

Once again, the Times Magazine looks back on the past year from our favored perch: ideas. Like a magpie building its nest, we have hunted eclectically, though not without discrimination, for noteworthy notions of 2009 — the twigs and sticks and shiny paper scraps of human ingenuity, which, when collected and woven together, form a sort of cognitive shelter, in which the curious mind can incubate, hatch and feather. Unlike birds, we can also alphabetize. And so we hereby present, from A to Z, the most clever, important, silly and just plain weird innovations we carried back from all corners of the thinking world. Enjoy. ***Too small to read! Get [Kindle Version](#)***

Advertisement That Watches You

"It happens when nobody is watching." As the tagline on a poster raising awareness about domestic violence, that's not bad. But it was the poster itself that was truly attention-grabbing — for it brought the issue of being watched (or not) to life.

The poster, placed in a bus shelter in Berlin, was a one-time installation sponsored by Amnesty International. When a person in the shelter was looking at the poster, he saw, along with the words, a photograph of an amiable couple: a stocky, professional-looking man in a blue oxford-cloth shirt, his arm around the shoulders of his girlfriend or wife. If no one in the shelter was paying attention to the poster, though, the image switched: now the man was raising his fist against the woman as she leaned away and protected her face. (There was a slight lag in the switch, so viewers could notice that the poster was changing its image.)

Designed by the Hamburg-based firm Jung von Matt (which bills itself as being in the business of "attention warfare"), the ad worked via a camera attached to a computer outfitted with face-tracking software with a working range of about 16 feet. A Potsdam company called Vis-à-pix created the technology. Jung von Matt described the ad as the first of its kind, and it won a silver prize at the 2009 Cannes Lions International Advertising Festival and a gold prize at the New York Festivals International Advertising Awards.



Using a camera and face-tracking software, a poster in a Berlin bus shelter demonstrates what may be happening only when nobody is looking.

The technology has since improved, according to Vis-à-pix. New posters can even identify the sex of onlookers.

Consider a poster created for the service counters of the rental-car company Sixt: when a man gets close, he is tempted with an image of a limousine; if the customer is a woman, she sees, instead, a spunky Cabriolet. CHRISTOPHER SHEA

[AC: http://www.wall.de/en/press/creative_news/facetracking_sensor]

Artificial Car Noise

Nothing seemed to herald the end of the internal combustion engine more than the ability of hybrid cars to leap suddenly to life without the slightest sound. Unfortunately, it turns out that the sweet silence of 21st-century technology has a serious downside: pedestrians and bicyclists are less likely to hear hybrids and electric cars coming their way and are more likely to be clipped or run over. That has prompted a back-to-the-future solution: fake car noise that will alert the unwary.



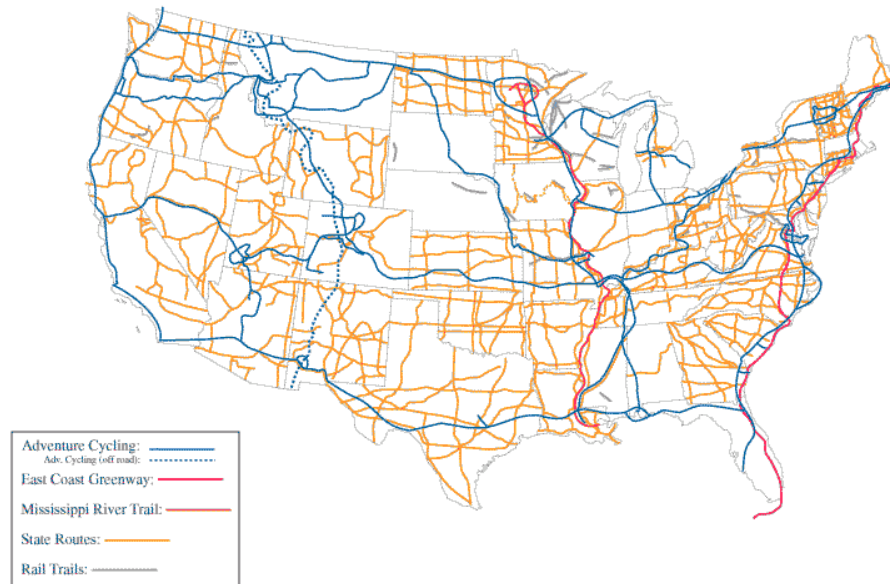
The evidence that hybrids might be hard to hear coming has been accumulating for years, though it wasn't until the National Highway Traffic Safety Administration recently released a study that the full extent of the problem was revealed. Data derived from thousands of accidents revealed that there was no difference between hybrids and conventional vehicles on straightaways. But at intersections, interchanges, parking lots and other places where cars traveled at slow speeds, hybrids proved far more hazardous, with pedestrians and bicyclists getting hit at up to twice the normal rate.

