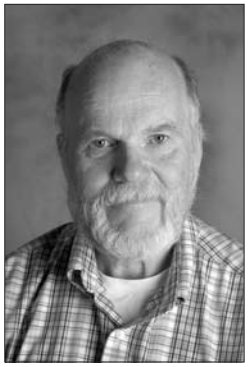
Artificial Intelligence and the Soul

Russell C. Bjork



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The view that there is an inherent theological conflict between strong artificial intelligence, on the one hand, and biblical teaching regarding the origin of the soul, human worth, and humanity being created in the image of God, on the other hand, is examined and shown to be ill-founded. Christian theology, therefore, has no stake in the claim that the possibility of technological accomplishments in this area is inherently limited. Consideration is also given to how a biblical understanding of human personhood can inform work in artificial intelligence.

"Finally, and most elusively, we are learning something about consciousness itself ... If we can identify that cognitive kernel, can we one day endow a machine with it? ... Human beings have always been brash enough to ask such questions but lacked the necessary gifts to answer them. At last, we are acquiring that ability ..." So ended the introduction to a special section in a recent issue of *Time* titled "A User's Guide to the Brain."[1]

For many years, thinkers have speculated about creating an artifact that deserves to be called a person. Moreover, intelligent robots or androids of various sorts have been prominent in works of popular culture (e.g., Commander Data of *Star Trek: The Next Generation*, R2D2 or C3PO of *Star Wars*, Andrew Martin of the Isaac Asimov short story which was later turned into the film *The Bicentennial Man,* or David of *Artificial Intelligence*). Is creation of such an artifact theoretically possible? Certainly there are many today who believe this to be the case. For example, Rodney Brooks, the director of the Computer Science and Artificial Intelligence Laboratory at MIT, claims that "the question then is when, not if, we will build self-reproducing intelligent robots."[2] However, some Christians have seen this possibility as contradicting Christian doctrines concerning humanity, such as the nature of the soul or humans being made in the image of God. As one writer put it, "I fully grant that my theology would crumble with the advent of intelligent machines."[3]

Is there an inherent conflict between biblical teaching and the idea of an intelligent artifact? Or is it rather the case that Christian theology has something to say about how one might approach such a goal? Note that these are phrased as theological questions, not technological ones. No existing systems even come close to the kind of intelligence displayed by, say, Commander Data, and there is no hard evidence that such a system will exist in the near future, if ever. But one who believes in this possibility can legitimately point to a long history of technologies that we take for granted today, that were once believed to be impossible. The question I wish to address here is whether Christian theology has any necessary stake in the impossibility of creating an artifact that deserves to be called a person, on the one hand, or has anything to say about how one might pursue such an objective, on the other hand. In particular, I want to address three issues:

1. Is there a conflict between artificial intelligence and biblical teaching about the origin of the human soul?
2. Is there a conflict between artificial intelligence and biblical teaching about human worth or our being created in the image of God?

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3. Does biblical teaching about human personhood have any implications for work in artificial intelligence?

First, though, we need to look at a preliminary question: what do we mean by the phrase "artificial intelligence"?

What Do We Mean by "Artificial Intelligence"?

With the invention of the digital computer, the idea of creating intelligent artifacts moved from the realm of fiction into actual research programs, often referred to as "artificial intelligence." However, different writers use this phrase with a wide variety of meanings, both with regard to goals and basic methodology. (Indeed, the author of one undergraduate textbook speaks of the "paradoxical notion of a field of study whose major goals include its own definition."[4]) In regard to goals, the term is used in two quite different ways.

Sometimes, "artificial intelligence" is used of processes that achieve the same results as human intelligence (or even better results) in a *specific* domain. (This is sometimes called "weak AI"). An old, but oft-quoted, definition that reflects this is "the science of making machines do things which would require intelligence if done by men."[5] For example, Deep Blue—the chess-playing program that defeated world chess champion Gary Kasparov in 1997 (by a score of 3.5 to 2.5 in a six-game match)—made use of heuristic knowledge of board situations from a library of master games played by human experts, coupled with sophisticated look-ahead strategies. Further work in this area could well result in systems that no human can ever beat.[6] The armies in *The Lord of the Rings: The Return of the King* were animated using software agents to generate the individual warriors. Many banks and other lenders use automated credit-scoring applications to evaluate prospective borrowers. Such systems, while very effective in their domain, are useless outside it—e.g., the agents used for animating *The Lord of the Rings* cannot play chess or score credit applications.

