



[ TECHNOLOGY ]

# good riddance

A highly selective list of human creations  
the world would be better off without



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## DAYLIGHT SAVINGS TIME

### The extra hour of sunshine comes at a steep price

**DAYLIGHT SAVINGS** time has marginally scientific origins: its inventor, New Zealand naturalist George Vernon Hudson, published two papers in the late 19th century arguing for a seasonal two-hour clock shift to “more fully utilize the long days of summer.” The primary appeal, though, has always been to save on energy costs, because extra daylight in the evening reduces the need for lighting. Germany instituted *Sommerzeit* (“summertime”) as a means to save coal during wartime, and by 1918 Europe, Russia and the U.S. had all followed suit. Clocks went back to normal in peacetime, until daylight savings was temporarily mandated again during World War II. In 1966 the U.S. Congress passed the Uniform Time Act, the first nonwartime implementation of the practice (although, technically, each state could decide whether to go along); daylight savings has since been extended as a response to energy shocks such as the oil embargo of the 1970s.

Unfortunately, the strategy may not confer any energy savings to the climate-controlled world. An upcoming study in the *Journal of Economics and*

*Statistics* examined electricity consumption patterns from a “natural experiment” in Indiana, where some regions observed daylight savings time and others didn’t, until the state mandated universal adoption in 2006. The regions that observed daylight savings consumed more electricity than those that did not. The authors attributed the findings to greater use of fans and air conditioners during extended summer days.

Other studies have demonstrated that the switch to daylight savings may lead to more traffic accidents (it disrupts circadian rhythms, leading to sleep deprivation), depression (a 2008 study showed that men are more likely to commit suicide in the early weeks of daylight savings), and may even contribute to increased risk of heart attacks (incidence spikes from 5 to 10 percent the first week after the clocks shift forward, according to a Swedish study). Quite a price to pay—when all George Vernon Hudson really wanted was a few extra hours of sunshine to collect bugs. —John Pavlus



## SPACE SHUTTLE

### This pickup truck to low Earth orbit was neither cheap nor safe

TO MANY AMERICANS, the Space Transport System—or space shuttle, as it is commonly known—embodies not just NASA’s efforts in low Earth orbit, but the entire endeavor of human spaceflight. That is exactly the problem—and why the shuttle’s retirement in 2011 is a good thing.

“Many people think that the shuttle is capable of going to the moon or beyond, and they see its cancellation as some kind of devastating hit to our spacefaring capability, when in reality that’s never been on the table,” says Jim Bell, professor of astronomy at Cornell University and president of the nonprofit Planetary Society. “The farthest it’s ever gone is still just a whisker above Earth’s surface.”

The public has always had the mistaken impression that the shuttle was a proven technology, when in reality it has always been a fundamentally experimental vehicle. “The question the shuttle was designed to answer is, ‘Is it possible to make spaceflight routine?’ The answer is no, not at that level of technology,” says Scott Pace,

director of George Washington University’s Space Policy Institute. “It was a brilliant engineering feat, but now we have different questions for manned spaceflight to address.”

Of course, the most compelling reason for retiring the shuttle is the sheer danger of flying it, as the *Challenger* and *Columbia* disasters demonstrated. “Spaceflight is always dangerous—there’s no getting around that,” Pace says. “But there are those who say that if we’re going to risk human lives, it should be for higher stakes than routine service missions.”

Bell argues that the end of the shuttle era should provide an opportunity for NASA to refocus on more ambitious objectives such as human travel to Mars and the solar system beyond. The shuttle is “a beautiful, sexy space machine, and we shouldn’t dis it,” he says. “But the shuttle today is as far removed from the beginning of the Apollo program as Apollo was from the *Spirit of St. Louis*. If you think about these turning points, we’re probably due for one.” —John Pavlus

COURTESY OF NASA (shuttle); EVA HEDLING Aurora Photos (clock)

## TEFLON

### Handy in the kitchen, deadly in lakes and rivers

**FOOD MIGHT NOT STICK** to Teflon, but Teflon sticks to us. The factories that produce the nonstick pans pollute lakes, rivers, wildlife and plants with perfluorooctanoic acid, a chemical by-product. The chemical, which does not break down in the environment, has found its way into the bodies of more than 95 percent of Americans and is “likely to be carcinogenic for humans,” according to the Environmental Protection Agency. Other studies have linked it to infertility, immune problems and impaired prenatal growth. Although Teflon is safe in the kitchen when used correctly, if an empty pan were left for several minutes on a burner, reaching 500 degrees Fahrenheit, the coating would break down, releasing toxic fumes.