Having spent years trying to make cars quieter, manufacturers of hybrids and electric cars now find themselves in the curious position of figuring out the best means of warning people that 3,000 pounds of metal is rolling their way. A melodious trill? The muted roar of a muscle car? A hook from some annoying song? So far there's no consensus, and absent any standard there's a risk that the roads of tomorrow will play host to a cacophony of hoots, whistles and whirs.

As the debate continues, manufacturers of hybrid and electric cars, like Nissan and Fisker, are rolling out models equipped with high-tech noises that broadcast both their car's presence and their futuristic status. Others, like the high-end manufacturer Tesla, are holding out and sticking with the sound of silence. STEPHEN MIHM

Bicycle Highways

The bicycle highway — no red lights, no cars — is every cyclist's fantasy. There are now signs that infrastructure is catching up with the dream. In October 2008, an association of U.S. state-highway officials approved the concept of a national Bicycle Routes Corridor Plan — the first step in potential American bike Interstates. But this amounts to little more than a go-ahead for states to put bike-route signs on existing roads.



Copenhagen, however, began last month to create the real thing: a system of as many as 15 extra-wide, segregated bike routes connecting the suburbs to the center of the city. These are not bucolic touring paths; Copenhagen's bike highways are meant to move traffic. Nearly 40 percent of Copenhagen rides a bike to work. On Norrebrogade, a two-

mile street in the center of the city, 36,000 cyclists clog the bike lane every day.

The Bicycle Office of Copenhagen's design calls for service stations (with air pumps and tools for simple repairs) and plans to employ so-called intelligent transportation systems — not unlike the technology that makes the E-ZPass possible. Using handlebar-mounted RFID or GPS technology, for example, commuters could detect other riders on the routes, helping them to assemble into pelotons or "bike buses." These groups could in turn emit signals that trip traffic lights in their favor, resulting in a "green wave" of bicycle momentum. But Jan Gehl, the Danish architect and infrastructure consultant, warns that as appealing as the bike highway seems, it is not the first step in creating a bicycle culture.

The bicycle highway is needed, he stresses, only after a city is comfortable for bike riders, as Copenhagen is. He considers the hundreds of kilometers of protected bike lanes in central Copenhagen to be a kind of bicycle oasis. "Some cities will go for the bicycle highways and let people fend for themselves once they reach the city," he says. "You get off the highway, and then you're in the desert. In Copenhagen we have first irrigated the desert, then built the highways." WM. FERGUSON

