cool, costly cryogenic equipment is required on the train cars. "The German maglev uses conventional electromagnets rather than superconducting ones, but the system is inherently unstable because it is based on magnetic attraction rather than repulsion," Post says. In both systems, a malfunction "could lead to a sudden loss of levitation while the train is moving." Minimizing that hazard means increased "cost and complexity."

The Livermore approach uses permanent room-temperature magnets, powerful kin to the familiar refrigerator magnet and once thought inadequate to the levitational task. "On the underside of each train car," explains Post, "is a flat, rectangular array of magnetic bars called a Halbach array" (after its inventor). With the bars in that special pattern, the magnetic-field lines combine to produce a very strong field below them.

The other critical element in the "Inductrack" (as the new maglev system is called) is track "embedded with closely packed coils of insulated wire." When the train cars move forward, the magnets arrayed beneath them induce currents in the track's coils, which in turn generate an electromagnetic field that repels the Halbach arrays, lifting the train. "As long as the train is moving . . . a bit faster than walking speed," the arrays "will be levitated a few centimeters above the track's surface." Side-mounted Halbach arrays provide lateral stability. Because the levitating force increases as the magnets get closer to the coils (if the train is carrying a heavier load, for instance, or rounding a bend), this maglev system is "inherently stable," Post says.

What would happen if the drive power suddenly failed? "The train cars would remain levitated," Post says, "while slowing down to a very low speed, at which point the cars would come to rest on their auxiliary wheels."

A 1997 study concluded that an Inductrack system would be cheaper than the German maglev, and "proved that the concept is workable," Post says. And it may work for more than high-speed rail: The National Aeronautics and Space Administration thinks the Inductrack approach could prove helpful in getting rockets off the ground.

Nuclear Power Lives!

"The Need for Nuclear Power" by Richard Rhodes and Denis Beller, in *Foreign Affairs* (Jan.–Feb. 2000), 58 E. 68th St., New York, N.Y. 10021.

Nuclear power, which seems to generate more fear than electricity, is yesterday's energy source, its critics contend. On the contrary, it's very much alive and on the verge of coming into its own, argue Rhodes, author of *The Making of the Atomic Bomb* (1986), and Beller, a nuclear engineer who works at the Los Alamos National Laboratory.

Though the number of U.S. nuclear power plants has fallen from 111 in 1990 to 104, today's plants generate more electricity. Still the world's biggest producer of nuclear energy, the United States gets 20 percent of its electricity from reactors.

Nuclear power's role is even larger in other nations, such as Sweden (42 percent) and France (79 percent). "With 434 operating reactors worldwide, nuclear power is meeting the annual electrical needs of more than a billion people," Rhodes and Beller point out.

But two billion people--one-third of the world's population–currently have no access to electricity. As global energy demand grows, the authors say, so will the role of nuclear power. The British Royal Society and Royal Academy of Engineering recently predicted that worldwide energy consumption will at least double in the next half-century, posing an awesome environmental challenge: how to limit surface and air pollution and global warming.

The "worst environmental offender" (leaving aside petroleum, the leading energy source, used mainly for transportation), say Rhodes and Beller, is coal, which supplies about a fourth of the world's energy today. In the United States alone, according to recent Harvard University studies, pollutants from burning coal cause about 15,000 premature deaths a year. Besides toxic particles and noxious gases (such as sulfur oxide and carbon monoxide) that contribute to acid rain and global warming, burning coal releases mildly radioactive elements, including uranium. Were U.S. coal plants subjected to the same safeguards and restrictions on radioactive emissions as nuclear utilities are, Rhodes and Beller say, "coal electricity would no longer be cheaper."

Renewable energy sources also result in "significant, if usually unacknowledged" harm to the environment, the authors say. Making photovoltaic cells for solar collection, for example, produces highly toxic waste metals and solvents. A 1,000-megawatt-electric solar electric plant, over a 30-year lifetime, would generate 6,850 metric tons of hazardous waste from metals processing alone.

"Natural gas has many virtues as a fuel compared [with] coal or oil, and its [22 percent] share of the world's energy will assuredly grow," write the authors. But supply is limited, and it pollutes the air.

"The great advantage of nuclear power," Rhodes and Beller aver, "is its ability to wrest enormous energy from a small volume of fuel." One metric ton of nuclear fuel produces as much energy as two to three million metric tons of fossil fuel—and with less danger to the environment. Unlike fossil fuel plants, nuclear power plants release no noxious gases or other pollutants into the environment.

As for the radioactive nuclear waste, Rhodes and Beller say that the risk from *low-level* radioactive waste is negligible, while the relatively small volume of *high-level* radioactive waste "can be meticulously sequestered behind multiple barriers."

Unlike coal's toxic waste, which stays toxic, Rhodes and Beller write, the radioactive nuclear waste "decays steadily, losing 99 percent of its toxicity after 600 years—well within the range of human experience with custody and maintenance, as evidenced by structures such as the Roman Pantheon and Notre Dame Cathedral."

ARTS & LETTERS

The Culture Totem

"What We Talk about When We Talk about Culture" by Matthew Greenfield, in *Raritan* (Fall 1999), Rutgers Univ., 31 Mine St., New Brunswick, N.J. 08903.

For many in the tribe of literary critics, cultural studies is now the rage. The very word *culture* has taken on high totemic status, with "an almost magical power to confer authority and assuage anxiety," notes Greenfield, an English instructor at Bowdoin College, in Brunswick, Maine. "Merely to pronounce the word expands the territory of literary criticism," at the same time warding off doubts about the field's basic worth. It lets English professors venture into far-flung areas to take up subjects such as the "intertextuality" of rock 'n' roll or the history of images of physical disability. Universities, academic disciplines, and even campus bookstores have been busily rearranging themselves to show proper obeisance. Meanwhile, contends Greenfield, culture's intellectual day may be passing.

The concept of culture invariably shifts the focus away from "the agency and intention of individuals and toward the mapping of larger structures," he notes. Borrowing the concept from anthropology, literary critics often employ a "simplified, distorted, or undertheorized version" of it, with the vagueness quite possibly only enhancing its "tremendous authority" in the field. Literary critics see *culture* as collective "games," as collective "performances," or, most commonly, as like a "text"—and therefore susceptible to literary interpretation.

But as critics shift their focus away from individual writers, toward "larger cultural systems," they run into difficulties, Greenfield says. One is how to explain historical change, in Marxist or other terms, when the cultural theories presume a "culture" with a coherent function or structure that is static or at least resistant to change.

Second, he says, the concept of culture is at odds with literary critics' current convic-