On the other hand, "artificial intelligence" is sometimes used in a broad sense, to refer to the goal of creating artifacts that are intelligent (and hence even self-conscious persons) just as we humans are—e.g., like the science fiction robots and androids listed earlier. (Sometimes this is called "strong AI"). While some artificial intelligence researchers see work on weak AI as generating insights which will ultimately lead to achieving strong AI, other researchers are quite happy to devote their attention to the former without any commitment to the latter.[7]

While work on weak AI can raise significant ethical issues related to the appropriateness of entrusting certain tasks to machines, it is strong AI that raises issues related to the essential nature of humanity, the focus of this article. To make this clear, I will sometimes use the word "person" instead of the words "intelligent" or "human." "Intelligent" lends itself to multiple interpretations, and also seems to be applicable (at least to some extent) to animals. "Human" is too restrictive—the Christian faith acknowledges the existence of persons who are not human (e.g., God and the angels).[8] Of course, the term "person" itself needs definition. I will use the term in the sense of Lynne Rudder Baker's definition: "What makes a human person a person is the capacity to have a first-person perspective."[9] She elsewhere defines this as "a perspective from which one thinks of oneself as an individual facing a world, as a subject distinct from everything else," and goes on to argue that "all sentient beings are subjects of experience (i.e., are conscious), but not all sentient beings have first-person concepts of themselves. Only those who do—those with first-person perspectives—are fully self-conscious."[10]

Artificial Intelligence and the Origin of the Soul

That Christian doctrine and artificial intelligence might conflict has been part of the discussion from the outset. The earliest paper[11] to espouse what we now call "artificial intelligence" (though it did not actually use this phrase) was Alan Turing's "Computing Machinery and Intelligence." Turing devoted much of the paper to addressing various objections to the idea of "thinking machines," of which the first is what he called "The Theological Objection":

> Thinking is a function of man's immortal soul. God has given an immortal soul to every man and woman, but not to any other animal or to machines. Hence no animal or machine can think.[12]

This view was not Turing's (He explicitly stated, "I am unable to accept any part of this."); rather, he was attempting to state and respond to an objection to his thesis that he assumed others would have.[13]

This objection does not really concern the *nature* of the soul,[14] but rather the *origin* of the soul. It considers God's creative acts to be of two kinds—material and immaterial. Technology has access only to what belongs in the realm of the former, but human personhood involves an immaterial component that only God could create. If this overall understanding is correct, then there would appear to be a conflict between biblical teaching and technological efforts to create an artifact that can rightly be called a person. Is this, however, an accurate understanding of biblical teaching?

The creation of humanity is described in Gen. 2:7 (KJV): "And the LORD God formed man of the dust of the ground, and breathed into his nostrils the breath of life (*neshamah hayim*); and man became a living soul (*nephesh*

hayah)." Many Christians understand this to speak of what are, in effect, two separate creative acts by God[15]: first, God formed man's body; and then—separately—God created man's soul (understood as an immaterial component part of humans, "an immortal though created essence, which is [man's] nobler part"[16]). On this view, the former is seen as physical—perhaps an immediate act of God or perhaps a process mediated through a mechanism such as evolution by natural selection—but the latter is seen as involving a divine act that lies outside the material realm.

However, this does not seem to be what the text actually says. It does not say that God made man's *body* of dust. It says he made *man* of dust. Neither is the "breath of life" something immaterial which sets humanity apart from animals. When the phrase *neshamah hayim* next occurs (in Gen. 7:22), it explicitly refers to all creatures (both humans and beast) drowned by the flood, describing them as those who had "the breath of life." Moreover, the text does not say that man "received" a living soul, but rather "became" a living soul—which seems better understood as meaning a living organism that has animate life rather than as an immaterial substance which sets humans apart from other creatures. (It does not make sense to say that man "*became* an immaterial substance"; moreover it is not clear that *nephesh* ever has the latter meaning.[17]) In the first two chapters of Genesis, *nephesh hayah* is used a total of six times; in the remaining occurrences (1:20, 21, 24, 30; 2:19), it explicitly refers to nonhuman creatures. (Indeed, many newer translations translate *nephesh hayah* in Gen. 2:7 with a phrase like "living being" for this reason.) In order to read this text as teaching two kinds of divine creative acts, one must implicitly substitute words that are not there for those that appear—e.g., "man's body" instead of "man," "immaterial soul" instead of "breath of (physical) life," "received" in place of "became," and "immaterial soul" in place of "living (animate) being." We will return later to the crucial point of the text: what makes humans special is not what humanity *is*, but rather it is God's *relationship* to us based on his purpose for making us.

