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Noreen L. Herzfeld
College of Saint Benedict/Saint John's University, nherzfeld@csbsju.edu

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Terminator or Super Mario: Human/Computer Hybrids, Actual and Virtual

By Noreen Herzfeld

Abstract: Is a human/computer hybrid feasible: If so, in what ways would such hybridization affect our concept of what it means to be human? There are two forms of such hybridization, the actual and the virtual. Actual hybridization involves the implantation of mechanical devices in the human body. In actual hybridization the computer comes to us and to our body to enhance our functioning in our world. In virtual hybridization we go to the computer, projecting our minds into the world of cyberspace and being formed there. Perhaps the most common form of virtual hybridization is the immersion our children experience in the world of video games. Both forms of hybridization encourage us to think of ourselves only in terms of function, just when most of our theologians find that humans reflect the image of God through our relationships. This emphasis on function best serves the military, but leaves us in the theological community with a dissatisfying concept of what it means to be human.

Key Terms: Image of God, Video games, Biomechatronics, Computers.

The Six Million Dollar Man, the Bionic Woman, Robocop, Dr. Octopus, the Terminator. The symbiosis between human and machine has provided stock characters (known as cyborgs) for science fiction. But are cyborgs confined for all time to the realm of science fiction? Is a human/computer hybrid feasible; and in what ways would such hybridization affect our concept of what it means to be human?

Human/computer hybridization is no longer just the dream of film writers; there are already two forms of such hybridization, forms which I will call the actual and the virtual. Actual hybridization, like the Six Million Dollar Man, involves the implantation of mechanical devices in the human body. This follows a long tradition of implants such as prosthetic limbs, pacemakers, and hearing aids and raises only a few new ethical or religious questions.

Virtual hybridization is a horse of a different color. In actual hybridization the computer comes to us and to our body to enhance our functioning in our world. In virtual hybridization we go to the computer, projecting our minds into the world of cyberspace and being formed there. Perhaps the most common form of virtual hybridization is the immersion our children experience in the world of video games. In a hearing before a Senate committee in 2000, Eugene Provenzo, Professor of Education at the University of Miami, noted this form of hybridization, claiming that the games provide "the cultural equivalent of genetic engineering, except that in this experiment, even more than the other one, we will be the potential new hybrids, the two-pound mice."[1] Virtual hybridization raises far more ethical and religious questions than actual hybridization because it is not only current, but common and insidious.

Noreen Herzfeld is a professor in the Department of Computer Science at St. John's University in Collegeville, MN. She is the author of *In Our Image: Artificial Intelligence and the Human Spirit* (Fortress 2002).

Actual Hybridization: Computers embedded in Humans

The idea of implanting mechanical parts in the human body in order to restore or improve function is nothing new. Most of us are familiar, and comfortable, with the use of prostheses in place of missing limbs, pacemakers to smooth an erratic heartbeat, lens implants following cataract surgery, or cochlear implants that restore or augment hearing. While early mechanical implants were relatively inert, many today, including the pacemaker and the cochlear implant, involve an intricate combination of biology, mechanics, and electronics. The development of devices of this type is currently known as biomechatronics and is a growing research field. There are current biomechatronic prostheses to aid motor control, hearing, and vision. These devices connect directly to the physiological and/or neurological systems of the human body. In most cases the imbedded system assumes a limited range of tasks.

Devices for assisting movement have been used in the treatment of those with impaired motor control due to stroke, incomplete paraplegia, or cerebral palsy.[2] One example, the Active Ankle-Foot Orthosis (AAFO), developed at MIT, fits over the ankle and foot of a patient and restores movement to a paralyzed or partially paralyzed ankle. A similar exoskeletal apparatus, the Berkeley Lower Extremity Exoskeleton (BLEEX) fits over a wearer's legs and is used to aid in the bearing of weight while walking.[3] Funded by the Defense Advanced Research Project Agency, Berkeley researchers expect the device to have applications in the military, firefighting, and rescue operations.[4] BLEEX moves biomechatronics from the realm of therapy to that of enhancement. BLEEX is not designed to restore function to an impaired system. It actually gives the wearer a level of functioning beyond the body's normal capability. While mechanical enhancement of the body's capabilities is nothing new (the automobile, or even the mule, are technologies that already enhances the body's ability to transport loads over a distance), what is new is BLEEX's direct connection to the user's body.

