of U.S. policy on embryos and concludes that making it more coherent will be a challenge.

I strongly recommend this book for scholarship and for teaching. It contains information that few moral theologians have at their fingertips and renders what can sometimes be expressed as vague concerns about justice in concrete terms. It also furthers what may be the main contribution of the Catholic common-good tradition: envisioning the possibility of real social change. Catholic social ethics has never endorsed a separatist, countercultural agenda, nor abandoned hope of social reform. Papal social-encyclical tradition (see, for example, Leo XIII, *Rerum novarum,* 1891 [implicitly], and John Paul II, *Sollicitudo rei socialis,* 1987, nn. 46, 48) as well as episcopal statements, such as the U.S. bishops' important 1993 statement on healthcare reform, "A Framework for Comprehensive Health Care Reform: Protecting Human Life, Promoting Human Dignity, Pursuing the Common Good," envision bioethics as a socially engaged endeavor, aiming at the transformation of social practices. *Genetics and Ethics* moves this agenda forward.

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McKibben, Bill. *Enough: Staying Human in an Engineered Age.* New York: Henry Holt and Company, LLC, 2003. xvi + 272 pp. Index.

Fifteen years ago, in 1989, Bill McKibben wrote *The End of Nature,* in which he passionately and convincingly argued that we must radically change our way of living so as to drastically reduce the greenhouse emissions that cause global warming. If we do not, he warned, we will experience the end of nature as we have known it—a wild and free place, independent of human influence. Now, in his latest book, *Enough,* McKibben again raises a prophetic voice, this time to warn us about three emerging technologies that have the potential to destroy our very humanity: human genetic engineering, robotics, and nanotechnology.

The book is divided into five simply named chapters: "Too Much," "Even More," "Enough?" "Is Enough Possible?" and "Enough." Each of the five chapters is organized around a broad topic, although there is considerable overlap and cross-fertilization among chapters. The focus of chapter 1 ("Too Much") is on human germline engineering, the technology by which we will have the ability to modify the genetic makeup of our children and thereby shape the future of humankind. McKibben describes how the availability of this technology combined with our competitive, consumerist mindset will all but insure its adoption by society: "If germline genetic engineering ever starts, it will accelerate endlessly and unstoppably into the future" (35). He rounds up the usual suspects—Lee Silver, Gregory Stock, Richard Dawkins, and Francis Fukuyama, for example—and brings in others, too, such as biologist Stuart Newman, philosopher Albert Borgmann, and anti-germline-manipulation crusader Richard Hayes.

Chapter 2 ("Even More") delves into the science-fiction-like world of robotics and nanotechnology. McKibben is concerned with the more futuristic predictions of these technologies. The discussion centers on the predictions of several key personalities in the area of computer science and robotics (Hans Moravec, Rodney Brooks, and Ray Kurzweil) and nanotechnology (Eric Drexler). Futuristic ideas are presented, including: nanorobots (nanobots) that enter the bloodstream and correct health problems, or enter the inner sanctum of the cell (the nucleus) and correct genetic defects; antiwrinkle nanomachines; and universal nano-assemblers that will rearrange matter at the atomic level, converting a pile of grass clippings into a chunk of beef, for example. McKibben also discusses Bill Joy's 2000 article in *Wired* magazine in which Joy expressed concern about the self-replicating capability of genetics, nanotechnology, and robotics, a capability that might

cause out-of-control nanobots in the environment to reduce the biosphere of earth to a mass of "gray goo" in days.[1]

It is here that the reader begins to wonder if the predictions about nanobots, "gray goo," and antiwrinkle nanomachines are realistic. Are they just the dreams of people whose sense of reality has become defined by their computer screens? Just because something can be envisioned does not mean it can happen. There are also legitimate questions about the technical feasibility of nanoassemblers. But, McKibben dismisses these questions and instead writes: "You'd be tempted to say they [these new technologies] are 'science fiction' visions, but that's wrong. They are *science* visions, and in some form or another, they will come true" (108, original emphasis).

It is also here in the second chapter that *Enough*, which otherwise gives a powerful warning, displays at least two weaknesses. First, there are pressing issues related to the health and environmental impact of nanotechnology that need to be addressed right away. It is indeed true that nanotechnology is upon us; it has been heralded as the next industrial revolution and is being heavily supported by the U.S. National Science Foundation and the National Institutes of Health. As with any new technology, one must be concerned about safety. However, the concern about nanotechnology runs deeper because the tiny structures that are being manufactured have never before been seen in nature. Nanostructures, such as buckminsterfullerenes, have unique and powerful surface properties. Because of this, recent studies have shown they can cause changes in cells (generation of reactive-oxygen species and immune-system responses) that in turn lead to extensive tissue damage. Likewise, they can wreak havoc on the environment. These safety issues need to be carefully studied. Unfortunately, McKibben does not discuss them; he instead focuses on the futuristic aspects of the technology. The second criticism is that a preoccupation with futuristic scenarios that likely can never happen detracts from the clear and present danger of human genetic technology, which is upon us now. (Witness the cloning of a viable human embryo this spring by a team of South Korean scientists.) By taking this approach, McKibben has weakened his otherwise strong arguments in the area of genetics and biotechnology.