An attractive alternative is to understand the immaterial aspect of humans (personhood) as an emergent phenomenon: personhood emerges from the interaction of the neurons in the brain. While this is certainly not the historical understanding (nor could it be, given that knowledge of the workings of the brain is fairly recent), it is not at all inconsistent with the silence of Scripture as to the details of exactly *how* God created a race of beings in his image. A Christian who holds an emergent view of personhood affirms the reality of God's creatorship of persons—in much the same way that he or she affirms the reality of God's ultimate responsibility for both the origin and day-to-day functioning of other aspects of the universe God created, even while affirming the reality of secondary causes.

Emergence is a phenomenon that has been observed in many complex systems. Such systems often have properties that cannot be reduced to the properties of the underlying parts, and which can have a causal influence on the underlying parts. For example, the behavior of flocks of birds or colonies of ants emerges from the behavior of the individual birds or ants, though it cannot be predicted from even a very detailed knowledge of an individual, and the behavior of individuals is shaped, in part, by the behavior of the whole. William Hasker presents the idea as follows:

> The human mind is produced by the human brain and is not a separate element "added to" the brain from outside. This leads to the further conclusion that mental properties are "emergent" in the following sense: they are properties that manifest themselves when appropriate material constituents are placed in special, highly complex relationships, but these properties are not observable in simpler configurations nor are they derivable from the laws which describe the properties of matter as it behaves in these simpler configurations.[18]

Emergence may, at first glance, seem almost mystical, but similar phenomena have been observed at many places in nature. Moreover, if one holds instead that human beings consist of two substances having separate origins, then it is difficult to account for the observed strong dependence of the hypothesized immaterial mind on the material brain—e.g., the fact that brain injuries and diseases such as Alzheimer's can totally disrupt the functioning of the mind, or even the fact that consciousness seems to cease temporarily during sleep or under anesthesia. How does an immaterial substance whose origin is separate from that of the body become so dependent on it?

Interestingly, while emergence does not *require* traditional body-soul dualism, it is compatible with both dualistic and nondualistic understandings of the nature of humanity. For example, William Hasker is a dualist, and calls his view "emergent dualism" (which he differentiates from traditional substance dualism in terms of its account of the origin of the immaterial aspect of humanity). However, other writers who hold to emergence hold nondualistic views such as nonreductive physicalism.[19]

Body-soul dualists sometimes allege that the Christian hope of eternal life requires dualism.[20] While I do not believe this contention to be valid, it is not an issue here. Emergence and Christian hope are really addressing two totally different questions—the *origin* of human persons, on the one hand, and the *destiny* of human persons, on the other. Moreover, emergence does not necessarily preclude dualism.[21]

Of course, Gen. 2:7 speaks only of the creation of the first man. Those who understand it as describing two

separate creative acts by God have generally understood the origin of the souls of Adam's descendants in terms of either (soul) creationism[22] or traducianism. Soul creationism is the view that God separately creates the soul of each individual at conception (or, in some variants, somewhat later)—thus repeating for each individual what he did for Adam. (This appears to be the view that Turing had in mind.) Traducianism is the view that the soul God created for Adam (though immaterial) is propagated to his descendants at the same time that the body is propagated, in conjunction with conception, but in a way that is otherwise left unexplained. (Though soul creationism is the more common view, to this day both views enjoy significant support from systematic theologians.)

How does the evidence for emergence compare with that for soul creationism and traducianism? There is no direct biblical teaching on the subject. Sometimes soul creationists argue for their position based on texts which teach that God is the creator of the human spirit.[23] However, as Augustine pointed out, Scripture also teaches that "God gives men their bodies ... although no one doubts that the said bodies are given, made, and formed by him by seminal propagation."[24] Thus, support for any view largely comes indirectly, by way of inferences from other doctrines.

Soul creationists argue that an immaterial soul is incompatible with the traducian view of propagation of the soul in conjunction with the material act of conception. However, this is not an argument against emergence, since—even in its dualistic form—emergence holds that the soul emerges some time after the body (which is purely material) begins to develop.

Emergence is actually quite similar to traducianism, in that both hold that our soul (personhood) derives from the soul (personhood) of our parents, and is propagated in conjunction with the generation of our bodies. Thus, the key argument that has historically been put forth in favor of traducianism also turns out to be an argument for emergence: the universality of human sin among the descendants of Adam conceived in the ordinary way. This is difficult to explain if each person has a soul separately created by God. A. H. Strong, in arguing for traducianism, presents this as follows:

> [Soul creationism] if it allows that the soul is originally possessed of depraved tendencies, makes God the direct author of moral evil; if it holds the soul to have been created pure, it makes God indirectly the author of moral evil, by teaching that he puts this pure soul into a body which will inevitably corrupt it.[25]

Traducianism and emergence differ sharply on how they account for the origin of the soul (personhood) of Adam. The account offered by emergence is preferable if the interpretation of Gen. 2:7 given above is correct. Emergence also offers an explanation as to how propagation of personhood takes place, something with which traducianism has difficulty since it must account for the propagation of an immaterial soul through a material act. Finally, emergence easily handles a challenge for traducianism (and actually for soul creationism as well): it accounts for the phenomenon of identical twins. Though twins are distinct persons, they are conceived as a single embryo, which splits at some point after conception. This necessitates either two souls being generated, or the one soul splitting when the embryo does. Emergence has no problem with this, since the separation occurs long before the development of personhood (the capability for a first-person perspective).

