

can TECHNOLOGY save the planet?

OUR OPPOSABLE THUMBS GOT US INTO THIS MESS, AND THEY CAN HELP GET US OUT, SAYS FUTURIST AND SCIENCE FICTION WRITER **BRUCE STERLING**.

MASSIVE TECHNOLOGICAL CHANGE IS COMING. Are we ready? Given the pace of technological innovation we have experienced in the past 50 years, by mid-century we will have an infrastructure as radically different from today's as industry in 1900 was from that of 1700.

If we handle the huge transition correctly, it will be worth cheering. In 50 years, nature will be less oppressed, culture will be wiser, government will take new and improved forms, industrial systems will be more efficient and capable, and business will be less like a rigged casino. Purveyors of art, fashion, and design will see what went on nowadays and bust a gut laughing in derision. Our children and grandchildren will get up in the morning, look at the news, and instead of flinching in terror, they will see the edifying spectacle of the world's brightest people transparently solving the world's worst problems. This sounds utopian, but it could soon be everyday life.

To achieve this victory, we need to understand technology with a depth of maturity that humans have never shown before. We tend to obsess over newfangled discoveries: the radio age, the space age, the atomic age, the computer age. We need to stop fussing over these tiny decades-long "ages" and think historically and comprehensively, employing technology as a means to preserve the web of life rather than for its own sake. The Iroquois considered the impacts of their decisions on seven generations, and so can we.

Thanks to information technology, we can already track what previous generations have sown. According to the United Nations' Millennium Ecosystem Assessment, a four-year research effort by more than 1,300 scientists, nearly two-thirds of the world's ecosystems are being degraded because the human race is living beyond its means. Without substantial changes in policies and practices, they contend,

Earth faces an environmental disaster that will threaten all people in the 21st century.

Understand this timeline, and there are only three basic kinds of technology that are truly worth our attention. None of them is entirely possible now. It is our task to invent them.

THE FIRST AND MOST SENSIBLE TECHNOLOGY is one that does its work and then eventually rots and goes away by itself. Its core materials and processes are biodegradable, so it's self-recycling. Writer Janine Benyus talks about "biomimetic" technologies; architect William McDonough describes "cradle to cradle" production systems. This means harnessing the same biochemical means of production that built the natural world and using them to create industries, cities, products, everything. It means the industrial use of new materials with the sturdy, no-nonsense qualities of spider silk, mussel glue, coral, seashell, horn, bone, and timber. It means room-temperature industrial assembly without toxics: no foundries, no pesticides, no mercury. When an object made by these processes is abandoned or worn out, it becomes part of the biosphere.

This is already happening, but too often in

by Bruce Sterling



uncontrolled ways. The shell of my desktop computer is made of aging plastic; its chips and wiring overheat and off-gas. It's becoming part of the biosphere as I type and blast electricity through it. And I'm busily inhaling those tiny bits of computer debris. I have to pray that they're not slowly accumulating somewhere deep in my tender anatomy. The designer of Apple's Macintosh died this year of pancreatic cancer. I don't blame his Mac; Silicon Valley is notorious for its Superfund sites. The leaders of America's computer revolution have been living in a stew of toxic debris. That's no way to build an industry.

The second kind of technology is monumen-

tal. These are artifacts built to outlast the ages—artifacts with the honest, solid design demanded by, say, craftsman William Morris and art critic John Ruskin. In theory, monuments reduce the human load on the environment because they are “consumed” only over many generations. With no planned obsolescence, they're very thrifty, and they never go away. Compare the quality and livability (and asking price!) of a New York City “Classic Eight” apartment built at the turn of the last century to a postwar pop-up in the suburbs. Look at Union Station in Washington, D.C., still a public-transit hub nearly a century after being built—or the Louvre and Notre-Dame, still in use some 500 and 800 years, respectively, after construction.