Other biomechatronic devices connect directly to the user's sensory systems. Researchers at the University of Pennsylvania, led by Kwabena Boahen, have developed retinal implants that detect motion, such as someone shaking his or her head.[5] Cochlear implants are currently used by more than 40,000 men and women worldwide.[6] Another 250 patients have had bilateral loss of hearing restored through the use of the auditory brainstem implant.[7] Electrodes implanted in the brain limit tremors in patients with Parkinson's, mitigate symptoms in Tourette's syndrome, and aid in the treatment of depression.[8] All these devices, whether implanted in the sensory organ or in the brain itself, send and receive signals in concert with the brain.

Is there a BLEEX equivalent, i.e. a prosthesis that not only restores normal functioning, but enhances human performance, on the horizon in the realm of neurosensory biomechatronics? If implanted chips restore hearing or vision, why not use them to enhance sensory capabilities, such as to provide infrared vision, or to bestow new cognitive capabilities, such as embedding a calculator in the mind?

Steffan Rosahl, of the Department of Neurosurgery at the University of Freiburg, notes that any implantation which allows for an exchange of energy and information between two systems has the potential to evoke change in either system. In other words, "the implanted device may interfere with the organ it is implanted into. In the case of sensory implants, the organ of interference is the human brain, which most scientists today regard as the physical substrate of the mind."[9] Sensory implants thus raise a caution not raised by neuromuscular biomechatronics, namely, the potential of these devices to literally change our minds, to alter our cognitive functionality, that which we most closely identify as our selves. Rosahl notes that it is already possible with current technology to "equip or 'arm' human beings for better performance, better mood or other advantages by means of an electronic implant."[10] Yet, few have lined up for such enhancements.[11] One reason is that sensory implants are permanent. While the army might find it advantageous to equip its soldiers with night vision, one must recognize that this feature would not go away on a soldier's decommissioning. The soldier is equally unlikely to risk permanent loss of vision should such an implantation go awry. Similarly, most humans fear the potential loss of a sense of self or loss of control that a cognitive implant could engender. Such an implant could be controlled, or at minimum could malfunction, in the presence of microwaves, radio waves, or altered magnetic fields.

Virtual Hybridization: Humans embedded in Cyberspace

If few are rushing to have computers embedded in them, most of our children gladly embed themselves in the world of the computer. In a survey of 778 students in grades four through twelve conducted in December 2003, the National Institute on Media and the Family found that 87% of all students and 96% of the boys reported playing video games regularly.[12] Adult players also add to the $10 billion a year industry; the average gamer is now 28 years old.

Like biomechatronics, video games improve human performance in limited areas. A 2003 study at the University of Rochester, NY, showed that proficient gamers markedly improved their spatial skills and their ability to pay attention to changes in the visual environment.[13] Video games have been used to help recover mobility in stroke victims and to overcome fears in the phobic. Cyberspace is an excellent venue for learning, offing the opportunity for endless repetition of a task. Thus, many of the same goals found in the field of biomechatronics can be realized, not be embedding computers in us but by embedding our consciousness in the computer.

The first ethical issue arises when one considers that the skills learned by many video game players are violent ones. In a study of a random sample of video games rated T (for Teen) by the Entertainment Software Rating Board, 98% included violence, with an average of 122 deaths per hour of game play. 69% either rewarded a player for killing or required a player to kill.[14] Such first person shooter games improve marksmanship, which is why they are used by the US military for training. But most are used by teens. Attorney Michael Breen, representing families of three students killed in a school shooting in Paducah, Kentucky, noted their efficacy:

> [The shooter] clipped off nine shots in about a 10-second period. Eight of those shots were hits. Three were head and neck shots and were kills. That is way beyond the military standard for expert marksmanship. This was a kid who had never fired a pistol in his life, but because of his obsession with computer games had turned himself into an expert marksman.[15]