Historically, while some theologians have been insistent about a particular view of the soul's origin, others have been more reticent. Augustine—the church father who considered this question more thoroughly than any other—refused to the end of his days to commit to either soul creationism or traducianism[26] and stated that "I have therefore found nothing certain about the origin of the soul in the canonical Scriptures"[27]—a position echoed by more recent theologians as well.[28] This is not to argue that those who have been reticent to commit to one of the earlier views would recognize emergence as "the answer"—rather, it is to say that the question is one where the paucity of biblical teaching implies a need for cautious openness and calls into question "the supposed dichotomy of substances in man in its relation to the biblical picture of man."[29]

It does seem theologically plausible, then, to hold that personhood emerges from the (physical) interaction of neurons in the brain. Such a view is consistent both with the holistic tenor of Scripture and with empirical evidence for continuity among living creatures and for mind-brain interdependence. If this is the case, then there would not seem to be—in principle—a *theological* reason why personhood could not emerge in similar fashion from the operation of a sufficiently complex technological artifact. (This, of course, is not the same as saying that such an accomplishment is technically possible, or, if so, when it might occur.)

Artificial Intelligence, Human Worth, and the Image of God

Should achievements in artificial intelligence impact our worth as persons? Historically, even before the era of computers, whenever a technological artifact has been able to surpass humans, people have seen this as a challenge to human worth.[30] Today, when computers routinely outperform humans in many tasks, people often take comfort in the fact that a computer is "only a machine." For example,

after losing to Deep Blue in 1997, Gary Kasparov was "rather gleeful that despite its win, it did not enjoy winning or gain any satisfaction from it."[31] What if an artifact were to exist that made this comfort ring hollow?

An answer to this question hinges on how we understand the relationship between human worth, on the one hand, and a belief that the human constitution is fundamentally unique, on the other hand. When human worth is tied to human constitutional uniqueness, the possibility of strong AI seems to pose a serious threat to one of our most cherished concepts. Indeed, some have argued that developments in this area constitute the final blow to the notion of human specialness. First, they claim, Copernicus and those who followed showed that our physical place in the universe is not special; then, Darwin and those who followed showed that our physical bodies are not special; finally, discoveries concerning animal intelligence along with artificial intelligence are showing that even our minds are not truly special.[32] There are several possible responses to this.

One possible response is a form of denial: humans are special, and, therefore, whatever challenges this cannot possibly be true.[33] At this point in time, actual achievements in the realm of artificial intelligence appear to leave that possibility open. The writer whom I quoted at the beginning of this paper, for example, goes on to say "without such (intelligent) machines on the horizon, I feel safe in my 'archaic' theology."[34] This statement was written over fifteen years ago, yet is no less true today. But it is not at all clear that this is a viable position in the long run. Moreover, even without artificial intelligence, study of animal behavior has shown that some (limited) aspects of intelligence, consciousness, and emotion may also be present in nonhuman animals.

A second possible response is to accept the data as implying that humans are actually not special. Instead, we are simply biological machines, and the fact that we are rational and conscious and have emotions constitutes a proof that machines can be rational, etc.—because we are.[35] Living consistently with this perspective, however, is easier said than done. Some who are committed to the possibility of artificial persons deal with this by compartmentalizing their scientific and personal lives. For example, Rodney Brooks wrote:

> On the one hand, I believe myself and my children all to be machines. Automatons at large in the universe. Every person I meet is also a machine—a bag of biochemicals interacting according to describable and knowable rules. When I look at my children I can, when I force myself, understand them in this way. I can see that they are machines interacting with the world. But this is not how I treat them. I treat them in a very special way, and I interact with them on an entirely different level. They have my unconditional love, the furthest one might be able to get from rational analysis. Like a religious scientist, I maintain two sets of inconsistent beliefs and act on each of them in different circumstances.[36]

What makes humans special is not what humanity is, *but rather it is God's* relationship *to us based on his purpose for making us.*