Teflon has given DuPont, the company that manufactures the coating, its own share of headaches. In 2005 the company was slammed with a \$16.5-million fine—the biggest civil administrative penalty in the EPA’s history—for hiding test results showing that perfluorooctanoic acid was contaminating drinking water near a DuPont facility in West Virginia and that



the chemical crosses the placenta from mother to child. DuPont says the chemical is safe; nonetheless, the company has vowed to eliminate it from the Teflon manufacturing process by 2015 and to replace it with alternatives that break down more quickly. Renee Sharp of the Environmental Working Group, a nonprofit watchdog, says too few data are available: “We don’t have a lot of assurance that the stuff coming onto the market now is considerably safer.”  
—Melinda Wenner Moyer

## LANDFILLS

### Garbage doesn’t just disappear after we throw it out

**AMERICANS GENERATE** 250 million tons of trash every year, of which only 83 million tons—about a third—gets recycled or composted. The rest goes into landfills, which are essentially giant factories that convert garbage into toxic materials and greenhouse gases. Water leaching through the detritus picks up industrial chemicals and heavy metals, all too often depositing those poisons in nearby groundwater supplies. Meanwhile anaerobic bacteria convert organic matter into methane, a greenhouse gas more potent than carbon dioxide.

When confronted with this reality, a number of organizations, both private and municipal, have attempted to live by a zero-waste philosophy, pushing to reduce the amount of trash they send to a landfill to nearly zero by reusing what they can and recycling the remainder. Ideally landfills would eventually become a thing of the past.

Unilever’s Lipton Tea plant in Suffolk, Va., for example, now

sends 92 percent less waste to landfills than it did in 2007. The plant now recycles 70 percent of its waste and composts 22 percent more. Many other companies, including Apple, Epson, Hewlett-Packard, Xerox and Walmart plan to sharply curtail their waste streams or eliminate them entirely.

These companies are acting in their own self-interest: achieving zero waste by using fewer resources in the first place is a way to cut costs. The Lipton plant eliminated plastic straps from shipping pallets, replaced disposable wipes with reusable rags and gave every employee a lunch tin with metal utensils. Every year the plan saves more than eight million gallons of water, five gigawatt-hours of electricity and, not least, tens of thousands of dollars.

Dozens of cities have also signed on to the zero-waste goal, using incentives instead of technology to get there. San Francisco instituted a “pay as you throw” program that charges residents based on volume of household trash they throw out. It is also one of the first cities in the U.S. to implement a curbside composting program in addition to recycling. The measures have already allowed San Francisco to divert 72 percent of its waste, rolling back the clock on the amount of trash it sends to landfills to rates not seen since 1980. —Christopher Mims



## WALLED GARDENS

### How much longer can Apple's safe, cultivated world hold out against history?

COMPUTERS ARE CHAOS. That's the appeal behind the so-called walled garden, a carefully curated electronic ecosystem that allows you to interact only with vetted software or Web sites. The philosophy underpins Apple's wildly popular iOS—the operating system that powers iPads and iPhones—which may be the most wide-reaching walled garden of all. The success of these devices is challenging the long-held belief that, when it comes to computers and the Internet, openness will always win out.

The superiority of open systems has been axiomatic since the fall of AOL. In the 1990s, when the World Wide Web was new, customers flocked to AOL's comfortable menu of prepackaged content. After a few years, however, users began to realize that the world outside this wall was infinitely more interesting, and entrepreneurs wanted to build new businesses free of interference from overseeing "gardeners." "This is about more than just saying, 'Oh, how nice and open we are!'" says Jeff Jarvis, director of interactive journalism at City University of New York and author of *What Would Google Do?* "Openness brings real, positive business changes to how you operate—whether it's media, software, anything."