But it's just a game, right? Evidently not to our brains. Dr. Klaus Mathiak at the University of Aachen used MRI technology to study the brains of 13 men who played violent video games for an average of 2 hours a day. He found that during the fights in the video game the emotional centers of the brain associated with aggression, the amygdala and parts of the anterior cingulate cortex, became more active. This pattern is associated with aggression and with the suppression of positive social emotions such as empathy. Mathiak speculates that playing violent video games over time would strengthen these patterns in the brain: "Contrary to what the industry says, it appears to be more than just a game."[16] As educational psychologist Jane Healy puts it, "habits of the mind become structures of the brain."[17] Just as with biomechatronics, immersion in cyberspace sets up a cybernetic loop between the human and the machine, a loop that allows each to be changed by the other. The player plays the game and the game plays the player.[18]

Cyberspace also gives an illusion of human enhancement. Gamers report feeling empowered, freed from the structures of normal life. In particular, in the virtual world one is freed from the limitations of the human body; one can move in three dimensions, into and through objects, and can appear and disappear. Nicole Stenger, of the Human Interface Technology Lab at the University of Washington, describes how "cyberspace grafts a new nature of reality on our everyday life. It opens up an infinity of space in an eternity of light . . . On the other side of our data gloves we become creatures of colored light in motion, pulsing with golden particles."[19] Game players experience this freedom in their abilities to leap, fly, and float through space, walk through objects, fire guns without reloading. This can be a mind-expanding imaginative experience. However, it can also distance a child from the real world. Hours spent in front of a screen are hours not spent messing around outdoors. Carl Pope describes what is lost:

> In losing our contact with the natural world we are losing something precious. In a way, we are losing part of what it means to be human. We evolved in nature, dependent on its rhythms, inextricably connected to other living things ... American children are losing that connection.[20]

The ultimate human enhancement is immortality. Within video games this is simulated through the option of playing in "God mode," in which the player becomes invincible, is given unlimited weapons, special powers, or unlimited lives.[21] In the words of one player, "I really like games – especially shooting games – that have some kind of invincibility option or god-mode, and you get to just run around and cause total [bleeping] havoc. Explosions and limbs flying everywhere. Ahhhh ... Sometimes that's just what you need."[22] Of course, God mode is over once the game is over. No one can live in cyberspace forever.

Or could they? Oddly enough, even this is considered a possibility by some researchers. Computer scientist Ray Kurzweil, in *The Age of Spiritual Machines*, suggests that cyberspace provides a place where we can evade the mortality of the body by downloading our brains into successive generations of computer technology. Here we would have the ultimate embedding of the human in the computer. Kurzweil writes:

> Up until now, our mortality was tied to the longevity of our hardware. When the hardware crashed, that was it. For many of our forebears, the hardware gradually deteriorated before it disintegrated ... As we cross the divide to instantiate ourselves into our computational technology, our identity will be based on our evolving mind file. We will be software, not hardware ... As software, our mortality will no longer be dependent on the survival of the computing circuitry ... [as] we periodically port ourselves to the latest, evermore capable "personal" computer ... Our immortality will be a matter of being sufficiently careful to make frequent backups.[23]

Kurzweil suggests we might achieve this new platform within the next 50 years. He is not the sole holder of this expectation, though he may be among the more optimistic in his timeline. Software engineer Michael Benedikt envisions cyberspace as a place where "we would enjoy triumphs without risks and eat of the tree and not be punished, consort daily with angels, enter heaven now and not die ... [it is] the Heavenly City, the New Jerusalem of the Book of Revelation. Like a bejeweled, weightless palace it comes out of heaven itself ... a place where we might re-enter God's graces ... laid out like a beautiful equation."[24] Eternity as a never ending video game.

Computer/Human Hybridization and the Image of God

The therapeutic use of computer technology, whether in the form of computerized implants or virtual reality programs, falls easily enough within the Christian call to heal the sick and help the suffering. Ted Peters notes that, as morally responsible human beings, we are called to build a better future for one another, and our work in this area is "a form of human creativity expressive of the image of God imparted by the divine to the human race."[25] Nor does the occasional use of video games for entertainment or momentary distraction present a problem that goes much beyond our use of other media, such as film or television. Yet both types of computer/human hybridization, particularly as they move from the realm of therapy to the realm of enhancement, leave us feeling a bit uneasy. This unease is not a problem with the concept of human enhancement, *per se*. James Peterson notes that human reality is characterized by change. "If human beings are called to develop themselves, purposeful and direct enhancement of capacity could be appropriate, or according to some, even required."[26] The problem with both types of computer/human hybridization, whether actual or virtual, is that they are based on an incomplete view of the human person, one that is merely and entirely functional.

