

ENVIRONMENT

Terraforming Earth

IN THE FACE OF CLIMATE CHANGE, A FOUNDING FATHER OF THE GREENS ARGUES, THE MOVEMENT MUST EMBRACE WHATEVER WORKS—EVEN IF THAT HAPPENS TO BE NUCLEAR POWER, MASS URBANIZATION, OR GENETIC MODIFICATION.

By **Mark Williams Pontin**

The environmental left, futurist Stewart Brand argues in *Whole Earth Discipline*, needs to view the world afresh. Once it has done so, he writes, it is likely to see that many of its most cherished notions are inconsistent with reality. It might see nuclear power as a plausible answer to our need for carbon-free energy, for instance. It might decide that DDT isn't so bad after all. It might be more open-minded about ideas like genetic modification, mass urbanization, and geoengineering.

Fat chance, one may suspect. In his acknowledgments, Brand notes that his book began as a piece called "Environmental Heresies" in *Technology Review's* May 2005 issue. The faithful subsequently assailed him for imagining an environmentalist movement that embraced, in his words, "Green biohackers, Green technophiles, Green urbanists, and Green infrastructure rebuilders." The reaction provided ample evidence for Brand's contention here that default green thinking is "too negative, too tradition-bound, too politically one-sided for the scale of the climate problem."

Brand's position is notable because of his historical significance: he was the lifestyle guru who, in 1968, launched the *Whole Earth Catalog*, a publication whose covers often featured a picture of Earth seen from space and whose pages advocated the transformation of the planet through people's use of ecologically friendly tools. The publication continued into the 1990s and did as much as anything else during the last century to introduce eco-awareness to the masses.

Forty years ago, Brand believed cities were bad things, and the good thing—was a rural lifestyle. Now, he passionately believes that cities are beneficial for both people and the planet. Then, Brand was antinuclear. Now, he writes: "Greens caused gigatons of carbon dioxide to enter the atmosphere from the coal and gas burning that went ahead instead of nuclear."

A statement like that amounts to an apostasy of sorts, and *Whole Earth Discipline* presents Brand's reasons for it. Given the question in any reasonable reader's mind—if Brand was wrong then, why is he right now?—this occasionally makes for droll reading.

Overall, however, Brand deserves credit for forthrightly stating that "when the facts change, I change my mind." He deserves credit, too, for asking to be held accountable for his book's predictions and for providing a website, Longbets.org, where one can go to tell him that he's wrong.

What changed his mind? Reality. Brand is a cofounder of the Global Business Network (GBN), a consulting firm that offers multiple scenarios, prepared by experts and insiders, to help companies, nongovernmental organizations, and governments plan strategically. One frequent GBN client has been the Pentagon's Office of Net Assessment, directed by the 88-year-old semilegendary futurist Andy Marshall.

In 2003, Marshall's office asked GBN for scenarios of abrupt global climate change. The data, from temperature indicators embedded in ancient Arctic ice, showed

that temperatures had been known to shift with shocking speed. Brand realized, he says, that "climate change wasn't something remote, but could happen anytime—and fast." Our species has burned half a trillion tons of carbon since the Industrial Revolution began and could burn an equal amount in the next 40 years as China and India arrive at the First World banquet table. Brand realized. He understood that the planet might warm as much as five degrees before the end of the century. The most recent data support him: a 2009 study by the MIT Joint Program on the Science and Policy of Global Change indicates a median probability that Earth's surface temperature will rise 5.2 °C by 2100. One of the coauthors, Ronald Prinn, reports: "There's significantly more risk than we previously estimated."

Brand acknowledges that the consequences of climate change and climate policies remain uncertain: some stabilizing factor in the planetary ecosystem might mitigate the heating effects of our carbon emissions. "Counting on that, though, would be like playing Russian roulette with all the chambers loaded but one," he writes.

Hence, Brand has come to the position that humanity must be unbiased in its resolve to do whatever works. He opposes doctrinaire forms of environmentalism like the campaign to globally ban the pesticide DDT—a decision that, according to malaria expert Robert Gwadz of the National Institutes of Health, contributed to the deaths of 20 million children worldwide. Most pernicious, in Brand's view, greens have resisted nuclear power, claiming that renewable sources of energy like wind and solar will one day generate all the grid electricity we now derive from fossil fuels.