A third possibility, however, is to recognize that constitutional uniqueness and value are really two very different things. That is, the proposition "if humans are not somehow constitutionally unique, then they don't have worth" is not actually a true statement. The account in Gen. 2:7 describes God as involved in a very intimate way with the origin of humanity—of no other creature is it said that "God breathed into [its] nostrils the breath of life." Only after creating man and woman did God pronounce that his creation was not just good, but "very good." We naturally look for something in the way we are made that answers the question of why God values us. However, the same language used in Gen. 2:7 is also used with regard to animals elsewhere in Genesis, and biologically, humans are very similar to other organisms, even at the DNA level.[37] Many writers feel (and I concur), that human worth has more to do with our *purpose* (our relationship to God and what God intends us to *be* and *do*), rather than our constitution (what we *are*). Our constitution is not what makes us special; rather, it is necessary so that we can be special.

For Christians, a further question arises: should artifacts that exhibit genuine personhood some day exist, what would this mean for the Christian understanding of humanity as having been created in the image of God? The suggestion that fallen humans might create something that is actually in the image of God seems idolatrous (for good reasons, I think).[38] But, is it necessarily the case that creating a technological artifact that deserves to be called a person is tantamount to creating an artifact that is in the image of God?

The answer to this question hinges on the relationship between rational personhood and being in the image of God. The meaning of "the image of God" has been debated for centuries, and it is not my purpose here to

argue for a particular view. For the purposes of this paper, there are three possibilities: rational personhood (in particular, the mind) *is* (all or part of) the divine image;[39] being in the divine image is something else, though it may *require* rational personhood; or there is no connection between the two concepts. Of course, if rationality is all or part of the divine image, then the possibility of strong artificial intelligence implies that technology can produce artifacts that are in the image of God (which seems idolatrous). This, in turn, suggests that the production of such an artifact must not be possible, or at least not legitimate. However, if the divine image is to be understood in some other way (as many theologians contend), then there is no logical conflict between strong artificial intelligence and the doctrine of the image of God. In particular, one can certainly hold that "being created in the divine image requires (and hence implies) being rational" without holding the converse: "being rational implies being created in the divine image," just as one can hold that "all humans are mortal" without holding that "all mortals are human" (an obvious falsehood unless one contends that all animals are human).

This having been said, suppose technology were able to create artificial persons that are equal to (or even, in some cases, surpass) humans in rational powers. Suppose, further, that God were to choose to provide redemption for these persons[40] and that, as a result, they would be able to enter into a personal relationship with God that is no less real than that which we humans can experience, accompanied by a divine promise akin to the Christian hope. Suppose these persons were partners with us in exercising dominion over the earth, and could also manifest something of the divine character. Would even this nullify the worth of human beings? Why? (I offer this as a form of philosophical thought experiment, without at all suggesting that something like this will occur!)

Most of us who are parents have, at some time, addressed the child's question "Why do you love me?" Those of us who have multiple children have perhaps also addressed the older child's (verbalized or unverbalized) question about the birth of a sibling, "Will you love me less because you love my brother/sister?" The psalmist asked a question similar to the first: "What is man that you are mindful of him, the son of man that you care for him? You made him a little lower than the heavenly beings, and crowned him with glory and honor" (Ps. 8:4–5). Interestingly, though, the psalm never provides an answer to this question. Could this be because it has no answer that is *intrinsic* to us?

If, in the end, our value to God is not based on anything intrinsic to us, then the fear that artificial persons might somehow undermine our value as humans really represents a fundamental misunderstanding of biblical teaching. Of course, this also means that our worth as human beings cannot be understood without reference to our Creator. The existence of artificial persons might seriously undermine attempts to ground human worth in our intrinsic nature, apart from our value to God. But is this a bad thing? Perhaps technology, while seeming at times to lessen our need to depend on God, actually is having the opposite effect of showing us just how much we need him for our ultimate worth and purpose. Thus, though a secular form of humanism might indeed be threatened by the notion of artificial intelligence, a Christian form should not be.

Implications of a Biblical View of Personhood for Work in Artificial Intelligence

What ramifications, if any, does a biblical understanding of personhood have for work in artificial intelligence? Were it the case that there were a *theological* conflict between biblical teaching and the notion of strong AI or that strong AI were to constitute a threat to humanity's place in God's creation, then the answer might well be that Christians should confine their work to weak AI and steer clear of anything smacking of strong AI. This, of course, would raise the issue of where one draws the line. However, I have argued that neither of these is the case—i.e., there is no need to draw a *theological* line separating the doable from the not-doable (though the *ethical* ramifications of proposed applications would still need to be considered carefully). Given that no such line is called for, what does a biblical view of personhood have to say about work in artificial intelligence?