One avenue toward understanding how we conceive of our nature as human persons is to consider the image of God "imparted by the divine to the human race" to which Peters refers. Interpretations of what this image might entail have varied over the centuries, yet most can be categorized in one of three ways: substantive interpretations view the image as an individually held property that is a part of our nature, most often associated with reason; functional interpretations find the image of God in agency, specifically our exercise of dominion over the earth; relational interpretations locate God's image within the relationships we establish and maintain.[27] While substantive interpretations have dominated historically, twentieth-century theologians have viewed the image of God in humanity in primarily functional or relational terms.

A functional interpretation finds the image of God in the stewardship over the rest of creation that is spelled out in Genesis 1:26: "Let us make humankind in our image, according to our likeness; and let them have dominion over the fish of the sea, and over the birds of the air, and over the cattle, and over all the wild animals of the earth, and over every creeping thing that creeps upon the earth." In this view, what we do lies at the core of who we are. The functional interpretation stems, not only from a close reading of Genesis 1:26, but also from an examination of the use of the term "image" in extra-Biblical sources. In 1915, Johannes Hehn suggested that the image of God be understood as a royal title or designation rather than an attribute of human nature.[28] Old Testament scholar Gerhard von Rad was one of several who extended Hehn's work. In his commentary on Genesis, von Rad argued for our creation "as the image of God" rather than "in the image of God."[29] Von Rad writes:

> Just as powerful earthly kings, to indicate their claim to dominion, erect an image of themselves in the provinces of their empire where they do not personally appear, so man is placed upon earth in God's image, as God's sovereign emblem. He is really only God's representative, summoned to maintain and enforce God's claim to dominion over the earth.[30]

This approach has come to dominate the field of Biblical exegesis. We are actors, independent agents in the world, in imitation of God's agency or, in the words of Philip Hefner, "created co-creators."

A different approach sees the image of God as arising in humanity only in and through our relationships with God or with others. This places the center of our humanity in a corporate rather than an individual context; what matters most are the relational bonds between us. One of the most influential proponents this interpretation is Karl Barth. According to Barth, the image of God is identified with the fact that the human being is a counterpart to God.[31] Like the functionalists, Barth roots his argument in textual exegesis, focusing, however, on different portions of the Genesis text: "Let us make man in *our* image" (Gn 1:26) and "male and female he created them" (1:27). Barth interprets the plural in "Let us make man" as referring, not to a heavenly court, but to the triune nature of God, a nature containing both an "I" that can issue a call and a "Thou" capable of response.[32]

Thus, the Christian understanding of the Trinity presupposes a God who embodies relationship within God's very self. We image God when we too give ourselves over to relationship. The image is found in the relationship itself, not the capacity for relationship. Thus the image of God can only be evidenced corporately. It exists first in our relationship to God and second, in our relationships with each other. Barth suggests that it matters not so much what a human does, but that we exist in a web of relationship.

Barth takes a highly embodied view of what constitutes authentic relationship. He notes that some aspects of relationship include the ability the look the other in the eye, to speak and hear, and to give aid.[33] Biomechatronic systems that restore lost vision, hearing, or mobility aid this sort of relationality. But what about systems designed for enhancement? These systems focus on function. Their whole purpose is to increase human functionality in some realm. Since this functionality would not be available to all humans, but only to the wealthy, or to those with the right military ties, these systems hold the possibility of being divisive of the human family, distorting relationships rather than furthering them. The fact that research into such systems in the United States is funded primarily by the military does nothing to mitigate this concern.