As much as I like antiquity, monuments are very hard to design and build. (And in some cases, permanence is undesirable. People sometimes want a chance to change their minds, their locales, and their circumstances.) While many designers have sought lasting so-

lutions for technological problems, the fact is that most technology isn't as durable as a great building. You can use a century-old hand tool or wheelbarrow that performs as beautifully as it did the day it was made, but the hope for a perfect and lasting solution also led Dieter Rams of the German firm Braun to design a permanent player for vinyl records. Bach, Mozart, and Beethoven left monumental achievements. But a record player? Mere hardware should be a servant to humanity, not a cenotaph.

Then there's the third kind of decent technology, a cybernetic industrial base. Imagine a fully documented, trackable, searchable system in which the computer revolution has permeated manufacturing, inventorying, and transporting. Every manufactured object is bar-coded, scanned, and tracked throughout its lifetime. Consider a Dell computer: It doesn't even exist until you place your order, setting in motion a tightly controlled manufacturing and delivery process. (On a smaller scale, I can keep track of my writing—material stored on my hard disk—using a Google search. Eventually I hope to be able to Google my misplaced car keys.) While this sounds like Big Brother, when it comes to managing the resources that go into industrial processes, such hyper-control creates great economic and environmental efficiency. Imagine a whirring technology that would keep full track of all its moving parts and, when its time inevitably came, recycle itself.

The main advantage of this "Internet of Things" would be the ways in which it would transform our relationships to our possessions.



Emerson mourned that "things are in the saddle and ride mankind." But in an Internet of Things, objects are not burdensome; they are incidental. An Internet of Things would be as different from today's industrial status quo as Google is from the 1910 *Encyclopaedia Britannica*. It would mean a truly dizzying world that would stun us the way a Victorian would be blown away by television.

I HAVE FEW ILLUSIONS about the ways people interact with technology. So let me be clear: Society's problems do not get solved by merely inventing new stuff. Breakthroughs are easy to publicize, but genuine environmental victory means annihilating some major evils perpetrated by our great-grandparents. The bad old stuff has to be torn up and junked.

That requires changing the way we understand technology. Right now the term *technology* simply means "things invented since I was born." These can be itchy and frightening things, freighted with unknown implications for good or ill. They're things of shock, awe, wonder, and suspicion. They're headline makers.

Technologies invented before I was born are basically invisible to me. It scarcely matters how powerful and dangerous they are. Since I'm used to them, I'm blind to them. I regard them as normality, the fabric of the universe.

Today nobody calls railroads *technology*. They are thought of as old-fashioned, cuddly objects with praiseworthy public-transit applications. But when railroads were young, they did most every fearsome thing we dread from new technologies. They exploded and derailed with horrific regularity. They turned cities inside out. They caused financial booms and panics, massive government corruption, vast migrations, wildfires, pollution, and the comprehensive slaughter of the American bison. Railroads were hell on wheels.

Yet railroads are still powerfully transformative, just as they were when every red-blooded boy wanted to be Casey Jones, the insanely daring train engineer. We still think in that flawed way, only with newer toys. (For us moderns, *technology* is a synonym for *computers*.)

In the case of electricity and running water, these technologies are visible only by their absence. When people nowadays lack electricity and plumbing, we don't think of it as a normal way of living. We call it camping out, or poverty. But electricity and plumbing are at the

root of the most profound threats to the continuity of our civilization—climate change, loss of biodiversity, soil erosion and salinization, water-table depletion and water shortages, exhaustion of fossil fuels, and the bio-accumulation of various toxics in water, food, soil, and the bloodstreams of all living creatures. Electricity and plumbing aren't evil and wrong. But we've trained ourselves to take their presence too much for granted. We don't yet see technology as an ancient, comprehensive, continually unfolding set of artificial processes, spread through every level of society.

Once we fully deal with the darker consequences wreaked on our world by our desire for pretty table lamps and nice hot baths, we'll become far more civilized. And the technologies that can dig us out of, rather than deeper into, the abyss will make more sense. Fortunately, environmental calamity captures our attention better than other political and social concerns: It's based in tangible and physical reality. Acid rain falls on the just and the unjust alike.

