



FOR AN ETHICS OF TECHNOLOGY

Genetic engineering and other modern technologies have the potential to change the world. They can alter plants, animals, the way human beings are made—the very structures of human life. This news is not necessarily good, however. Given what history reveals to be a chronic myopia when predicting the negative consequences of scientific and technological change, the idea of humans remaking the world may strike some people as frightening.

Because of these fears, establishing limits to technological intervention has become a first-order priority. The idea of relying on individual human freedom and creativity alone no longer makes any sense. Freedom and creativity are important. But if they are the sole considerations guiding decisions about the direction of today's technology, we are in grave danger.

SCIENCE AND TECHNOLOGY

The notion of an "ethics of limits" is a very difficult concept for Americans—especially American scientists—to accept. Scientists typically insist on freedom from interference with their work in both pure science and its application to the world. The idea of imposing limits on their work would be a tough sell.

Many scientists today operate from a particular



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here, Toward a More Humane Medicine: A Catholic Bioethics.

*A Science
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BY JAMES F.
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intellectual perspective. In this view, science is a process of discovery based on quantitative observations rationalized via causal mechanisms to either prove or disprove a formulated hypothesis. There is no room in this process for human emotion and no need to address philosophical and ethical questions. This scientific perspective represses a broader way of understanding reality, which scientists and philosophers historically experienced with a certain awe and reverence. Awe and reverence, as it happens, tend to ground a respect for nature and provide the starting point of an ethics of limits—an ethics that would encourage science and technology while, at the same time, restraining scientific and technological interventions that could radically alter or even destroy the awesome order of reality that is the source of both science and ethics.

Human beings are unique in their ability to understand the order inherent in reality. Although contemporary culture tends to see science as the most important vehicle for human understanding, it is, in fact, just one among many vehicles. Truly great scientists show that their understanding of reality transcends the coldly rationalistic. Such people become personally immersed in the reality with which they work. They exhibit in their work what could be described as an *indwelling*: an immersion in the reality with which they work. Their relationship with cosmology or biology could, in some instances, be described as reverential, perhaps even mystical.

But this dimension of science tends to be lost for many of today's scientists. They seem incapable of moving beyond the more banal tasks of observing and measuring narrow aspects of the whole. These gatherers and counters of data consider themselves scientists in the full sense of the term. Indeed, they hold themselves up as models of what science means. And yet they ignore an



important aspect of their discipline: that is, the awe and the indwelling experienced by great scientific geniuses. In doing so, they ignore the important distinction made by Francis Bacon between "fact gatherers" and real scientists.¹

The great scientific geniuses were truly creative. They were tuned into the inner rationality and established order of the universe and dwelt within it. They identified personally with what they were trying to understand. Their attitudes, intuitions, feelings, and aesthetic sensitivities were as much involved in their science as counting and fact gathering.* Their science involved their whole person, not just a capacity for cold objectification.[†]

THE NEED FOR SCIENTIFIC AND TECHNOLOGICAL LIMITS

Many of the intelligentsia just a generation ago were convinced that communism would eliminate human poverty and that penicillin would eliminate infectious disease. We know what happened under communism—it extended the poverty it claimed to eliminate. Antibiotics have failed to eradicate infectious disease, and, what is worse, their misuse has created dangerous resistant bacterial strains. These facts should make us think about untoward consequences, about the possibility of disaster—and about establishing ethical limits to technological interventions.

Some contemporary scientists, shaped by a perspective that emphasizes willpower and creativity, are likely to interact with reality in a destructive way. Because they have no personal regard for the objects of their study, they tend to intervene in nature with hammer and tongs. Having done that, they may presume to reorganize the pieces according to their "creative instincts." They can remain narrowly focused because they have no personal sensitivity for the broader order of things. They can do brazen things to the natural world because they do not care about it personally. Indeed, they may be more interested in fame and fortune than anything else. The experience of awe—which puts the importance of an individual in perspective—has been lost to such people. The coherence and rationality of the larger reality escape their notice and concern. Nothing about that broader cosmic reality might cause such people to modify their personal ambitions or moder-

* Albert Einstein was an example of the kind of scientist who has a broad, creative, almost mystical involvement with his subject matter.

† This point was developed by Michael Polanyi, a great scientist who, late in life, became a philosopher of science. See Polanyi, *Personal Knowledge*, University of Chicago Press, Chicago, 1962.

ate the use of their technological instruments.

