In Whose Image? Remaking Humanity through Cybernetics and Nanotechnology

C. Christopher Hook, M.D. *Mayo Clinic (Rochester, MN)*

Though the controversies surrounding human cloning and stem cell research have recently captured the public's attention, the less well-known technologies of cybernetics and nanotechnology are equally worthy of focus in that they have the potential to transform the way we think about human beings. Unfortunately, our conceptions of cybernetics have largely been formed by Hollywood and have thus been dismissed as mere science fiction, while most of us have heard little to nothing about nanotechnology. The goals of this essay are therefore to provide an overview of cybernetics and nanotechnology, to consider the current state of development of these fields, and to explore some of the ethical issues that these technologies will surely raise.

Cybernetics

The term "cybernetics" was coined in 1948 by Norbert Weiner in his book by the same name. Weiner's ideas were popularized in his 1950 book, *The Human Use of Human Beings*. He believed that the key to successful functioning of both living organisms and machines was the "information feedback loop," a process which allows self-regulating activity via continuously updated information about the current status of a machine or organism and its environment. Because living organisms and machines depend equally on this feedback process, Weiner believed that they could be combined to produce a superior device or creature. In 1960, Manfred Clynes and Nathan Kline advanced the idea of using Weiner's theory as a means of preparing human astronauts for space flight. Clynes and Kline coined the term "cyborg" (for *cyb*ernetic *org*anism) to refer to the blending of humanity and technology – or man and machine. Their speculations resulted in a 1963 NASA report, "Engineering Man for Space: The Cyborg Study."

Those of us who depend on technological innovations such as glasses or contact lenses, hearing aids, pacemakers, or prostheses are already cyborgs. However, far beyond anything we have yet seen, we are on the verge of a bold new era of incredible cybernetic enhancements. For example, cybernetics pioneer Steve Mann, a University of Toronto professor who for the last two decades has been perfecting wearable computers, recently influenced several others to adopt his novel way of life. He taught a class of 20 students how to use and "blend with" special "personal imaging and photoquantigraphic image processing" devices which allowed the wearers to remain in continuous contact with the internet and each other. Mann noted that 16 of the 20 students did not return their "xybernaut" computers at the end of the

course. He stated that "They have been assimilated" – a chilling reference to a race of cybernetic beings called the "Borg" that inhabit the Star Trek universe of the 24th century.

It is not cybernetic devices, however, that initiate the assimilation process of the Borg; these are added later to improve connectivity to the "collective" and to provide various prostheses to assist each drone in the performance of specific duties. Rather, assimilation begins from within, as the body is remodeled – literally cell by cell, and sometimes molecule by molecule – by microscopic "nanorobots" that are injected into a person's body. Although the Star Trek scenario of a cybernetic race is still futuristic speculation, nanotechnology is already a real and growing field.

Nanotechnology

The term nanotechnology was coined in 1974 by Japanese researcher Norio Taniguchi to mean "precision machining with tolerances of a micrometer or less." It refers to engineering on the molecular and atomic level. However, it was Eric Drexler who introduced the word and concept into the public consciousness with his 1986 book *Engines of Creation* and a subsequent study on scholarly feasibility entitled "Nanosystems." To further his dreams of improving the human condition, Drexler created the Foresight Institute, which is dedicated to the development of nanotechnology and other life extension technologies.

Though Taniguchi and Drexler are noted for their contributions to the field, the real pioneer of nanotechnology is physicist Richard Feynman. During the December 29, 1959 meeting of the American Physical Society, Dr. Feynman presented his ideas about the possibilities of nanotechnology. He spoke of printing the entire 24 volumes of the *Encyclopedia Britannica* on the head of a pin such that they could be read by an electron microscope. Feynman defended the feasibility of this seemingly impossible task, stating "... I am telling you what could be done if the laws are what we think; we are not doing it simply because we haven't gotten around to it."