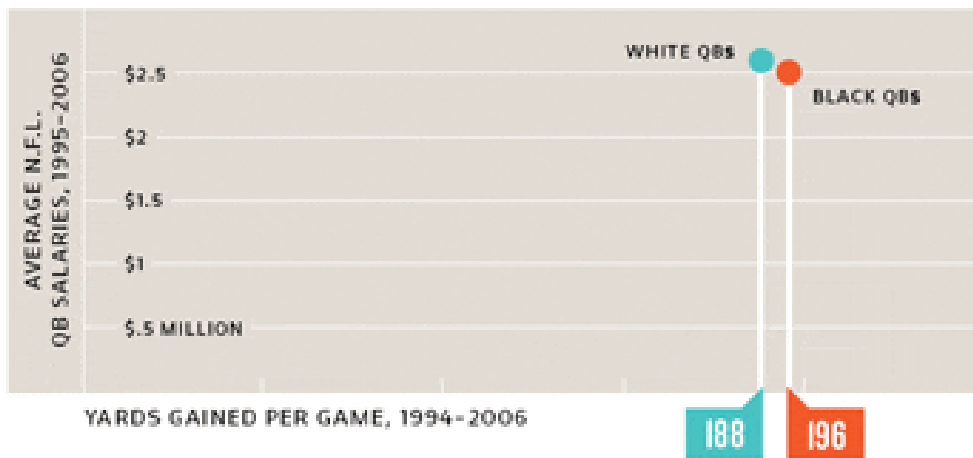
[AC: <http://www.americantrails.org/resources/trans/usbikeroutes07.html>]

Black Quarterbacks Are Underpaid

When Rush Limbaugh tried and failed to join the clubby ranks of National Football League owners this year, his past comments came back to haunt him, none more so than his assessment of the Philadelphia Eagles star Donovan McNabb — namely that the news media overrated McNabb because he is black and that he was simply not "that good of a quarterback." But according to the economists David J. Berri and Rob Simmons, Limbaugh might have been giving public voice to what the owners who spurned him think privately.

In an article for the February issue of *Journal of Sports Economics*, Berri and Simmons found that black quarterbacks tend to be paid less than their white counterparts and that the pay disparity is especially pronounced for top-flight black quarterbacks, who don't make as much money as the best white quarterbacks.

Given the N.F.L.'s sorry history when it comes to black quarterbacks — it wasn't until the mid-1990s that many black athletes even began playing the position — it's possible that the pay disparity is attributable to simple racism. But Berri and Simmons offer a more subtle explanation: statistical bias.



White quarterbacks earned more on average, but black quarterbacks outperformed them in a key category over a similar period.

The key is that owners do not

fairly compensate quarterbacks who are good at running the ball in addition to throwing it. Using 35 years of data, Berri and Simmons found that while white quarterbacks, on average, run with the ball on only 6.7 percent of their plays, gaining a measly 7.3 yards per game, black quarterbacks run, on average, 11.3 percent of the time and gain 19.4 rushing yards per contest. In other words, many black quarterbacks tend to be good runners as well as good passers. And quarterbacks are not paid for the rushing yards they produce.

Perhaps that's because the quarterback rating — the N.F.L.'s gold standard for evaluating quarterbacks statistically — does not include rushing yards as one of its four components. The formula considers only completions, passing yards, touchdowns and interceptions. Thus "a key offering" of many black quarterbacks, write Berri and Simmons, "is ignored." JASON ZENGERLE

Cognitive Illiberalism

Could the Supreme Court be undermining its legitimacy through its ignorance of some basic tenets of social psychology? Three law professors — Dan M. Kahan of Yale, David A. Hoffman of Temple and Donald Braman of George Washington — made that case in an article published in January in *The Harvard Law Review*. They charged the justices with the sin of "cognitive illiberalism."

The article centered on a 2007 case, *Scott v. Harris*. Victor Harris was rendered quadriplegic after the police rammed his car, ending a nine-mile high-speed chase outside Atlanta. The issue was whether a suit by Harris against the officer who rammed him should be allowed to proceed to a jury trial. Lower courts were inclined to give Harris his day in court, because he had committed no crime except speeding before he fled, and while he topped 85 miles per hour during the chase, he was in theory in control of his car.

The Supreme Court disagreed and defended its position in an unprecedented way: by posting a video of the chase, taken by the police, on its Web site. "No reasonable jury," Antonin Scalia wrote for the majority, could watch the video without agreeing that the chase had to be stopped, even if it meant killing Harris. John Paul Stevens was the lone dissenter. Scalia wrote that Stevens's argument that Harris was not necessarily driving with life-threatening recklessness was so plainly false that anyone with eyes could see so. "We are happy to allow the videotape to speak for itself," Scalia wrote.