Yet when it comes to innovation, the Achilles' heel of AOL's walled garden approach, Apple seems to be beating the odds. Many developers—the entrepreneurs who ultimately determine whether a platform will feature the most interesting applications—prefer Apple's closed technology to competitors, such as Google's Android, that use open-source software. The single platform means they don't have to create 10 different versions of their program for a jumble of different devices and wireless carriers. The iOS "allows us to focus on our craft and not the expensive and time-consuming administrative, technical and compatibility-related issues that plague most platforms," says Cal-

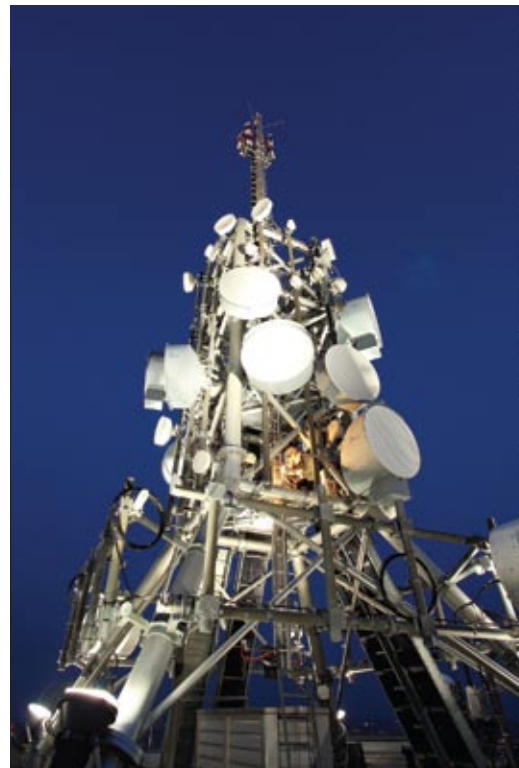
vin Carter, founder of Bottle Rocket, a prominent iPhone app developer.

To some degree, a new generation of tech-savvy consumers may also have a higher tolerance for closed systems than previous consumers. Social-networking juggernaut Facebook, which began as a walled garden for Ivy League college students, suffered a major backlash from users when it started relaxing its privacy policies, opening personal data up to outside view.

The most important issue to today's users may not be openness so much as trust. Openness is still important, Jarvis says, but it's just one among many variables; trust, on the other hand, is essential. For example, Google's pervasive products and bottomless databases could easily seem sinister (and do, to many), but the company goes to great lengths to give its customers reason to trust it, including its support of the Data Liberation Front, which helps users maintain control over their personal information, and other initiatives.

How well will Apple be able to hold on to its customers' trust? Its handling of iPhone apps doesn't bode well. Some prominent app developers have publicly renounced the iOS platform because Apple's App Store approval rules—which the company has never deigned to publish or explain in detail—seemed to them capricious. Critics have charged that Apple censors political speech. And the firm's restrictive developer agreements prohibit programmers from using certain popular tools, such as Flash, to build their apps.

Apple CEO Steve Jobs insists that these measures are essential if Apple is to maintain the high quality that made the iPhone such a hit in the first place. But if the history of AOL is any guide, Apple's quality advantage won't last forever. Sooner or later, it might have to learn a thing or two about trust from the likes of Google. —John Pavlus



## DROPPED CALLS

### Data-hungry smart phones still have to work as phones

**AS BANDWIDTH-HUNGRY** smart phones proliferate, cellular networks have been crushed by downloads and video streams in densely populated urban areas, leading to dropped calls and slow data transfer rates. The exemplar of the unfortunate trend is AT&T, whose networks in New York City and San Francisco have been vigorously mocked by the iPhone-toting technorati.

Unfortunately, the fundamental problem is not technology, but geometry. The strength of a signal coming from a cell tower drops off rapidly with distance, and three quarters of the area covered by any given tower is in the distant half of its range. Worse yet, the wider the coverage area of any one tower, the more cell phone users it must handle.

The obvious solution is to build more towers. Wireless companies have begun to divide coverage area into smaller units served by low-cost "microcells." Dividing a coverage area in two increases the available bandwidth by 85 percent. The smallest of the microcells, called femtocells, can be placed in a user's home or apartment, albeit for a price. In March, AT&T began to sell \$150 femtocell base stations that route calls through a customer's home Internet connection; Sprint is rumored to be working on base stations of its own.

