A Quantum Jump for Computers?

"The Best Computer in All Possible Worlds" by Tim Folger, in *Discover* (Oct. 1995), 114 Fifth Ave., New York, N.Y. 10011–5690; "A Quantum Leap for Computers?" and "Computer Scientists Rethink Their Discipline's Foundations" by James Glanz, in *Science* (July 7 and Sept. 8, 1995), American Assn. for the Advancement of Science, 1333 H St. N.W., Washington, D.C. 20005.

Computers are getting faster and more powerful all the time. They are also approaching their design limits. Shrinking circuits to make them run faster, explains Glanz, a staff writer for *Science*, also makes it harder to connect components, and increases the heat generated by electrical resistance. A different sort of obstacle may appear in the form of quantum mechanics. "At very small scales," Glanz says, "electrons behave not as point particles but as waves. And that makes them hard to handle."

Will computing then have become all that it can ever be? Not necessarily. Physicists and computer scientists recently have begun to explore the possibility that quantum mechanics, instead of being an obstacle, could be a way of taking computing into a new realm, one far removed from transistors, resistors, and wires.

By the strange laws of quantum mechanics, Folger, a senior editor at *Discover*, notes, an electron, proton, or other subatomic particle is "in more than one place at a time," because individual particles behave like waves. Ten years ago, Folger writes, David Deutsch, a physicist at Oxford University, argued that it may be possible to build an extremely powerful computer based on this peculiar reality. In 1994, Peter Shor, a mathematician at AT&T Bell Laboratories in New Jersey, proved that, in theory at least, a full-blown quantum computer could factor even the largest numbers in seconds—an accomplishment impossible for even the fastest conventional computer.

Several scientists are now trying to build a quantum computer. "In conventional computers, the presence or absence of electric charge on a circuit element like a transistor stands for a zero or a one in binary code," Folger notes. "At its simplest level, a computer works by storing or changing these binary numbers as it carries out its calculations." One approach of the quantum mechanics researchers is to use lasers to make the ions in an electromagnetic field jump between two quantum energy states. "The excited state represents a one in binary code," Folger explains, while "the ground, or lower, energy level is a zero."

The quantum computer is only one of the unconventional possibilities that researchers are now exploring. Another is a biochemical computer based on DNA. It's all enough to make even a computer scientist's head spin. "It's going to be a while," comments Richard Lipton of Princeton University, "before we know what a computer is again."

The Silicone Disaster

"Are Breast Implants Actually OK?" by Marcia Angell, in *The New Republic* (Sept. 11, 1995), 1220 19th St. N.W., Washington, D.C. 20036; "A Confederacy of Boobs" by Michael Fumento, in *Reason* (Oct. 1995), 3415 S. Sepulveda Blvd., Ste. 400, Los Angeles, Calif. 90034–6064; "Anti-Medicine Man" by Henry Miller and "Implanting Fear" by B. D. Daniel and Michael Weiss, in *National Review* (Oct. 9, 1995), 150 E. 35th St., New York, N.Y. 10016.

When in 1992 Food and Drug Administration (FDA) commissioner David Kessler banned silicone breast implants because they had not been proven safe, he set off a stampede of alarmed women and lawyers. In the next two years, some 1,000 attorneys filed more than 16,000 lawsuits on behalf of women with breast implants. Dow Corning and the other major manufacturers, maintaining that the devices were safe but fearful of ruin, agreed in 1994 to a $4.25 billion class-action settlement (with the attorneys getting one-third). More than 440,000 women registered for the settlement, of whom roughly 70,000 said they were ill. The anti-implant crusade may expand to include various other medical implants, such as the contraceptive Norplant, which also makes use of silicone.

Angell, the executive editor of the *New England Journal of Medicine*, is only one of the most prominent of those who say that the crusade is misbegotten: when Kessler made his decision, there was little or no scientific evidence of any link between silicone breast implants and disease.

Two FDA advisory panels had pointed out the absence of scientific evidence, but the FDA chief ignored their advice. Since then, studies have begun to pile up (including a major one of nearly 90,000 nurses) showing, in Angell's words, "that any risk of connective tissue [or autoimmune] disease from implants is so small that it has been impossible to detect."