Virtual systems, in particular video games, are not highly relational. The emphasis is on individual control and mastery: defeating adversaries, whether violently or not, beating opponents, designing or mastering tools. This emphasis on control is not far from the human will-to-power that, according to Reinhold Niebuhr, lies at the root of the Christian concept of sin. Niebuhr notes, "There is a pride of power in which the human ego assumes its self-sufficiency and self-mastery."[34] To see the self only in terms of mastery is risky. Some multi-player games do require interaction and cooperation between players. EverQuest is one of the most popular massively multi-player role-playing games. Players create their own characters, go on quests, solve puzzles, and kill evil creatures. Other players can be either teammates or opponents, and some of the quests can only be solved in groups. However, such cooperation is rare in the video game world. Most games demand that the player act alone. Even in EverQuest, the players must often make decisions too quickly for them to be in any real sense collaborative. In the end, the cyberworld of video games is a very lonely place.

Conclusion

One place where there is an active use of both virtual and actual human/computer hybridization is in the American military. The army uses video games as both a recruiting tool (America's Army, and Full Spectrum Warrior) and as a teaching mechanism. In 2000, the Pentagon invested $45 million in a partnership with the video game industry. Even video games not designed for the military prepare our young men for battle. As one marine enthused after a battle in Iraq, "I was just thinking one thing when we drove into that ambush, Grand Theft Auto: Vice City. I felt like I was living it when I seen the flames coming out of windows, the blown-up car in the street, guys crawling around shooting at us. It was fucking cool."[35] What isn't cool, of course, is the unprecedented number of amputees being produced by the war in Iraq due to the efficacy of body armor, which protects the torso but not the limbs. These men come home candidates for computerized prostheses.[36] Thus we seduce and train soldiers with one form of hybridization then fit them out with the other. Both allow for a less sober assessment of the war than that which would be necessary without these hybridization technologies.

Both biomechatronics and virtual reality programs, especially when used for enhancement rather than therapy, promote a preoccupation with the self, and with our own perfection, mastery, and control. We seek enhanced performance to overcome both natural and social insecurity. And in seeking mastery over our environment, Reinhold Niebuhr notes how quickly we move from "power over matter" toward "power over men."[37] But this power is always tainted, for performance and mastery, in the end, refer only to the self. They turn us inward, failing to lead our vision toward our neighbor and the love of that neighbor that lies at the heart of Jesus' teaching.

Endnotes

1. Eugene Provenzo, "Testimony before the Senate Commerce Committee Hearing on 'The Impact of Interactive Violence on Children,' chaired by Senator Sam Brownback," March 21, 2000.

2. For a review of the state of motor system biomechatronics see P. H. Veltink, H. F. Koopman, F. C. van der Helm, and A. V. Nene, "Biomechatronics—Assisting the Impaired Motor System," *Archives of Physiology and Biochemistry*, vol. 109, no. 1, 2001, 1–l9.

3. See the websites of the Biomechatronics Group at MIT and the Berkeley Robotics Laboratory for more details. *http://biomech.media.mit.edu/research/pro3_3.htm*, *http://bleex.me.berkeley.edu/bleex.htm*.

4. Sarah, Yang, "UC Berkeley researchers developing robotic exoskeleton that can enhance human strength and endurance," press release, 3 March 2004. *http://www.berkeley.edu/news/media/releases/2004/03/03_exo.shtml*.

5. Kwabena Boahen, "Neuromorphic Microchips," *Scientific American*, May 2005, 58–59. Very little progress has been made in the enhancement of other senses, such as touch, smell, or taste.

6. Steffen Rosahl, "Vanishing senses—restoration of sensory functions by electronic implants," *Poiesis Prax* (2004) 2: 288.

7. Ibid., 289.

8. Helen Mayberg, "Deep Brain Stimulation for Treatment-Resistant Depression," *Neuron*, vol. 45, 651–660, March 2005.

9. Ibid., 287.

10. Ibid., 293.

11. Kevin Warwick, professor of Cybernetics at the University of Reading, has implanted a chip in his arm that allows him to remotely control the movement of a robotic arm through nerve signals. However he is one of few interested in such an implant. I am reminded of *Star Trek: The Next Generation* episode 35 (1987), "The Measure of a Man," in which Lt. Commander Data notes that Command Officer Geordie La Forge's bionic eyes perform functions far beyond the human eye, yet few humans seem to be wishing to replace their biological eyes with bionic ones.