Did it? Kahan, Hoffman and Braman showed it to a diverse group of 1,350 Americans. Most of the test subjects saw things as the Supreme Court did: 75 percent concurred that deadly force was justified.



JUSTICE JOHN PAUL STEVENS

The dissenters, however, were not randomly distributed: they reflected distinct subcategories of Americans, like liberal African-American women from cities in the Northeast.

The law professors argued that the justices in the majority were in the grip of a common psychological fallacy: that other people's perceptions might be shaped by socioeconomic position or political commitment, but they themselves perceived the objective truth.

The authors recommend that, before summarily deciding a case, "a judge engage in a sort of mental double-check." If he or she can picture a discrete group of Americans who would disagree that a decision is self-evident, go with a jury. To imply that minority groups are flatly unreasonable sends a "denigrating and exclusionary message" and will diminish support for the law. CHRISTOPHER SHEA

Counterfeit Self, The

Wearing imitation designer clothing or accessories can fool others — but no matter how convincing the knockoff, you never, of course, fool yourself. It's a small but undeniable act of duplicity. Which led a trio of researchers to suspect that wearing counterfeits might quietly take a psychological toll on the wearer.



To test their hunch, the psychologists Francesca Gino, Michael Norton and Dan Ariely asked two groups of young women to wear sunglasses taken from a box labeled either "authentic" or "counterfeit." (In truth, all the eyewear was authentic, donated by a brand-name designer interested in curtailing counterfeiting.) Then the researchers put the participants in situations in which it was both easy and tempting to cheat.

In one situation, which was ostensibly part of a product evaluation, the women wore the shades while answering a set of very simple math problems — under heavy time pressure.

Afterward, given ample time to check their work, they reported how many problems they were able to answer correctly. They had been told they'd be paid for each answer they reported getting right, thus creating an incentive to inflate their scores. Unbeknownst to the participants, the researchers knew each person's actual score. Math performance was the same for the two groups — but whereas 30 percent of those in the "authentic" condition inflated their scores, a whopping 71 percent of the counterfeit-wearing participants did so.

Why did this happen? As Gino puts it, "When one feels like a fake, he or she is likely to behave like a fake." It was notable that the participants were oblivious to this and other similar effects the researchers discovered: the psychological costs of cheap knockoffs are hidden. The study is currently in press at the journal *Psychological Science*.

Could other types of fakery also lead to ethical lapses? "It's a fascinating research question," says Gino, who studies organizational behavior at the University of North Carolina. "There are lots of situations on the job where we're not true to ourselves, and we might not realize there might be unintended consequences." MARINA KRAKOVSKY

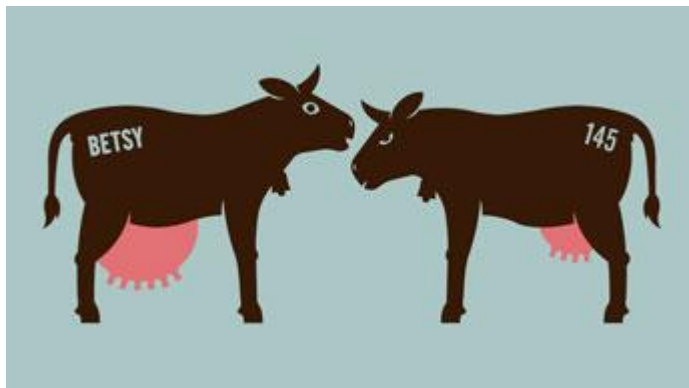
[AC: Also read [Predictably Irrational: The Hidden Forces That Shape Our Decisions](#) by [Dan Ariely](#)]

Cows With Names Make More Milk

For dairy farmers, whether to name their cows may seem like a matter of taste. But it might not be. It could be a business decision.

