is sufficiently robust to generate apparently endless experiences of subject temporality, which Tipler sees as being possible if the mind is instantiated within the fabric of the cosmos itself, at Omega Point (Tipler 1994, 138).
7. Kurzweil developed the first print-to-speech reading device using optical character recognition (OCR), the first character-recognizing flatbed scanner, the first text-to-speech synthesizer, the first music synthesizer capable of recreating the grand piano and other orchestral instruments, and the first commercially viable speech-recognition device. His foresight and innovation have earned him many awards and honors, including the Lemelson-MIT Prize, the world's largest award in invention and innovation; the 1999 National Medal of Technology, the United States's highest honor in technology; the 1994 Dickson Prize (Carnegie Mellon University's top science prize); Engineer of the Year from *Design News*; Inventor of the Year from M.I.T.; and the Grace Murray Hopper Award from the Association for Computing Machinery.

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