

metric constructions.” The limitations of the analytical techniques (based on precedent and rule of thumb) used to predict the building’s performance and ensure its structural adequacy further reduced the range of acceptable designs.

But not any more, Mitchell writes. “Modern CAD (Computer Aided Design) systems allow designers to create very complex three-dimensional geometric models with ease.” And cheap computer power allows sophisticated analyses and simulations

to be done to predict, reliably and precisely, the performance of even the most imaginative structures.

Architect Frank Gehry’s initial sketches and model for the Guggenheim Museum in Bilbao, Spain, had “an even more audacious assemblage of free-form curved surfaces than Utzon’s,” Mitchell says. But thanks to the digital revolution, Gehry did not have Utzon’s problems. “The completed building—remarkably true to the architect’s first visionary sketches—opened in 1997 to universal acclaim.”

The Genetic Genie

“The Moral Meaning of Genetic Technology” by Leon R. Kass, in *Commentary* (Sept. 1999), 165 E. 56th St., New York, N.Y. 10022.

Are popular fears about genetic technology the product of ignorance? Many scientists say so—but not Kass, a physician-philosopher at the University of Chicago. “The public is right to be ambivalent” about genetic technology, he argues.

Genetic technology differs from conventional medicine. When the technology is fully developed, genetic engineers will deliberately make changes that will be passed on to succeeding generations, and may even be able to alter particular future individuals. Genetic enhancement may allow creation of new human capacities. “The genetic genie, first unbottled to treat disease, will go its own way, whether we like it or not,” Kass believes.

Genetic engineering aside, gaining advance knowledge of an individual’s likely or possible medical future by “reading” his genes may not always be a good thing, Kass observes. “Should we welcome knowledge that we carry a predisposition to Alzheimer’s disease [or] schizophrenia?” Such knowledge could prove inhibiting, even crippling. Without “blind hopes,” human aspiration and achievement may be diminished.

Most genetic technologists imagine themselves to be enhancing people’s freedom in making decisions about their health or reproductive choices. But in reality, Kass contends, genetic power may well curb the freedom of most people, subjecting them even further to “the benevolent tyranny of expertise.” Already, in many cases today, he says, “practitioners of prenatal diagnosis refuse to do fetal genetic screening in the absence of a

prior commitment from the pregnant woman to abort any afflicted fetus.” In other situations, pregnant women are pressured to undergo genetic testing. Eventually, Kass believes, strong economic forces are likely to develop that will work to compel genetic abortion or intervention. “All this will be done, of course, in the name of the well-being of children.”

At the root of popular anxiety about genetic technology, Kass says, is the challenge it poses to human dignity. It puts scientists in the role of God, standing “in judgment of each being’s worthiness to live or die.” And the road from in vitro fertilization “leads all the way to the world of designer babies.” Producing genetically sound babies will mean “the transfer of procreation from the home to the laboratory,” turning it into “manufacture.” This new arrangement, he says, “will be profoundly dehumanizing.”

As genetic engineering progresses, Kass contends, the standard of health by which it is guided will become increasingly vague. “Are you healthy if, although you show no symptoms, you carry genes that will definitely produce Huntington’s disease?” And with the inevitable arrival of “genetic enhancement,” he continues, the standard will vanish along with “our previously unalterable human nature. . . . Because memory is good, can we say how much more memory would be better? If sexual desire is good, how much more would be better? Life is good; but how much extension of life would be good for us?”

Is the Brave New World inevitable? Everything depends, Kass says, on whether the technological approach to life “can be

restricted and brought under intellectual, spiritual, moral, and political rule.” About that, he is not optimistic.

The ‘Digibabble’ Age

Writing in *Forbes* ASAP (Oct. 4, 1999), Tom Wolfe, author most recently of *A Man in Full* (1998), casts a skeptical eye on “the current magical Web euphoria,” in which it is supposed—à la Pierre Teilhard de Chardin, by way of Marshall McLuhan—that global communications will elevate humanity to a new level of consciousness.

May I log on to the past for a moment? Ever since the 1830s, people in the Western Hemisphere have been told that technology was making the world smaller, the assumption being that only good could come of the shrinkage. When the railroad locomotive first came into use, in the 1830s, people marveled and said it made the world smaller by bringing widely separated populations closer together. When the telephone was invented, and the transoceanic cable and the telegraph and the radio and the automobile and the airplane and the television and the fax, people marveled and said it all over again, many times. But if these inventions, remarkable as they surely are, have improved the human mind or reduced the human beast’s zeal for banding together with his blood brethren against other human beasts, it has escaped my notice. One hundred and seventy years after the introduction of the locomotive, the Balkans today are a cluster of virulent spores more bloody-minded than ever. The former Soviet Union is now 15 nations split up along ethnic bloodlines. The very zeitgeist of the end of the 20th century is summed up in the cry, “Back to blood!” What has made national boundaries obsolete in so much of eastern Europe, Africa, and Asia? Not the Internet but the tribes. What have the breathtaking advances in communications technology done for the human mind? Beats me. SAT scores among the top tenth of high school students in the United States, that fraction that are prime candidates for higher education in any period, are lower today than they were in the early 1960s. Believe, if you wish, that computers and the Internet in the classroom will change all that, but I assure you it is sheer Digibabble.

Is Science Education Irrelevant?

“The False Crisis in Science Education” by W. Wayt Gibbs and Douglas Fox, in *Scientific American* (Oct. 1999), 415 Madison Ave., New York, N.Y. 10017–1111.

Ever since *Sputnik* was launched in 1957, there have been repeated cries that American elementary and secondary science education is in “crisis.” Supposedly, runs the repeated complaint, it is failing, or on the verge of failing, to produce enough scientists and engineers to assure continued U.S. economic and scientific dominance. Nonsense, assert Gibbs and Fox, a senior writer for *Scientific American* and a freelance science writer, respectively. Indeed, they argue, American schools are *too* devoted to turning out future scientists. They should be reoriented toward producing scientifically literate citizens.

Science education in the public schools traditionally has worked to filter out all students except the brightest and most motivated, according to Paul DeHart Hurd, an emeritus professor in Stanford University’s School of Education. The curriculum is heavy on formulas, jargon, and memorization—bound to put off all but the most committed youngsters.

At the universities, further filtering takes place, Gibbs and Fox note. Of the 305,000 students who took introductory college physics courses in 1988, only 1.6 percent went on to get a bachelor’s degree in the subject. And of those nearly 4,900 physics