The core of chapter 3 ("Enough?") is an assessment of the likelihood that biotechnology can solve what McKibben sees as three major problems facing the world today: poverty, illness, and aging. Here, he argues that sustainable organic-farming operating at the level of local communities, not genetically modified crops, will help alleviate poverty and world hunger. In the area of reproductive and genetic technologies, he states that human cloning lies indisputably beyond what he calls the "enough" line, but so-called therapeutic cloning lies squarely on the line. Preimplantation genetic diagnosis (PGD) "walks right up to the line" but does not cross it. McKibben actually puts in a fairly strong plug for PGD, but, in the end, he recommends limiting its use to "the relatively short list of life-or-death genetic diseases" (136). Finally, the discussion turns to aging research, and to the pursuit of the fountain of youth—immortality. McKibben explains that "the dream of immortality is shared by many of the people driving these new technologies forward; it is the secret force pushing them to push the envelope" (146–147). Among these people is Michael West, founder of Geron Corporation and Advanced Cell Technology, Inc., who, in 2001, parthenogenically cloned a human embryo and brought it to the six-cell stage before it died. But much of this discussion of immortality, such as a future scenario involving an immortal humanoid species called *Homo permanens*, borders on the absurd. Like "cruising nanobots" or "mind uploading," immortality is a pipe dream, and giving it validity, as McKibben does here, detracts from issues of vital concern, such as the imminent dangers of human cloning and genetic manipulation.

In chapter 4 ("Is Enough Possible?"), McKibben argues that, despite what some

[1]Bill Joy, "Why the Future Doesn't Need Us," *Wired* 8.04 (April 2000).

people say, we as a society do have the ability to say "no" to these dangerous emerging technologies. He debunks the notions that genetic enhancements are inevitable (Gregory Stock), or that scientists such as Nobel laureate James Watson have any special wisdom when it comes to making the right decisions about technology. He presents historical cases—the Chinese in the fifteenth century and the Amish today, for example—in which societies intentionally have turned their backs on technologies because they were deemed harmful or dangerous.

Finally, in chapter 5 ("Enough") McKibben argues that an embrace of "progress" at all costs is not inevitable, that we instead could choose to *mature* as a species and as a global society, and that maturation is not the same as stagnation. Toward the end of the chapter, he hints at the importance of a seamless love of all life—both natural and human—for a healthy perspective on all of these issues related to technology:

> I can walk out my door and into the woods and hence into the endless repeating cycles of the natural world which offers its own argument and its own consolation. Immortality matters less among the rotting trees and the sprouting saplings, just as "enhancement" matters less among people who take good care of each other. (223)

In the end, is it not a deep appreciation for the ecology of the earth and our grounding in it that is vitally important to making our way through the morass of dilemmas presented to us by genetics, nanotechnology, and robotics? Although there are glimpses here and there, McKibben does not present a cohesive argument for restraint based on ecology. In *The End of Nature*, he wrote about the need for us to live simpler, humbler lives. That message, presented so forcefully fifteen years ago, is largely absent in his latest book. Looking back nostalgically, we read the following quotation in *The End of Nature* from John Muir's *My First Summer in the Sierra*. The passage becomes a kind of prayer for us:

> We are now in the mountains, and they are now in us, making every nerve quiet, filling every pore and cell of us. Our flesh-and-bone tabernacle seems transparent as glass to the beauty around us, as if truly an inseparable part of it, thrilling with the air and trees, streams and rocks, in the waves of the sun—a part of all nature, neither old nor young, sick nor well, but immortal.[2]

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[2]John Muir, quoted in McKibben, *The End of Nature* (New York: Anchor Books, 1999), 74.

Murphy, Nancey, Brad J. Kallenberg, and Mark Thiessen Nation, editors. *Virtues and Practices in the Christian Tradition: Christian Ethics after MacIntyre.* Deerfield, IL: Trinity Press International, 1997. Reprint, Notre Dame, IN: University of Notre Dame Press, 2003. xiv + 386 pp. Indexes. Bibliography.

Alasdair MacIntyre concludes *After Virtue,* arguably one of the most important works in moral philosophy in the twentieth century, with a bleak vision of the future in a society bereft of true moral dialogue. His only hope in "the new dark ages which are already upon us" is the advent of "another ... St. Benedict" (2nd ed. [1984], 263) who will form the kind of small, intentional community that can sustain the virtues and practices on which the intellectual and moral life depends.

The editors of this volume, however, strive to present a more positive vision by seeking to show how the Christian church has and continues to embody the kind of virtue tradition whose loss MacIntyre so starkly laments. The stated purpose of this volume is threefold: first, to describe and situate MacIntyre's meta-narrative of the history of ethics within the Christian tradition of ethical discourse. Second, using MacIntyre's concepts, to articulate the central features of Christian ethics as the expression of Chris-