Much of the early work in artificial intelligence assumed that intelligence can be abstracted from implementation—what John Haugeland called GOFAI ("Good Old Fashioned Artificial Intelligence"[41]) or what others have called "symbolic AI." GOFAI claims that intelligence *is* symbolic computation; hence, it is possible, in principle, to implement intelligent processes (of "the same scope … as human action") in any sufficiently powerful physical symbol system, including, in particular, a human brain or a digital computer.[42] Workers in symbolic AI have tended to focus on problems that require high-level human intelligence (e.g., playing chess, or expert performance in a domain such as medicine). While many such problems have yielded to this approach, everyday acts that we take for granted (e.g., distinguishing visually between a dog and a cat), or even things that "unintelligent" animals do routinely (e.g., moving around in a complex world), have proven intractable for symbolic AI.

In the past few decades, several other approaches have developed alongside symbolic AI. Connectionism (with roots that precede the digital computer) builds simulated neural networks that resemble the interconnection of the neurons in the brain.[43] Genetic computing evolves pro-

grams using mechanisms modeled after biological evolution. Behavior-based robotics seeks to build systems that behave intelligently in the real world by directly coupling perception and action. Rodney Brooks, the originator of this approach, characterizes it in terms of two key ideas: "Situatedness: The robots are situated in the world, they do not deal with abstract descriptions" and "Embodiment: The robots have bodies and experience the world directly."[44]

The Bible portrays humans as part of God's creation—the pinnacle of it, yes, but not in any sense, outside of it. In fact, Gen. 2:7 says that God formed us from the "dust of the ground," and the Bible sometimes speaks of humans as "dust" (Gen. 3:19; Ps. 103:14). God did not create abstract intelligence—he created physical brains, evidently using an evolutionary process, which incorporates features that closely resemble those in the brains of lower creatures. Approaches such as connectionism, genetic computing, and behavior-based robotics seem more in line with this than symbolic AI's view of intelligence as something abstract. (In fact, the latter more closely resembles Platonic dualism than biblical holism.) This is not at all to minimize the value of symbolic AI techniques for weak AI problems that have a strong symbolic component—often ones involving "higher" intelligence such as symbolic mathematics, "expert systems," natural language processing, or games like chess. But, in many areas, principles like those espoused by Brooks appear to be a better match to the biblical concept of personhood.

Moving beyond our origin, Genesis 3 makes it clear that we are not as God created us to be, and that death is a consequence of our sin. Genesis 3:15 introduces—and the rest of Scripture describes—God's plan for our redemption and restoration to eternal fellowship with him. It is possible, however, for work in artificial intelligence to be seen as an alternative to the hope revealed in Scripture. Hans Moravec and Ray Kurzweil, for example, contend that the very near future will see intelligent machines whose mental powers vastly exceed those of biological humans, and whose powers will allow the solving of problems that have long plagued humanity.[45] Their works portray what amounts to an anticipated technological deliverance for the human race through what Moravec calls our "mind children." But Scripture insistently warns against idolatry, which basically involves looking to someone/thing other than our Creator to meet one's needs. Isaiah rightly mocks those who look to the works of their own hands to save them (Isa. 44:16–20). Would superintelligent computers produced by our own hands really be the ultimate answer to the problems of humanity? Human history certainly suggests otherwise! Moreover, Moravec and Kurzweil argue that robotic technology might endow us with personal immortality. Here the goal is not so much to produce independent intelligences as to produce virtual brains into which a human's personality can be "uploaded," which, in conjunction with making backup copies periodically, will render a person immune to death by accident, disease, or old age.[46] In contrast, the closing verses of Genesis 3 portray fallen man as being driven out of the Garden of Eden, because "He must not be allowed to reach out his hand and take from the tree of life and eat, and live forever" (Gen. 3:22). This is ultimately for our good, since an eternity in our fallen condition would quite literally be hell. (It is worth noting that, though Moravec and Kurzweil are highly respected and prolific researchers, their views are hardly representative of the mainstream of the AI community.[47])

As is true throughout the sciences, work in artificial intelligence can be wrongly motivated, but it can also represent a very legitimate part of humanity's fulfillment of the cultural mandate (Gen.1:28) through enhanced understanding of the greatest marvel of God's creation: human beings. There is no inherent theological conflict between a biblical view of personhood and work in artificial intelligence, nor would successes in this field undermine human value or the doctrine of the image of God. This having been said, a realistic assessment of what has been accomplished to date suggests avoiding grandiose projections of what will be achieved in the near future (a temptation to which workers in this field have often yielded). We need to approach this area with an attitude of great caution and even reverence, for, as Scripture says, we are "fearfully and wonderfully made" (Ps. 139:14). ✦

Notes

[1]"The New Map of the Brain"—Introduction to special section titled "A User's Guide to the Brain," *Time* 169, no. 5 (January 29, 2007): 57.