Science and technology must, like other human endeavors, be bound by ethical constraints. Scientists and engineers can no more do whatever they like than popes or presidents can. All human activity has a moral dimension and is subject to moral constraints. Evil is possible. Ethics attempts to identify the evil and to establish the constraints. In doing so, it neither undermines science nor unnecessarily restrains technology. Required courses in the philosophy and ethics of science are appropriate for every graduate program in science.

Yes, scientists must be free and allowed to be creative. But they should also take into consideration the fact that freedom and creativity derive from respect for the broad rational order of reality itself. The great scientists have shown this respect and acted responsibly. Mediocre scientists (and worse) are the problem because they now have access to powerful technological instruments. In today's world, seemingly small technological interventions can suddenly blossom into enormous disruptions. Such disruptions could destroy the very conditions for life.

Consider, as an example, the highly publicized issue of genetically altered corn and the monarch butterfly. The use of genetic technology to alter basic foods—corn, wheat, and rice—has become common in recent years. The developers of this technology naturally claim that it is safe. Unfortunately, the dangers involved in altering basic crops may not become evident until the alterations are beyond remedy. Genetically altered corn, which has proliferated widely, appeared to produce pollen containing a natural insecticide that kills monarch butterfly caterpillars. The natural structure of farming and food production is delicate, indeed fragile. Another genetically altered crop might conceivably wreck, not a population of butterflies, but some critical component of the human food chain itself.

Genetically altered crops are not the only potential threat to continued human existence. Any number of new technologies generated by contemporary science and engineering can create instruments of mass destruction. Frightful evil is not just what terrorists or rogue governments can do. Now even ordinary laboratory scientists and technicians can cause widespread destruction. (The recent anthrax incident may have been the work of a single laboratory scientist.)

IDENTIFYING A BASIC ETHICAL PRINCIPLE FOR LIMITS

How can science, so dependent on creativity and freedom, be made subject to limits without undermining science itself?



The ancient Greek philosophers distinguished between two levels of reality: *ananke* (fate), over which human beings have no power; and *techne*, which is open to human intervention. *Techne* is also the root of our English word *technology*, which roughly means a system or set of skills for making changes. The ancient Greeks, a creative people, had an enthusiasm for changing things whenever possible. Aristotle could be said to have launched the quest for an ethics of technology, and he did so from what in Latin is referred to as *Recta ratio factibilium* ("What reason requires with regard to those things which we are able to do").² For him, what regulates the making of things is the practical intellect, or practical reason.

"Reason" was the key word for Aristotle. Reason, he believed, can show us not only what we are able to do to reality, or nature (the Greek word for which is *physis*), but also what we should not try to do. Reason, in other words, can indicate the *limits* of technology. Reason reveals to us humans the positive and negative obligations we bear toward the reality that surrounds us and with which we interact. Ethical technology is production under the guidance of reason.

Christianity essentially adopted Aristotle's view of the relationship between science and nature. The early Christians held that nature, being God's creation, is just what God meant it to be. Nature, or *physis*, is therefore the foundation of morality. Insofar as technology imitates nature, helps it, or corrects its occasional malfunctions, then it is ethically right. Insofar as technology destroys, subverts, or inhibits nature, it is ethically wrong. Medieval Christian thinkers prized Aristotle's aphorism: "If one way be better than another, you may be sure it is Nature's way."³

St. Thomas Aquinas, who built his arguments on Aristotelian logic, believed that humans were closest to God in their ability to reason.⁴ However, in the 14th century two Catholic scholars, John Duns Scotus and William of Ockham, argued that humans are most godlike in our ability to act freely.⁵ They held that we behave morally not when we understand and imitate nature but, rather, when we use our wills to *dominate* it. *Intellectus, si est causa voluntatis, est causa subserviens voluntati*, as Duns Scotus put it ("Intelligence, in effect, serves the will and is subordinate to freedom").

This change in perspective brought with it a completely different ethics. Technology, which was formerly justified by its imitation of reality, now is justified by its domination of reality. This view, underlying the 17th- and 18th-century rev-

olution in science and technology, was radically optimistic. Nothing is impossible, thought the philosophers of the Enlightenment. Illness and all other forms of human unhappiness would soon be eliminated. Reason was still important, as long as it served will and freedom. In our own time, some scientists have come to see themselves as cocreators-God's partners, as it were, in the creation of reality.

