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The Religion of Technology: The Divinity of Man and the Spirit of Invention by David F. Noble (New York: Knopf, 1997) 274pp. $26.00 (Canada $36.00) hardcover.

In this book David Noble examines the history and contemporary state of the relationship between technology and religion in the Western world. A major theme is the coevolution of scientific instrumental reason and revealed religion; they are not as far apart, he says, as they might appear. Another theme, familiar from an earlier book of his entitled *A World Without Women*, is a study of the reasons why science and technology have traditionally been male domains. Specific technological projects such as artificial intelligence and genetic engineering, which make headlines today, are examined in their ideological assumptions.

In his historical overview of the development of technology, or "the useful arts," as it was once known, Noble deals primarily with the Christian clerical origins of science in medieval Western Europe and takes us up to the present-day USA. He does not discuss scientific developments in, say, ancient Greece or the medieval Islamic civilization. He starts with observations concerning certain

features of Christianity inherited from Judaism: ideological elevation of humanity over nature and of man over woman (as set forth, for example, in the *Book of Genesis*), and messianism. The scientific revolution of the West that took off in the seventeenth century may have been anticlerical (i.e., at odds with the Roman Catholic Church) but was nevertheless very Christian. The vision of the avatars of technology is an eschatological one. Technology became implicated in notions of transcendence and redemption, the attempt of men to recover Adam's divine likeness, reverse the curse of the Fall, and establish the universe of Paradise regained.

The scientific culture we know today started, Noble says, with the Carolingian renaissance of Charlemagne's empire, among orders of monks, and eventually spread beyond the cloister through the efforts of mendicant friars. An early figure in the promotion of study of the useful arts and crafts was Joachim of Fiore, who founded his own order and inspired later movements such as the Franciscans. The monks pursued the "holy labor" of activities such as tanning and blacksmithing. The Benedictines were an order that worked on developing windmills, watermills, and new methods of agriculture.

The spirit of invention in Christian Europe expanded with Renaissance humanism and hermeticism in the works of men such as Marsilio Ficino and Pico della Mirandola. The Age of Discovery that began in the thirteenth century was fueled to a great extent by a vision of evangelical challenge: to convert the Jews, Tatars, and Mongols, then crush Islam for the final victory of Christ. Christopher Columbus subsequently took this challenge on to begin the conquest of the Western Hemisphere. The development of sciences such as geography and astronomy and technologies such as navigation, metallurgy, and weaponry greatly assisted these goals.

The Reformation excited millenarian hopes (though Noble does not discuss this in connection with the great peasant jacqueries of that time), and at about this time the secret occult society of

the Rosicrucians emerged to promote alchemy, divine illumination, and recovery of paradise.

It was in England in the seventeenth century, however, that the scientific revolution started to accelerate as a prelude to both the industrial revolution in that country and the political revolutions in the United States and France. One of the key figures was Francis Bacon. For Bacon, science was always conceived in utilitarian terms. "Truth and utility are the very same thing," as he put it. He was a perfectionist who believed that men are not animals but "mortal gods," and he even predicted that man would create a new species. Bacon inspired educational reforms of the Puritans in the English Revolution, in which everything was to be made practical, but in pursuit of transcendent purpose. Scientific academies and circles such as the Royal Society, the Oxford Club, and the "Invisible College" emerged.

Scientists such as Isaac Newton, Robert Boyle, James Clerk Maxwell, and Charles Babbage (inventor of the "Calculating Engine, forerunner of the computer) were all godly men. The new science was championed by many Anglican churchmen.

The concept of God as craftsman and architect was increasingly influential as the Freemasons came into their own. The Masons, a brotherhood of sons of Adam, had its origins in medieval guilds of stonemasons and in Rosicrucianism. It was in seventeenth century England that what Noble calls "speculative Masonry" emerged (i.e., the guild became a secret society) and developed ties to the Royal Society and Anglican clergy. The Freemasons, among the earliest champions of industrialization, were to become very influential in France and the United States as well. The Masons became identified with engineering (the "civil," as opposed to military, kind) and created the Ecole Polytechnique in France, which was to nurture Henri Saint-Simon, the technophile utopian. Saint-Simon's disciple Auguste Comte, founder of the philosophical school of positivism, called himself the "Bacon of the nineteenth century." The technologies of transport associated with American capitalism—steamboats,

railroads, automobiles, airplanes, and spaceflight—have all seen heavy Masonic involvement.