[2]Rodney A. Brooks, *Flesh and Machine* (New York: Pantheon, 2002), 209.

[3]William Dembski, "Conflating Matter and Mind," *Perspectives on Science and Christian Faith* 43, no. 2 (June 1991): 109.

[4]George Luger, *Artificial Intelligence: Structures and Strategies for Complex Problem Solving*, 5th ed. (Reading, MA: Addison-Wesley, 2005), 2.

[5]Marvin Minsky, *Semantic Information Processing* (Cambridge, MA: The MIT Press, 1968), v.

[6]Murray S. Campbell, "An Enjoyable Game" in David G. Stork, ed., *HAL's Legacy: 2001's Computer as Dream and Reality* (Cambridge, MA: The MIT Press, 1997), 94. It appears, though, that Deep Blue's success has led to a loss of interest in further development of high-power chess-playing programs.

[7]Roger Schank, "I'm sorry, Dave, I'm afraid I can't do that," in Stork, ed., *HAL's Legacy*, 189.

[8]Of course, to say that there are persons who are not humans is not the same as to say that there are humans who are not persons. This is not what I am saying here!

[9]Lynne Rudder Baker, *Persons and Bodies: A Constitution View* (Cambridge: Cambridge University Press, 2000), 91.

[10]Ibid., 60. Baker goes on to distinguish between "weak first-person phenomena" (which higher nonhuman animals can experience) and "strong first-person phenomena" (which are essential for a full self-consciousness and a first-person perspective).

[11]Intelligent artifacts had appeared earlier in science fiction, but this was the first formal paper to discuss the idea.

[12]A. M. Turing, "Computing Machinery and Intelligence," *Mind* 59 (October 1950): 433–60. This article has been reprinted numerous

times; the quotations here are from Margaret Boden, ed., *The Philosophy of Artificial Intelligence* (Oxford: Oxford University Press, 1990), 49. Turing's attempt to answer this objection on its own terms—by asserting that an omnipotent God could give a soul to whatever he chooses to (including a machine)—would probably be unconvincing to a person who holds the view of the soul underlying this objection.

[13]Ibid.

[14]The word "soul" is understood in a wide variety of ways, and the range of meanings of the English word and of the Hebrew (*nephesh*) and Greek (*psuche*) terms commonly translated as "soul" are all different. One meaning—which is the sense in which I will generally use the term here—is to speak of a person, understood in a holistic way, though with particular emphasis on the inward side of life (intellect and emotions), sometimes as a virtual synonym for "self" or the personal pronoun "I." See the discussions by Hans Walter Wolff, *Anthropology of the Old Testament* (Philadelphia: Fortress, 1974), 10–25, for *nephesh*, and by Gunther Harder in Colin Brown, ed., *The New International Dictionary of New Testament Theology*, vol. 3 (Grand Rapids: Zondervan, 1978), 682–6, for *psuche*. The difference between the common meaning of the English word "soul" and that of the ancient words has led some writers to avoid the use of the word "soul" altogether. For example, see Nancey Murphy, *Bodies and Souls, or Spirited Bodies?* (Cambridge, England: Cambridge University Press, 2006), 1. Kevin Corcoran has titled his most recent book, *Rethinking Human Nature: A Christian Materialist Alternative to the Soul* (Grand Rapids: Baker, 2006).

[15]For example, Louis Berkhof, *Systematic Theology* (Grand Rapids: Eerdmans, 1939), 183.

[16]John Calvin, *Institutes of the Christian Religion* 1, trans. Henry Beveridge (reprint, Grand Rapids: Eerdmans, 1979), Book I, chap. 15, section 2 , p. 160 in translation.

[17]Hans Walter Wolff writes: "We must not fail to observe that *n.* is never given the meaning of an indestructible core of being, in contradistinction to the physical life, and even capable of living when cut off from that life," *Anthropology of the Old Testament* (Philadelphia: Fortress, 1974), 20. Even a writer such as John Cooper, writing in defense of a form of body-soul dualism, affirms that Wolff's analysis of Hebrew anthropological terms is "virtually undisputed among scholars of various theological persuasions," though he later claims that "holding that *nephesh* occasionally refers to human beings who have died is certainly possible, if not demonstrable, on the basis of Old Testament scholarship. It cannot be certified, but neither can it be discounted." John Cooper, *Body, Soul, and Survival* (Grand Rapids: Eerdmans, 1989), 38–9, 61.