Even our civilization's death grip on creaky old fossil fuels is loosening. Already, major European oil companies are perfectly capable of talking sense: BP sincerely hungers to be "Beyond Petroleum," while the honcho at Shell, an outfit chastened by fraud allegations, rides a folding bike to work and uses fluorescent bulbs at home. ExxonMobil posts the biggest profits in the world, but that's not a sign of health and good management; it's a sign of reckless mania.

A clever environmental campaign would explain to the rich how much they are suffering at the hands of old tech. A wealthy American with an environmentally caused cancer has the same bio-accumulative toxic burden as the rest of us; the ultimate environmental reality show would be something like *Wrecked Florida Beach Homes of the Rich and Famous*. Extend that metaphor to other groups that don't easily embrace environmental messages and you can show fundamentalist churches ripped to shreds by F4 tornadoes, or Sagebrush Rebellion ranchers who haven't seen a drop of rain in months. People understand suffering once it's divorced from the abstract and imposed on them.

We need to grasp the artificial environment from a full, long-term, holistic perspective. We can see just by looking at our own hands that we are uniquely suited to manipulating artificial objects. Humans are especially good with fire and edged weapons because they were discovered

IMAGINE TECHNOLOGY THAT WOULD KEEP TRACK OF ALL ITS MOVING PARTS AND, WHEN ITS TIME INEVITABLY CAME, RECYCLE ITSELF.

and invented not by us, but by our prehistoric ancestors. Furthermore, stone tools and fire are potent and dangerous technologies. By the standards of all other living creatures, they are fantastic, unimaginable, and horribly deadly. Today climate change is happening because of fire.

Stone tools and fire have also caused massive losses in biodiversity. If mega-creatures were still wandering Yosemite and Yellowstone, they would be a boon to ecotourism. But they're not around, mostly because Stone Age humans ate them all. That particular mass extinction has humanity's opposable thumbprints all over it. The ancient peoples who killed large Pleistocene animals had no way of measuring what their technology was doing to the natural world. It's hard for anyone to think 50 generations ahead. But we're gaining the ability to do so.

In the era of global warming, catastrophic change caused by humans is no longer limited to one region or even one continent. The atmosphere is tainted with emissions from pole to pole. Grass is growing in Antarctica. Nobody can "conserve" a landscape from planetary changes in rain, heat, and wind. The job at hand is aggressive restoration: We need to use technology to tear into the artificial environment the way our ancestors tore into the natural one. That means intervening against ongoing damage, as well as ripping into the previous technological base and rethinking, reinventing, and rebuilding it on every level of society. We need to imagine the unimaginable to avoid having to live with the unthinkable.

The consequences of bygone technologies are with us now; they've merely been rendered invisible by yesterday's habits of thought. When we see our historical predicament in its full, majestic scope, we will stir ourselves to great and direly necessary actions. It's not beyond us to think and act in a better way. Yesterday's short-sighted habits are leaving us, the way gloom lifts with the dawn. ■

BRUCE STERLING has written several novels, including *Zeitgeist* (2000) and *The Zenith Angle* (2004). His nonfiction includes *The Hacker Crackdown* (1992) and *Tomorrow Now: Envisioning the Next Fifty Years* (2002). He is "Visionary-in-Residence" at the Art Center College of Design in Pasadena, California.

ON THE WEB

The **Viridian Design Movement** (viridian.design.org) is Sterling's effort to promote high-tech, stylish, and ecologically sound design. **World Changing** (worldchanging.com) provides "models, tools, and ideas for building a bright green future" and offers a wealth of Web links to green-technology news, discussions, and resources. **The Dead Media Project** (www.deadmedia.org) is a collection of "research notes" on obsolete media technologies, from Incan quipus and Victorian phenakistoscopes to the video games and home computers of the 1980s.

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