The main part of Noble's history deals with the march of technology's utopia of progress in the United States, "the new Eden," whose defining myth has been intimately bound to millenarian Protestantism.

Nineteenth-century America was deeply involved in a host of utopian currents that often wedded Christian and socialist concepts, a great stew mixing the evangelical Protestantism of the Second Great Awakening and its legacy with socialist ideas brought over by European emigres. In the United States, scientific and industrial revolution followed fast on the heels of religious revival. Many well-known writers and heroes of invention were quite religious: Samuel F.B. Morse, Edward Bellamy, and Thomas Edison, whom Noble calls "the ultimate utilitarian."

America's scientific mission was brought to a new level during and after World War II with the arrival of atomic scientists fleeing fascism, such as Albert Einstein, and subsequently German scientists who had worked for the Nazis, such as Wernher Von Braun, who converted from the Lutheranism of his upbringing to born-again Christianity upon his transplantation to the USA. The development of rocket science and space exploration occurred against the backdrop of cold war and renewed millenarianism. Winston Churchill described the atomic bomb as "the Second Coming in Wrath." Christian theologians in the United States post-1945 latched on eagerly to the apocalyptic possibilities presented by nuclear weaponry. Billy Graham revived evangelical fervor, and Jerry Falwell preached on nuclear war as the deliverance of Armageddon. Edward Teller, scientific cold warrior, had a "religious dedication to thermonuclear weapons."

Von Braun named the early U.S. space program Adam and explained that it was God's purpose to send his Son to other worlds and bring the gospel to them. NASA became a virtual nest of evangelical belief. During the Christmas Eve 1968 flight of Apollo 8, a

tion of the shape this goal should assume or what he thinks it would take to achieve it. He points out that women were at one time well represented in the useful arts, but were shunted aside and increasingly restricted from Carolingian times on, and largely remain so today. It appears to be not so much technology per se, but technology invested with Judeo-Christian spiritual significance, that he objects to, but he's somewhat vague about this.

At one point Noble describes Marxism as "the most influential Western prophetic system since that of Joachim of Fiore" because it neatly complemented the Christian millenarian promise with its own promise of a world liberated from labor by machines. If this is true (and it is to the extent that Marxism became an ideology—or religion, if you like—of economic development and socialism a crude imitation of capitalism), he has almost nothing to say about it. One reason may be that his focus is on the religion of technology in the United States, where Marxism has had only a very small influence. Had his book concentrated on Europe and Russia, it would have been necessary for him to treat that subject in greater detail. Noble mentions only in passing the Soviet space program, implying that everything worth saying about it is covered in his study of the American space program.

In *The Religion of Technology* Noble mounts a powerful attack on the patriarchal religious aspect of technology. But he makes no effort to connect this to a critique of capital, and largely restricts his critique of technology to a feminist one. Nevertheless, the book is well written and a worthwhile read. As a historian of science Noble seems to know his material very well. His book comes along at a time when there is widespread and growing skepticism about technology and industrialism. The space program no longer generates much popular enthusiasm, anxieties proliferate about cloning and global warming, and evangelical Christian millenarianism appears to be running out of gas. At least, let's hope so.

broadcast was made of the astronauts reading from Genesis, an event that was not spontaneous but carefully planned beforehand. The first astronauts were all devout Protestants, but even Pope Paul VI hailed the Apollo 8 flight as a "millennial event." And during the lunar landing in 1969, Edwin Aldrin held a communion ceremony on the moon. President Nixon called the landing "the greatest week since…the Creation," although Nixon's religious adviser, Billy Graham, had to remind him that he'd forgotten the birth, crucifixion, and resurrection of Christ.

In the section covering the Artificial Intelligence (Al) movement, Noble takes us again back to the seventeenth century, where he finds its origins in Cartesian rationalism. Descartes saw the mind as man's heavenly gift, separate from the body with its burden of mortality: "The body is always a hindrance to the mind in its thinking." He believed it possible and desirable to think without the body. This posed the question of how it might be possible to liberate the immortal mind from its corporeal prison so it could better strive for perfection. Descartes' scientific and mathematical successors looked for ways to codify thought on a precise logical basis and came up with a calculus of reason that would mechanically simulate the human thought process. Noble cites mathematician George Boole and the logical positivists Bertrand Russell and A.N. Whitehead as other, sometimes reluctant, forerunners of the Al concept (Russell was not pleased that theorems from the *Principia Mathematica* could be automatically proved by a machine).