[18]William Hasker, *The Emergent Self* (Ithaca, NY: Cornell University Press, 1999), 189–90.

[19]This view is developed in Warren S. Brown, Nancey Murphy, and H. Newton Malony, *Whatever Happened to the Soul?* (Minneapolis: Fortress, 1998). Murphy explicitly calls consciousness an emergent property on p. 131.

[20]A very thorough statement of this position is given by John W. Cooper, *Body, Soul and Life Everlasting* (Grand Rapids: Eerdmans, 1989).

[21]In his preface to the second printing of his book, Cooper specifically addresses emergentism of the sort proposed by Hasker saying: "Although I still have reservations about it, I think that emergentism, if philosophically tenable, could offer a materialistic philosophy of human nature that is consistent with the traditional Christian doctrine of the afterlife" (Preface to the second printing, page xx).

[22]Systematic theologies typically refer to this view simply as "creationism," but I will use the qualified term "soul creationism" to avoid confusion with other, distinct ways in which the term is used in discussions of origins.

[23]E.g., Eccl. 12:7; Isa. 42:5; Zech. 12:1; Heb. 12:9.

[24]Augustine, *On the Soul and its Origin*, Book II, chap. 19. The quotation here is from www.newadvent.org/fathers/15082.htm (accessed on January 15, 2007).

[25]Augustus H. Strong, *Systematic Theology* (Valley Forge, PA: Judson Press, 1907), 493.

[26]Mary Inez Bogan, *The Fathers of the Church*, vol. 60 (Washington, DC: Catholic University of America Press, 1968), 246.

[27]Augustine, *Letter 190 (to Optatus)*. The quotation here is from the translation by Sister Winifred Parsons, SND in *The Fathers of the Church: A New Translation*, vol. 12 (New York: Fathers of the Church, Inc., 1955), 281.

[28]G. C. Berkhouwer discusses this question at length in his chapter on "Creationism and Traducianism" in *Man: The Image of God* (Grand Rapids: Eerdmans, 1962), 272–309.

[29]Ibid., 295.

[30]For example, the story of John Henry, the "steel-driving man" who died trying to outdo a steam drill.

[31]Brooks, *Flesh and Machines*, 170.

[32]Ibid., 159–71.

[33]Turing called this "The 'Heads in the Sand' Objection," and did not deem it worthy of a response; see, Boden, ed., *The Philosophy of Artificial Intelligence*, 50. An argument of the form "X is so terrible it cannot possibly be true" is usually not at all convincing to someone who believes otherwise!

[34]Dembski, "Conflating Matter and Mind."

[35]Brooks, *Flesh and Machines*, 175.

[36]Ibid., 174.

[37]Francis S. Collins, *The Language of God* (New York: Free Press, 2006), 124–41.

[38]The Hebrew word translated "image" in Gen. 1:26 (*tselem*) is one of several words used elsewhere in the Old Testament for idols, and its Aramaic cognate is used throughout Daniel 3 for the statue Nebuchadnezzar set up for his subjects to worship. Of the use of this word for idols, John E. Hartley says it "refers to the image as a representation of the deity. As such, images were strictly forbidden" (in R. Laird Harris, Gleason Archer, and Bruce K. Waltke, eds., *Theological Wordbook of the Old Testament* 2 [Chicago: Moody Press, 1980], 767).

[39]This, for example, is the position argued for by Thomas Aquinas (*Summa Theologica* I, Question 93, Article 6).

[40]I am assuming, of course, that anything which is the work of human hands would be affected by sin.

[41]John Haugeland, *Artificial Intelligence: The Very Idea* (Cambridge, MA: The MIT Press, 1985), 112.

[42]Alan Newell and Herbert Simon, "Computer Science as Empirical Inquiry: Symbols and Search," the Tenth Turing Lecture. First published in *Communications of the ACM* 19 (March 1976): 113–26.

[43]Neurons are inherently analog devices; however neural networks are almost always simulated on digital computers.

[44]Rodney A. Brooks, "New Approaches to Robotics" in *Cambrian Intelligence* (Cambridge, MA: The MIT Press, 1999), 60.

[45]This line of argument is developed in Hans Moravec, *Robots: Mere Machine to Transcendent Mind* (New York: Oxford University Press, 1999); Ray Kurzweil, *The Age of Spiritual Machines* (New York: Viking, 1999); Ray Kurzweil, *The Singularity Is Near* (New York: Viking, 2005).

[46]Kurzweil, *The Singularity Is Near*, 198–203.

[47]Brooks, *Flesh and Machines*, 204.