12. David Walsh, Douglas Gentine, Jeremy Gieske, Monica Walsh, and Emily Chasko, *Mediawise Video Game Report Card*, National Institute on Media and the Family, December 8, 2003, 3.

13. C. Shawn Green and Daphne Bavelier, "Action Video Game Modifies Visual Selective Attention," *Nature*, vol. 423 (29 May, 2003), 534–536.

14. Mary Ellen Shay, "Teen-Rated Video Games Loaded with Violence," press release, Children's Hospital Boston, March 11, 2004.

15. Gayle Hanson, "The Violent World of Video Games," *Insight on the News*, June 28, 1999, 15.

16. "No Hiding Place," *Economist*, vol. 373 no 8399, October 30, 2004, 83.

17. Brody, Michael. "Playing with Death." *Brown University Child & Adolescent Behavior Letter*, November 2000, 8.

18. Espen Aarseth, *Cybertext: Perspectives on Ergodic Literature* (Baltimore: Johns Hopkins, 1997), 162.

19. Nicole Stenger, "Mind is a Leaking Rainbow," in *Cyberspace: First Steps*, ed. Michael Benedikt (Cambridge: MIT, 1991), 58,52.

20. Carl Pope, "The Forgotten Family Value," *Sierra*, November/December 2000, 16–18.

21. It is sometimes also called "sniper mode."

22. Tim Boucher, "God-mode: Video Games, Virtual Reality & Religion," *http://www.timboucher.com/investigations/god_mode_maya_games.php*.

23. Ray Kurzweil, *The Age of Spiritual Machines: When Computers Exceed Human Intelligence* (New York: Penguin, 1999), chapter 6.

24. Michael Benedikt, "Introduction," in Benedikt, ed., 14–15.

25. Ted Peters, *Playing God?Genetic Determinism and Human Freedom*, (New York: Routledge, 2003), xvii.

26. James C. Peterson, *Genetic Turing Points: The Ethics of Human Genetic Intervention* (Grand Rapids MI: Eerdmans, 2001) 288.

27. Some have looked for the *imago Dei* in a quality of the human being, such as our physical form (Gunkel), the ability to stand upright (Koehler), our rationality or intellect (Aquinas), our personality (Procksch), or our capacity for self-transcendence (Niebuhr). Others have thought of God's image as dynamic, rooted in human actions such as our dominion over the animals (Caspari, von Rad). A third approach defines the image as emergent in the interrelationship of two beings (Barth, Brunner). See Claus Westermann, *Genesis 1–11*: *A Commentary* (Minneapolis: Augsburg, 1984), 147–48 for a summary.

28. Johannes Hehn, "Zum Terminus 'Bild Gottes'," *Festschrift Eduard Sachau zum Siebzigsten Geburtstag* (Berlin: G. Reimer, 1915), 36–52.

29. Gerhard VonRad, *Genesis: A Commentary* (Philadelphia: Westminster, 1961), 56.

30. Ibid., 58.

31. Barth lists and denies the variety of substantive and functional interpretations in vogue at his time: "The fact that I am born and die; that I act and drink and sleep; that I develop and maintain myself; that beyond this I assert myself in the face of others, and even physically propagate my sperm; that I enjoy and work and play and fashion and possess; that I acquire and have and exercise powers; that I take part in all the work of the race; and that in it all I fulfill my aptitudes as an understanding and thinking, willing and feeling being–all this is not my humanity," *Church Dogmatics*, vol. 3, *The Doctrine of Creation* (Edinburgh: T. and T. Clark, 1958), 249.

32. Ibid., 182.

33. Ibid., 250–53.

34. Reinhold Niebuhr, *The Nature and Destiny of Man: A Christian Interpretation*, vol. 1, *Human Nature* (Louisville: Westminster John Knox, 1996), 188.

35. Evan Wright, *Generation Kill* (New York: Berkeley, 2004), 5.

36. Ronald Glasser, "A War of Disabilities: Iraq's hidden costs are coming home," *Harpers*, vol. 311, no. 1862 (July 2005), 59–62.

37. Niebuhr, 192.