Stem cell research is (along with cloning) probably the best-known contemporary example of what might be called "cocreative science." Such research is performed, of course, on human embryos. Cocreative scientists argue that the study of stem cells will reveal important insights into the basic biology of human beings, ultimately leading to breakthrough therapy for devastating diseases.

The point is that genetic engineering, cloning, and other technologies now make possible radical alterations in the natural world. Without limits of some sort, such alterations seem certain to lead sooner or later to disaster. How, then, should we go about setting limits?

SETTING DEFENSIBLE LIMITS

Giving priority to an ethical perspective that requires, as the starting point and the reigning value, a respect for the established order makes sense. Such a perspective does not eliminate a role for human will and creativity. It also does not guarantee that technology-induced disaster will not occur anyway. Still, this perspective would tilt scientific and technological decision making away from disaster.

Of course, a perspective based on respect for the natural order will not automatically produce ethically defensible limits. To prevail, it must rest on persuasive argument from experts in science and technology, philosophy, law, and religion.

In any advanced culture, religious or secular, limitations on liberty must be justified. Religious cultures root such limits in a sense of a "created" order, which serves as the ultimate ground of ethical decision making. For such cultures, the world as a created order is a good in itself. It is not the ultimate good but nevertheless a real and objective good. Despite its fallen-ness, the world seen from a Judeo-Christian, "Natural Law" perspective retains order and goodness. It displays a harmony, beauty, and intelligibility that call for respect, and it provides a vantage point from which ethical reflection can begin. In such a world, basic ethical principles (freedom, justice, love, wisdom, dignity, and others) are grounded in the established order. Technological interven-

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Secular cultures also put restrictions on freedom and creativity. The late Isaiah Berlin, a political philosopher who championed liberty and democracy, argued that "it is at times justifiable to coerce men in the name of some goal (e.g., justice or public health) which they would, if they were more enlightened themselves, pursue but do not because they are blind or ignorant or corrupt."⁶ Berlin recognized the need for limits on liberty because, he saw, the world and human life are doomed without them. Preserving life is a rational, objective good, he held—meaning by that a value similar to what Catholic moralists would derive from Natural Law.

Religious and secular thinkers alike can see in the world's order the moral foundation for setting ethical limits. Allowing scientists to use today's powerful technologies to do whatever they wish would be wildly irrational. Employing human liberty to destroy human life makes no sense at all. Indeed, liberty makes sense *only* in the context of life on earth. Because this is so, continued life in a sustaining world is the moral foundation from which we should make judgments about specific technological interventions.

Whatever puts the world and human life at risk is rationally absurd and morally indefensible. Both religious people (who believe that God created the earth and life upon it) and secular people (who see reality as the product of chance) can defend this position. Although they give it different names, they share a basic respect for the established order and oppose any use of technology that might threaten that order.

Not that the established order is perfect. It includes, along with its beautiful aspects, ugly ones: pollutants, cancers, and war. Human beings can and should use technology to advance the beautiful and the good and reduce the evil and the ugly. But technological capacity must be exercised with great care. Otherwise, in trying to advance good and reduce evil, humans may do the ultimate evil and destroy everything.

We need a widely accepted ethical basis for limiting technological expressions of freedom and creativity. Respect for the established order is as close as secular and religious thinkers can come to agreeing on a primary moral principle, one from which further ethical reflection can proceed and particular decisions concerning technological interventions can be made.

Not everyone will accept this basic moral absolute, however. Mechanistic, reductionist, and materialist assumptions are so pervasive in con-

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temporary culture that some people—including some research scientists and physicians—assume that there is no such basic principle. Like certain fundamentalists, they simply take their personal assumptions for the truth. Many intellectuals will be immediately uncomfortable the moment they hear ethical limits proposed. The idea that, absent such limits, technology could lead humankind to disaster is likely to strike them as science fiction.

