

his doctorate from the University of California at Berkeley in 1993, is the large role that Kant himself gave to anarchy and conflict in bringing about the liberal peace.

In “Perpetual Peace” (1796), Kant argued that republics were inherently inclined toward peace, since citizens are more reluctant than kings to declare war. Republics could establish the rule of law among themselves by creating a federation of free states. War and the threat of war, in Kant’s view, serve as the “most essential” force for peace. “The growth of republics, and of the rule of

law among them (embodied in their federation),” Huntley explains, “is not an intentional creation as much as a gradual product of accumulating self-interested reactions to lawlessness and violence. Conflict is the fountainhead of progress—and so the propensity for war itself sows the seeds of war’s end.”

But “perpetual peace” was an ideal that might be destined, Kant said, “forever to remain a pious hope.” Since backsliding by a republic was always a possibility, peace would never be perfectly secured.

## SCIENCE, TECHNOLOGY & ENVIRONMENT

### *Too Pretty to Be True?*

“Do We Have the Structure of DNA Right?” by Robert Root-Bernstein, in *Art Journal* (Spring 1996), College Art Assn., 275 Seventh Ave., New York, N.Y. 10001.

The double helix of DNA (deoxyribonucleic acid) is one of the icons of the modern age. What most textbooks do not reveal, says Root-Bernstein, a professor of physiology at Michigan State University, is the real possibility that this is *not* the structure of DNA.

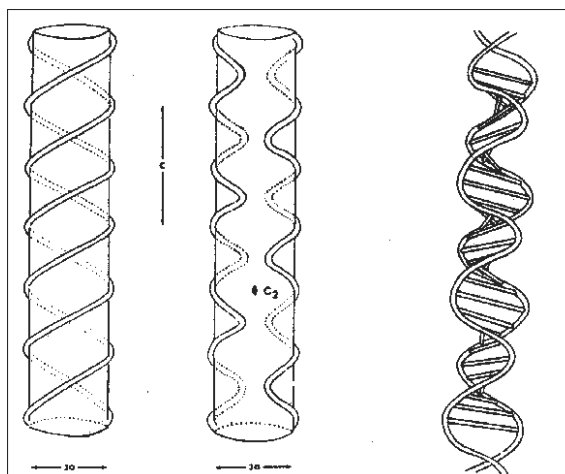
times since. However, the famous double-helix model remains “a bit doubtful,” Root-Bernstein says.

A big problem is that it is not clear how a DNA double helix is unwound so as to allow it to be replicated. Unwinding the DNA strands within the cell nucleus, Root-Bernstein says, would be like unwinding several hundred kilometers of twisted strands with the thickness of fishing line, inside a basketball: “Where does the energy come from to perform the unwinding of the strands? What mechanism can be imagined that could perform such a feat, even if the energy were available to do it?”

Watson and Crick themselves recognized in 1953 that the unwinding problem was “formidable,” and they noted a possible alternative to the double helix: a “ribbonlike” or “side-by-side” structure, in which the two chains were joined together by the base pairs but did not twist about each other. But the double helix, Root-

Bernstein says, had an aesthetic appeal for the two scientists that the ribbon-like alternative did not. As Watson himself often said, the double helix “was too pretty not to be true.”

Nevertheless, it may not be true, as some scientists have argued since the 1970s. Most researchers, however, cling to the double helix, avoiding the unwinding problems, Root-Bernstein says, by asserting “that the



DNA puzzle: Do the chains twine around each other (left), or are they “side-by-side” (center) and joined by base pairs (right)?

Biologists James Watson and Francis Crick proposed the double helix (with two chains twining around each other, connected by “steps” formed by pairs of nucleic-acid bases) as the structure in 1953, and later won the Nobel Prize for their work. Most features of their proposal—including the base-pairing idea, which is the basis for how information is encoded in genes—have been verified many

## *Silicon Real Estate*

Gordon E. Moore, chairman of Intel Corporation, proposes in *Daedalus* (Spring 1996) an arresting image of the semiconductor.

*Our industry sells an area on the silicon wafer for about a billion dollars an acre; this has remained roughly constant since the advent of the integrated circuit. By making things smaller, development density is increased. More function can be built on a given area, causing the price of electronic functions to be cheaper and cheaper.*

strands are repeatedly broken and reattached by enzymes during the replication process.” Such mechanisms may be nature’s ad hoc

way of sidestepping the problems with the double helix, he observes, but they hardly enhance its aesthetic appeal.

## *Electromagnetism Unplugged*

“Apocalypse Not” by Jon Palfreman, in *Technology Review* (Apr. 1996), Bldg. W59, Massachusetts Institute of Technology, Cambridge, Mass. 02139.

For more than 15 years, some scientists, journalists, and activists have been warning that the electromagnetic radiation generated by electric power lines may cause cancer or other diseases. Journalist Paul Brodeur, in a much-noted series in the *New Yorker* (and later in a book, *The Great Power-Line Coverup* [1993]), wrote about a high incidence of cancers among the residents of a Connecticut street and the staff of a California school, both near power substations. Despite such “smoke,” there is no convincing evidence of any “fire,” maintains Palfreman, a senior producer at WGBH, Boston’s public TV station, where he specializes in medical-political issues.

Of some four dozen epidemiological studies, he points out, none have established any cause-and-effect relationship between proximity to electromagnetic fields and disease. The high incidence of cancer Brodeur found, Palfreman notes, could well be simply the result of chance.

The proposition that power lines’ electro-

magnetic fields cause cancers or other diseases is unlikely in the first place, Palfreman says, given the extensive existing knowledge about the interaction of such fields with living tissue and what one physicist calls the “absolutely minuscule” strength of the fields involved. “Cancer is usually caused when very energetic radiation, or some chemical agent, directly breaks or rearranges DNA,” he observes. “But the forces holding DNA molecules together are millions of times larger than any force that electromagnetic fields from power lines could produce.”

Laboratory studies conducted as part of a \$65 million federal program under the auspices of the National Institute of Environmental Health Sciences have so far failed to find any adverse health effects in lab animals from electromagnetic fields.

“Even if we suppose that magnetic fields from power lines do cause cancer,” Palfreman points out, “the fact that the connection has been so hard to prove means that, by definition, the risk cannot be large.”

## *The Tinted City*

“City Lights” by James Bradley, in *Metropolis* (April 1996), 177 E. 87th St., New York, N.Y. 10128.

Since the 1970s, America’s cities have literally been cast in an entirely new light. During that decade, municipalities across the country began replacing their old incandescent and mercury-vapor streetlights with

more energy-efficient, high-pressure sodium lamps. The change, says Bradley, a New York writer, has hurt city street life.

The sodium lamps emit a yellowish light that casts a strange, muddy pall over the