—Christopher Mims

## BUNKER FUEL

### Exhaust from ships kills 90,000 people every year

**CARGO SHIPS** burn some of the nastiest stuff on earth: bunker fuel. Cheap and untaxed, it's a low-grade oil that is as thick as hot tar. The dirtiest variety—the kind ships burn when on the open ocean—is 4.5 percent sulfur by weight; sulfur, of course, is the foul element that forms sulfur dioxide, contributing to acid rain and respiratory ailments. (In contrast, diesel sold in the U.S. is just 0.0015 percent sulfur.) Bunker fuel leads to the premature deaths of an estimated 90,000 people a year.

This July the International Maritime Organization began to tighten controls on what was previously the world's least-regulated liquid fuel. In the first phase, a 1.5 percent cap on the sulfur content of bunker fuel burned close to shore (in so-called sulfur emission control areas such as the coast of California) will drop to 1 percent. By 2020 the organization will require that all bunker fuel have a sulfur content of less than 0.5 percent—a change that would halve its death toll.

These sulfur regulations are an important start, but they do not address a larger and potentially more important problem with bunker fuel: its carbon dioxide emissions contribute to global warming. If the international shipping fleet were a country, it would be the world's sixth-highest greenhouse gas emitter, right behind Japan and just ahead of Germany.

—Christopher Mims



## GENE PATENTS

### Naturally occurring genes are not a human invention

**MORE THAN THREE DECADES** ago Ananda Chakrabarty, a microbiologist at General Electric's laboratories in Schenectady, N.Y., genetically engineered a bacterium that was capable of dissolving crude oil. When he applied for a patent, the examiner initially refused his request, arguing that living organisms were not patentable. An appeals court later overturned the judgment, and in 1980 the U.S. Supreme Court ruled in Chakrabarty's favor.

For years this verdict seemed innocuous enough. Chakrabarty's bacterium was by most reasonable measures a novel invention, something profoundly different from the naturally occurring DNA that courts had previously ruled unpatentable. In time, however, the U.S. Patent and Trademark Office began to award patents to researchers not just for the invention of novel organisms but also for the act of isolating or purifying existing genetic material.

In the mid-1990s the Utah-based company Myriad Genetics secured patents for the *BRCA1* and *BRCA2* genes (pronounced "brick-ah"); mutations in these genes confer a fivefold increased risk of breast cancer in women who inherit them. Myriad's patents meant that a company effectively owned naturally occurring genes found in thousands, if not millions, of women. They also enabled the company to charge two groups of people large sums of money: women

who wanted genetic tests to see if they were at high risk for breast cancer and researchers who wanted to work with the genes in the lab. Patients such as Lisbeth Ceriani, a single mother from Massachusetts who had already been treated once for breast cancer, could not get tested for the gene, because she could not afford Myriad's \$3,000 price tag.

In 2009 Ceriani (along with several other patients, the American Civil Liberties Union and the American College of Medical Genetics) filed suit against Myriad, challenging the validity of its *BRCA* patents. Even though other courts had previously honored the Chakrabarty precedent, in March of this year U.S. District Court judge Robert W. Sweet struck down seven of the *BRCA* patents. In his verdict, Sweet called the common practice of isolating a gene to render it patentable "a 'lawyer's trick' that circumvents the prohibition on the direct patenting of the DNA in our bodies but which, in practice, reaches the same result."

Many scientists celebrated the verdict, arguing that gene patents can suppress independent research and innovation. Kenneth Berns, a microbiologist at the University of Florida, thinks eliminating patent protection for genes will make it easier to develop treatments for genetic diseases and provide patients with affordable genetic testing. ACLU spokesperson and staff attorney Sandra Park agrees that ending gene patenting would help clarify research opportunities. "A lot of researchers know genes are patented and don't want to bother pursuing work in a particular area," she says. "There's a fear that further on, if a scientist does find something clinical-

SAMI SLOAN/Alamy (oil blob); BRUCE BENEDICT/Corbis (driving)



## HUMAN DRIVERS

### The people behind the wheel are the most dangerous part of driving

IN THE WAKE of Toyota's much publicized recall for unintended acceleration, the idea of conceding control of our cars to software seems about as sane as letting a Roomba vacuum cleaner do brain surgery. And yet the data are unequivocal: according to multiple studies conducted over the past 25 years, so-called human factors—such as distraction, intoxication or just plain misjudgment—are the primary cause of traffic accidents and fatalities. Reason suggests that the sooner we can get fallible, inconsistent, idiotic humans out of the driver's seat, the safer our roads will be.