Why did Kessler impose the ban? Angell says that, like some feminists, he "seemed disdainful of women who wanted breast implants for purely cosmetic reasons," and so may have held the devices to "an impossibly high standard: since there are no benefits, there should be no risks." But before the FDA ban, surveys indicated that the vast majority of women who had had breast implants were pleased with the results, notes Angell.

The effect of the accumulating scientific evidence on the legal situation is unclear. Dow Corning had agreed to pay half of the $4.25 billion class-action settlement, but subsequently went bankrupt, and the settlement collapsed. Dow Chemical Company never made, tested, or sold the breast implants—but because it was one of Dow Corning's parent firms, it is a defendant in more than 13,000 breast-implant lawsuits. In October, a Nevada jury ordered Dow Chemical to pay $14.1 million in damages to a breast-implant plaintiff.

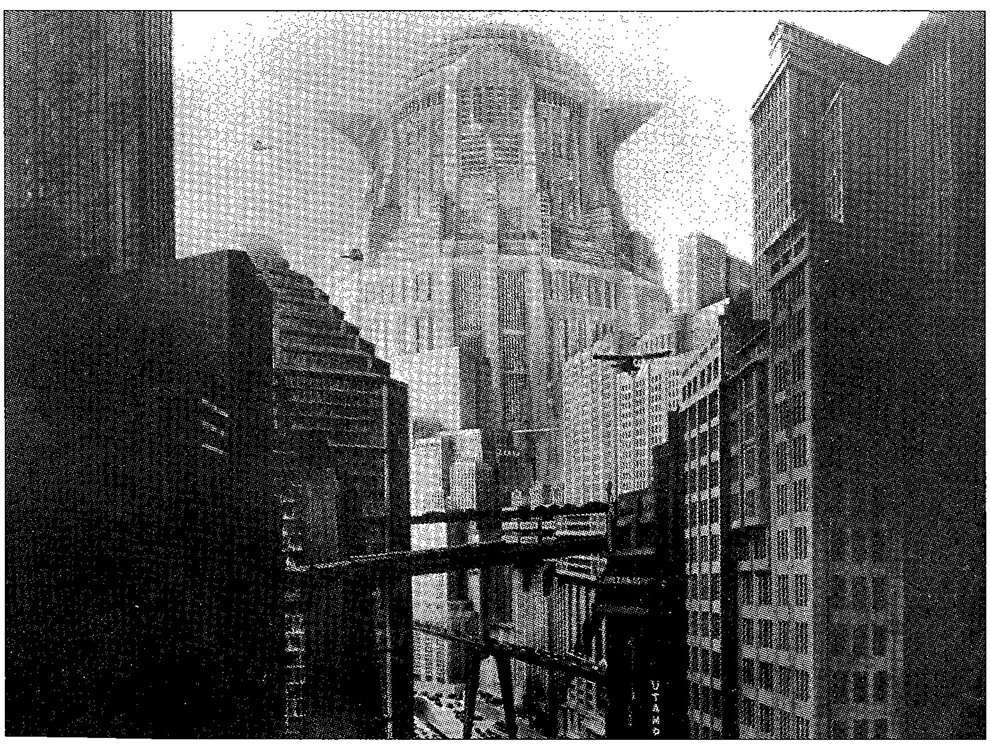
The consequences of all the litigation set off by the FDA ban may be far-reaching, the authors say. If fearful manufacturers of other medical devices, with or without silicone, pull out of the business, warns Fumento, a science journalist, "the future health of millions of Americans" may be threatened.

Toward the High-Tech City

"Bring Back the Urban Visionaries" by David Gelernter, in *City Journal* (Summer 1995), Manhattan Institute, 52 Vanderbilt Ave., New York, N.Y.10017.

In 1940, an express train could speed passengers from New Haven, Connecticut, to Grand Central Station in Manhattan in 90 minutes. In the 55 years since then, not only has no progress been made in reducing that time, but there is no express train—and the trip takes an hour and 41 minutes. Gelernter, a computer scientist at Yale University, blames such failures to advance on the absence of urban visionaries.

Technology could improve transportation and otherwise make city life better, Gelern-



A vision of the city in the year 2000, from Fritz Lang's Metropolis, *a 1926 German film.*