A study of several hundred British dairies published in the journal *Anthrozoös* in March compared responses to a survey about cow treatment with independently collected milk data and found that cows that have names make, in a given year, about 258 liters more milk per farm than anonymous ones — a bump of about 6 percent.

More research is still needed. The possible psychological effects on cows of having a name, for example, have yet to be determined. But the results so far reveal a correlation: "The naming," says Catherine Douglas, the Newcastle University animal behaviorist behind the research, "reflects the humans' attitudes toward the cows, and therefore how they behave around them." Named cows are more often treated nicely, and well-treated, calm and happy cows make more milk. The point, Douglas says, is that it definitely can't hurt to name your cows.



Naming criteria vary widely. Some farmers name cows alphabetically; others recycle parents' names. Herb and flower names are popular in Britain. "You know," Douglas says, "Daisy, Rose, Buttercup." Douglas once named a cow after her sister, Hattie.

But some American dairy farmers scoff at this idea. Barbara Martin, a third-generation California dairy operator, says naming her 2,200 cows would be completely unrealistic. "Everyone," she says, "has an ear tag with a number." PAT WALTERS

AC: Catherine Douglas and Peter Rowlinson, "Exploring stock managers' perceptions of the human-animal relationship on dairy farms and an association with milk production". *Anthrozoös*, Berg Publishing. DOI: 10.2752/089279307X224764

Cul-de-Sac Ban, The



Nothing divides suburban developers and "smart growth" advocates as much as the lowly cul-de-sac. The real estate community loves the meandering, dead-end streets; lots on them sell quickly and at a premium, thanks to their low traffic and perceived safety benefits. But critics complain that cul-de-sacs are a poor use of land; they funnel cars onto clogged arterial routes and restrict access to neighborhoods when emergency vehicles need to respond.

For decades the developers have been winning this battle. But this fall, Virginia, under the leadership of Gov. Tim Kaine, became the first state to severely limit cul-de-sacs from future developments. New rules require that all new subdivisions attain a certain level of "connectivity," with ample through streets connecting them to other neighborhoods and nearby commercial areas.

If subdivisions fail to comply, Virginia won't provide maintenance and snowplow services, a big disincentive in a state where the government provides 83 percent of road services.

Virginia expects the new rules to relieve its strained infrastructure budget: through streets are more efficient and cheaper to maintain, and they take pressure off arterial roads that otherwise need to be widened. "It's about connecting land-use and transportation planning and restricting wasteful and unplanned development," Kaine said in March.

And how will the people respond who actually have to live and drive in the new, cul-de-sac-free neighborhoods? "There are pros and cons," says Kaid Benfield, the director of the Smart Growth Program at the Natural Resources Defense Council. "Residents like walkability and they like not having to be forced onto an arterial road where the traffic jam is. On the other hand, there is a sentiment out there that cul-de-sacs are safe" — though Benfield says research actually shows fewer traffic fatalities occur on connected roads. Other states are watching the Virginia rules closely, and Benfield says he expects to see similar regulations adopted around the country in the next few years — which means the dead end may soon be a thing of the past.

CLAY RISEN

Drunken Ultimatums

The so-called ultimatum game contains a world of psychological and economic mysteries. In a laboratory setting, one person is given an allotment of money (say, \$100) and instructed to offer a second person a portion. If the second player says yes to the offer, both keep the cash. If the second player says no, both walk away with nothing.

The rational move in any single game is for the second person to take whatever is offered. (It's more than he came in with.) But in fact, most people reject offers of less than 30 percent of the total, punishing offers they perceive as unfair. Why?

The academic debate boils down to two competing explanations. On one hand, players might be strategically suppressing their self-interest, turning down cash now in the hope that if there are future games, the "proposer" will make better offers. On the other hand, players might simply be lashing out in anger.