Although a multitude of manufacturing and engineering applications of nanotechnology have been proposed, I will here list some of the proposed medical uses. Primarily, nanorobots would serve as implantable devices that could detect and destroy malignant cells and cancers, detect and combat infection, detect and repair genetic mutation or injury, deliver targeted drug therapies via synthesis and administration within the body, replace cellular structures with stronger or more efficient materials, repair or replace damaged tissues and non-cellular connective tissue, replace or augment physiologic functions, and remove atherosclerotic plaque in coronary and cerebral arteries. Tools like these could significantly prolong the lives of many people, reduce much disability and suffering, enhance quality of life, and even reduce certain health care costs. In fact, many "nanovisionaries" contend that nanotechnology will be an important tool to forestall aging and perhaps even to achieve a certain "immortality."

Ethical Questions & Issues

Both cybernetics and nanotechnology are extremely exciting fields. Cybernetics may provide us with the opportunity to help the blind to see, the lame to walk, and those bound and limited by physical or neurological afflictions to interact more dynamically with their world and perhaps even to overcome their limitations. Nanotechnology may help us fight cancer, vascular disease, and even infectious disease. However, both technologies have potential dark sides. It is one thing to use technology to repair an injury or to treat or heal an affliction, but it is quite another thing to use technology to engineer "better" human beings. Many who are healthy will likely be tempted to "enhance" themselves in various ways via cybernetics or to increase their longevity via nanotechnology.

Therefore, some of the first ethical questions raised by cybernetics and nanotechnology are the same as those being raised about genetic engineering. Who will have access to these techniques? Who *should* have access to them? Will it sometimes prove difficult to distinguish between the use of technology for treatment purposes and the use of technology for enhancement purposes? For example, height, strength, and intelligence are most often regarded as non-medical attributes. However, some consider these "attributes" to constitute disabilities which induce significant suffering. Even if we could make clear distinctions between treatment and enhancement, would there be sufficient reasons to prevent the use of technology for enhancement purposes? After all, isn't it a common desire of, if not a laudable goal for, each of us to improve ourselves and our children as much as possible? However, while some see these technologies as the means of leveling the playing field to make all people equal, history has shown that technology actually tends to produce even larger disparities between cultures and subcultures. We must remember that human attempts at creating a utopia, where there is prosperity and freedom for all, have thus far typically ended in tyranny. As long as sin remains alive among us, this will inevitably remain the case.

Other advocates of these evolving technologies perceive them as a means to free themselves and humanity from the physical limitations of the human body. This line of thinking has become known as "transhumanism" or "post-humanism" and is the unfortunate fruit of the marriage of modern and postmodern thought. Modernism touts an almost blind faith in inevitable progress, with the good defined as the suppression, replacement, and/or total control of the "natural" via science and technology. Radical autonomy is the trump card, declaring the right and duty of all people to control their own destinies and to engineer their own evolution. Postmodernism and its rejection of objective truth and the notion of a true, identifiable self has led to the belief that there is nothing intrinsically valuable about the biological form – particularly not the human form. Because there are no true norms for existence or behavior, human beings are free to create any reality they desire and to change themselves in whatever manner they choose. There is no image of God to consider since there is no God who has created us to have any particular characteristics or nature. We can foster whatever image we can imagine.

Biotechnologies are rapidly accelerating ahead of sufficient ethical reflection and appropriate plans for control. Recognizing that research will proceed, Christians should move forward in developing these technologies for therapeutic purposes while concurrently identifying ways to prevent harmful applications. We must exhibit not a fear of technology, but a courageous control of technology coupled with a refusal to let technology control us. As we seek to discern how cybernetics and nanotechnology may be used in morally praiseworthy ways, we must be guided by God's vision of perfection for us, rather than by our own vision which has been corrupted by sin. We must commit ourselves to holy transformation so that others who look at us will see not "virtual love," or "virtual Christianity," but the real thing, and then desire to be a part of it. ■