But are sci-fi-style, fully automated highways a realistic goal? David Shinar, head of Ben-Gurion University of the Negev's Human Factors Safety Laboratory in Israel, says that while human drivers will probably never be completely replaced, our role may simply change. "We're moving from a situation in which the driver is the controller of the system, to one in which the driver will be

monitoring the system—sort of like a plane on autopilot," Shinar says. "Even when that system is engaged, the pilot doesn't go back into the first class cabin and take a nap. What we can expect are cars that need less direct controls from the driver; instead, the driver will intervene in the event of something unexpected."

Established systems such as electronic stability control (which detects and prevents skidding) can combine with newer technologies such as devices that keep vehicles in their lanes to create a virtual "safety bubble" around the car that counteracts human error, allowing cars to maintain a steady, slot-car-like course on the road with minimal input from the driver. In 2007 a driverless Chevy Tahoe nicknamed "Boss" successfully navigated a challenge course that included realistic traffic flow—even traffic jams—raising the possibility that autonomous vehicles might arrive sooner than previously thought.

—John Paulus

ly useful, the patent holder will step in."

Myriad plans to challenge the verdict. "Judge Sweet's decision sets a bad precedent for the biotech industry," says Richard Marsh, the company's executive vice president and general counsel. "Without the promise of patents, companies will not make the capital commitment to advance the medical science behind these molecular diagnostic products." The argument for gene patenting boils down to the need to attract investment. Without the limited monopoly that patent protection creates, says Bill Warren, a life sciences specialist at the Sutherland law firm in Atlanta, investors will not provide the capital necessary to develop new genetic innovations and treatments. "Generally gene patents are a very good thing, and I would not want to see them broadly excluded," he says.

Who will ultimately triumph—Mother Nature or the biotech industry? The answer is still up in the air. If Myriad's planned appeal fails, Park says the patent office has indicated it will award no further gene patents, a sweeping move that would most likely resign gene patenting to the dustbin of American history: "Removing DNA from a cell does not turn it into an invention."

—Elizabeth Svoboda

## BISPHENOL A

### This widely used yet unnecessary chemical could be making kids sick

**AN ESTIMATED** 95 percent of Americans harbor traces in their bodies of bisphenol A (BPA), a chemical widely used to make plastic containers, canned-food linings and dental sealants. Animal studies suggest that BPA, which resembles the sex hormone estrogen, can impair brain, ovary and sperm development in children exposed to it directly or in utero and that it may increase their risk for cancer and obesity. And although results from animal studies do not always apply to humans, "it is foolhardy to ignore these signals," warns Philip Landrigan, director of the Mount Sinai Children's Environmental Health Center in New York City.

But ignored they have been. When the National Institutes of Health asked the National Toxicology Program to evaluate BPA's safety in 2003, the program hired an industry contractor, Sciences International, which deemed the chemical safe. As the nonprofit Environmental Working Group later revealed, the contractor's other clients included BPA manufacturers, a finding that raised questions about impartiality. Then, in 2008, the Food and Drug Administration sent a letter to the U.S. House of Representatives Committee on Energy and Commerce stating, again, that BPA was safe; the agency later admitted that it had largely based this conclusion on two studies sponsored by the American Plastics Council. One has not been published in a peer-reviewed journal, and the other has been critiqued by academic experts as having "flawed experimental design." In March 2009 an international panel of experts concluded that the FDA's safety assessment of BPA had been "incomplete and unreliable."

This past January the FDA finally admitted that it had "some concern" about the potential effects of BPA on fetal and child health; the NIH also promised to spend \$30 million on related research in the coming years. Politicians have made a bigger push by introducing bills in many cities and states limiting its use, including the promise by Senator Dianne Feinstein of California that when the FDA Food Safety Modernization Act is brought to the Senate floor later this year—the House passed it last year—she will propose an amendment that will ban use of the chemical in food containers.

Industry groups such as the Grocery Manufacturers Association and the U.S. Chamber of Commerce oppose banning BPA, claiming that the chemical is safe and that switching to alternatives might prove costly. Yet the public backlash to BPA is growing, and major companies such as Gerber and Nalgene have already begun to phase out its use.

—Melinda Wenner Moyer



ELIZABETH WATT/Getty Images (water bottle)