The researchers Carey Morewedge and Tamar Krishnamurti, of Carnegie Mellon University, and Dan Ariely, of Duke, recently tested the competing explanations — by exploring how drunken people played the game.

As described in a working paper now under peer review, Morewedge and Krishnamurti took a "data truck" to a strip of bars on the South Side of Pittsburgh (where participants were "often at a level of intoxication that is greater than is ethical to induce") and also did controlled testing, in labs, of people randomly selected to get drunk.

The scholars were interested in drunkenness because intoxication, as other social-science experiments have shown, doesn't fuzz up judgment so much as cause the drinker to overly focus on the most prominent cue in his environment. If the long-term-strategy hypothesis were true, drunken players would be more inclined to accept any amount of cash. (Money on the table generates more-visceral responses than long-term goals do.) If the anger/revenge theory were true, however, drunken players would become less likely to accept low offers: raw anger would trump money-lust.

In both setups, drunken players were less likely than their sober peers to accept offers of less than 50 percent of the total. The finding suggests, the authors said, that the principal impulse driving subjects was a wish for revenge. CHRISTOPHER SHEA

Empty Beer Bottles Make Better Weapons

Stephan Bolliger is one of Switzerland's leading forensic pathologists, and he often appears in court to testify as an expert witness. He isn't stumped very often by the questions he is asked, but it happened last year, with this one: can a beer bottle, when used as a weapon, put a crack in the human skull? To find out, Bolliger set up an experiment, the results of which were published in *The Journal of Forensic and Legal Medicine* in April.

Other scientists had already calculated how much energy it takes to crack the human skull — between 14 and 70 joules, depending on the location — so all Bolliger needed to do was to take the same measurements on a beer bottle. "If the bottle is more sturdy than the skull," he says, "then the bottle will win, and the skull will break." Simple as that.

Bolliger, who is head of forensic pathology at the University of Bern, went to the store and picked up 10 half-liter bottles of Feldschlösschen Original — his nation's most popular brew. He emptied six of them, left four full and, using a precisely calibrated energy-measuring device, started dropping a steel ball on the bottles from various heights. Bolliger's conclusion: Full bottles shatter at 30 joules, empties at 40, meaning both are capable of cracking open your skull. But empties are a third sturdier.



Why the difference? The beer inside a bottle is carbonated, which means it exerts pressure on the glass, making it more likely to shatter when hitting something. Its propensity to shatter makes it less sturdy — and thus a poorer weapon — than an empty one. As for the ubiquitous half-full bottle, if you hold it like a club, Bolliger says, "it tends to become an empty bottle very rapidly."

Now that we have scientific proof of the skull-crushing potential of glass beer bottles, should breweries switch to softer materials, like aluminum or plastic? Bolliger says he hopes not. "Beer," he says, "just tastes better out of glass."
PAT WALTERS

AC: [Journal of Forensic and Legal Medicine Volume 16, Issue 3](#), April 2009, Pages 138-142

Forensic Polling Analysis

The American Association for Public Opinion Research censured a Georgia-based firm called Strategic Vision L.L.C. in September for failing to reveal information about how it conducted its polls during the 2008 presidential race. The company's chief executive promptly threatened to sue, which struck Nate Silver, a polling specialist and political blogger, as a bizarre response.

Wondering if the company had anything to hide, Silver, the proprietor of fivethirtyeight.com, stayed up all night keying all of Strategic Vision's poll results over the last four years into a Microsoft Excel spreadsheet.

To test the polls, Silver made use of a statistical truism. As he puts it, "Tell a human to come up with a set of random numbers, and they will be surprisingly inept at trying to do so." They unwittingly fall into nonrandom patterns.

Silver took the results of every Strategic Vision poll question — from more than 100 polls on political races and issues of every sort — and analyzed the "trailing digits" in the results. (If a poll found that one candidate led another by 52-48, the trailing digits were 2 and 8.) Silver thought that, given the wide range of poll topics, the distribution of trailing digits should be more or less random. Instead — shades of "C.S.I." — he found a highly abnormal distribution of digits. For example, there were nearly 60 percent more 8s than 2s.