Given the current capabilities of those renewable technologies, Brand thinks, that's highly unlikely. A large coal-fired plant, a hydroelectric power station, and a nuclear reactor each might have one gigawatt (a billion watts) of generating capacity. To achieve the same capacity, a wind farm would need to cover more than 200 square miles; a solar

WHOLE EARTH DISCIPLINE: AN ECOPRAGMATIST MANIFESTO
By Stewart Brand
Viking, 2009

array, more than 50. That's a *big* footprint for renewables.

Admittedly, those estimates are disputed. Michael Totten, chief advisor on climate and energy at Conservation International in Arlington, VA, says that wind turbines have the smallest footprint of all energy technologies and that all current U.S. electricity consumption could be met with 400,000 turbines, each with two megawatts of capacity, placed over just 3 percent of the 1.2 million square miles of the Great Plains. If those turbines were hypothetically squeezed into one space, the footprint would cover just six square miles.

Mark Jacobson, a Stanford professor of civil and environmental engineering, confirms Totten's numbers. Footprint,



WHOLE EARTH DOLLARS In a June 1971 photo, Stewart Brand celebrates the "last" edition of the *Whole Earth Catalog* by donating \$20,000 in cash in San Francisco. Publication would continue occasionally into the 1990s.

Jacobson says, shouldn't be confused with spacing—the area between devices or around generator plants, which is usable for multiple purposes, like farming or wildlife refuge. If 50 percent of the world's energy needs were met by wind in 2030, Jacobson says, the footprint would be less than 50 square kilometers, although the spacing would require 1 percent of the planet's surface. Totten says, "Brand's arguments are blatantly wrong about wind and solar, as though he simply assembled in book form

what he's heard over the years from GBN's biggest customers."

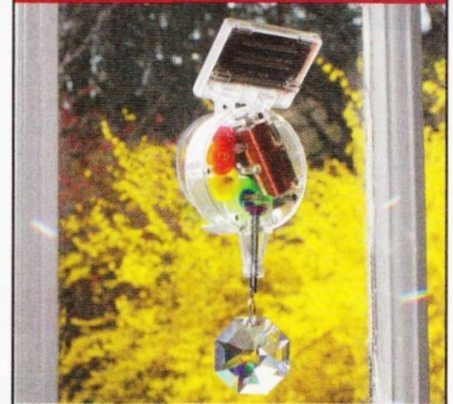
Arguably so. But asked about nuclear power, Totten invokes the prospect of Chernobyl-style meltdowns and reactors smashed open by terrorist-piloted planes. Reminded that these are technical impossibilities for modern reactor designs, he switches to an economic argument: nuclear plants are so expensive that the industry always requires government subsidies (*see "Nuclear Power Renaissance?" November/December 2009 and at technologyreview.com*).

But it's notable that in the 1970s, before regulations made construction costs skyrocket, nuclear energy provided America's cheapest electricity. Nor should we forget that France gets more than 75 percent of its electricity from nuclear power, emits two-thirds less carbon dioxide per capita than the United States, and is the world's largest net exporter of electricity—earning \$4 billion annually—thanks to its very low cost of generation.

Brand says it's entirely predictable that many greens neither know nor are interested in educating themselves about recent developments like new reactors or cleaner fuel cycles: "As far as they're concerned, nuclear had been stopped, they're glad it was, and now that it's happening again, they're confused and upset." That observation strikes at the heart of the matter. If today Greenpeace and an entire generation of activists simply cannot accept that nuclear power might be the most credible source of carbon-free energy, it's because doing so would entail an almost unbearable recognition: that a very large part of their life's work has been fundamentally, disastrously wrong, and that by obstructing the transition to nuclear back in the 1970s, they bear direct responsibility both for global warming and for the hundreds of thousands of deaths that have since resulted from coal-related pollution. It is to Stewart Brand's credit that he can recognize that disturbing truth. **TR**

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