The early engineers of Al, such as Alan Turing, Norbert Wiener, and John von Neumann, started their work during World War II in the Manhattan Project or in decoding German cryptography. Later they went on to various cold war projects in the service of the American military and the national security state. Marvin Minsky, who emerged as the foremost promoter of Al, worked for the military's ARPA (Advanced Research Projects Agency), which was interested in developing high-speed computer simulation of human cognitive processes. The first "virtual communities" (the term ac-

tually used) were of tank crew members working on large-scale, computer-aided armored maneuvers.

The visionaries of Al were wont to make such statements as "Technology will soon enable human beings to change into something else altogether" (Earl Cox) and "The manifest destiny of mankind is to pass the torch of life and intelligence on to the computer" (Rudy Rucker).

Similarly, the goal of the genetic engineers is a pursuit of perfection, a dream that Noble compares to Paracelsus' speculations about creating homunculi, Rabbi Low's creation of the Golem, or God's creation of Adam. Genetics is a fairly young science. Only in the nineteenth century came discovery of the patterns of inheritance of genetic traits according to laws of mathematical probability with the work of Gregor Mendel, an Austrian cleric. At about the same time nucleic acid was discovered. By the middle of the twentieth century, the basic structure of DNA was unraveled and described in a machine-based terminology of codes and information processing. DNA came to be thought of as eternal in a sense, the material basis for immortality and resurrection of the soul.

Some geneticists, in their perfectionism, became proponents of eugenics. A manifesto was produced by Hermann J. Muller in the 1930s proclaiming that the breeding of genius should be a human birthright. Not only could livestock be made to produce more milk and plants be made to grow in colder climates through genetic manipulation, but genes for IQ in humans could be tracked down. In 1969 geneticist Robert Sinsheimer called for a "new eugenics" to bring the unfit up to the highest level. By the 1990s it became possible to isolate genes for certain inherited diseases and to clone human embryos in laboratories.

Sinsheimer was one of the leaders of the effort to establish the Human Genome Project (HGP), which got started in 1990 with federal funding and whose purpose is to map and sequence all the genes of the human body. The community of scientists working on this project describe the human genome as the holy grail of genet-

ics, reports Noble, who remarks upon the enduring influence of the mythology of medieval Christianity in a scientific community that now includes a high percentage of Jews and atheists.

The HGP has many religious supporters. The majority of churches endorse it. The director (as of the book's writing) of the project, Francis Collins, is a member of the American Scientific Affiliation, an evangelical Christian organization. There is even an official dialogue between genetic scientists and theologians.

In conclusion, Noble emphasizes the continuity of the technological brotherhood from monks to hermetic philosophers to Masons to modern engineers, and their elitism and service to official power through the centuries. The new technologies were never meant to be universal and don't truly meet human needs. The roots of ecological crisis lie in the Christian dogma of man's transcendence of nature and the notion that the needs of mortals are not of the most important consequence. Women have not been identified with the religion of technology because Eve, lacking perfection, could not regain it; as the proximate cause of the Fall, woman can only be an impediment to its reversal. At the Resurrection, sex (i.e. the female sex) will disappear and Adamic man will be restored as if he had never sinned. Noble points out that to this day science, and particularly applied science, remains a masculine realm; there are few women in engineering, none at all in the Lawrence Livermore labs, and there weren't until recently women in the space program. Finally, he describes cloning as a product of the desire to turn reproduction into a "chaste male affair" without women. It's not too hard, however, to see that cloning could also be used to reproduce without men. And, surely, if women were equally represented at Livermore Labs, that would hardly constitute a social improvement!

Noble declares, in a strong statement, "Put simply, the technological pursuit of salvation has become a threat to our survival." He modestly hopes to deflate otherworldly dreams of the technocratic elite and "redirect our astonishing capabilities toward more worldly and humane ends," though he offers very little in elabora-