And they may be right. But they should consider, for example, an article published a few years ago in a well-known scientific journal. The article, by Marvin L. Minsky, an MIT professor who specializes in artificial intelligence, was entitled "Will Robots Inherit the Earth?" Yes, was Minsky's answer. As presently constructed, human beings are too short-lived, fragile, and unintelligent to truly flourish, he maintained. We must increasingly look to technology to augment our physical and mental abilities. "Eventually we will replace our brains—using nanotechnology. Once delivered from the limitations of biology, we will be able to decide the length of our lives—with the option of immortality—and choose among other, unimagined capabilities as well."⁷

As Minsky sees it, human beings are badly designed—but, fortunately, that design can be changed. The idea of using technology to alter the structure of human life is perfectly acceptable to him. Minsky sets aside both ethical considerations and worry about ominous possibilities. He focuses solely on his interests and his view of scientific "progress."

However, we can move this discussion from the research laboratory to a more familiar hospital setting. Wherever a technology threatens the established order of life, it becomes morally unacceptable. In many hospitals today, life-support technology is used to keep alive patients suffering from degenerative, incurable illnesses and for whom death is imminent and irreversible. Such uses of technology are wrong. Technology used to cure illness and improve quality of life is good. Technology used to prolong death is bad. Order exists in human life, and death and dying are part of that order. Violating the order, or failing to respect it, crosses the moral line.

SCIENCE AND SIN

Science and technology raise difficult ethical issues. Only after they had built the atomic bomb—after the first ones were dropped on Japan and in the midst of a nuclear arms race that threatened the future of humanity—did some of its creators admit that "physicists have known

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sin."⁸ They had finally come to see that their technology had caused enormous evil and little good. They recognized that they had crossed a moral line.

Trying to think through the task of establishing limits to technology will be complicated and arduous. But we cannot afford to shrink from it. And we can take some comfort from coming to agreement, across wide ideological chasms, on an ethical starting point and an agreed-upon ethical principle. □

NOTES

1. Francis Bacon refers to this distinction throughout his major work, *Novum Organum* (see *The New Organon, and Related Writings*, Bobbs-Merrill, Indianapolis, 1984). Real science, he argues, does more than collect facts. Fact collection can end in ignorance. Bacon's method provides a direction, first, for experiment and, ultimately, for real knowledge. He rejects empiricism ("fact gathering") at one extreme and rationalism at the other.
2. Aristotle, *The Nicomachean Ethics: Book VI*, Martin Ostwald, trans., Bobbs-Merrill, Indianapolis, 1962, p. 154.
3. Aristotle, *The Nicomachean Ethics: Book V*, p. 131.
4. Thomas Aquinas, *Summa Theologica*, I, II, 94, 3:21, 1c.
5. John Duns Scotus, *Opus Oxoniense*, III, 19; William of Ockham, *Quodlibeta*, III, 9, 13.
6. Isaiah Berlin, *Two Concepts of Liberty: Inaugural Lecture as Chichester Professor of Social and Political Theory*, Oxford University Press, Oxford, England, 1969, p. 132.
7. Marvin L. Minsky, "Will Robots Inherit the Earth?" *Scientific American*, October 1994, p. 271. The complete article, with what the author describes as minor revisions, can also be found at www.ai.mit.edu/people/minsky/papers/sciam.inherit.html
8. J. Robert Oppenheimer said, "In some sort of crude sense which no vulgarity, no humour, no overstatement can quite extinguish, the physicists have known sin; and this is a knowledge which they cannot lose." *The Oxford Dictionary of Quotations*, Oxford University Press, Oxford, England, 1966, p. 449.

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Program Director: Regina M. Clifton

Program Contact: Sr. Mary Fran Flynn, SSND, at 314-253-3417 or mflynn@chausa.org

NOTE: This program was postponed from September 2001.

MAY

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Program Contact: Linda Raney at 314-253-3507 or lraney@chausa.org

NOTE: This program was postponed from September 2001.

AUGUST

3-6 CATHOLIC HEALTH ASSOCIATION-CATHOLIC CHARITIES JOINT MEETING

Chicago

Catholic Health Association-Catholic Charities USA joint meeting to celebrate the 275th anniversary of the common founding of Catholic health care and social service ministries. The joint meeting will start at approximately 1 p.m. on Saturday, August 3 and conclude at noon on Monday, August 5. CHA's abbreviated 87th assembly will start at noon on Monday, August 5 and conclude by 2 p.m. on Tuesday, August 6.

Assembly Director: Joanne Elden Beale

Assembly Information: www.chausa.org or 800-230-7823