NATE SILVER

The probability of such a distribution occurring in authentic polls, Silver calculated, was "millions to one against."

Silver concluded that the firm's data were not random. "It's not close to random," he wrote. "It's not close to close."

When readers asked for a comparison study, he presented a similar analysis for the well-respected Quinnipiac poll. In that case, there were "a few too many 2s and 3s," but nothing outside the realm of chance.

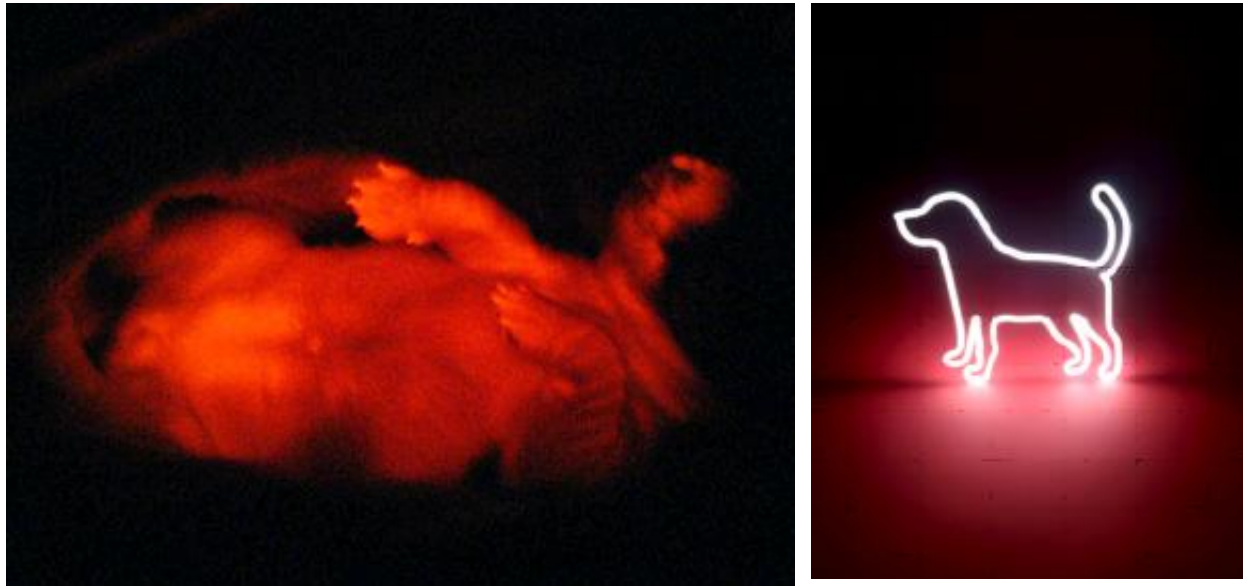
In the coup de grâce, a retired physics professor at the University of Illinois, Michael Weissman, stepped in, deploying more sophisticated tools (Fourier analysis). If Strategic Vision's polls were legitimate, Weissman concluded, the odds that they would produce the numbers Strategic Vision published were 1 in 5,000 — better than Silver found, but still suspicious. Strategic Vision has threatened to sue Silver, too, but the company has yet to release documentation of its methods. CHRISTOPHER SHEA

[AC: It always takes a physicist. The most recent airline boarding scheme (by zones) was discovered by a physicist. The frozen o-ring of space shuttle Challenger was also discovered by one.]

Glow-in-the-Dark Dog, The

In April, the world was introduced to Ruppy, the first known fluorescent dog. In natural light, Ruppy seems to be an almost-normal beagle — though his paws look as if he has stepped in pink ink. Under ultraviolet light, the effect is quite evident: he emits an eerie red glow.

Ruppy is the first transgenic puppy, which means that he has genes taken from another species. His red fluorescent luminosity comes from the gene of a sea anemone: the gene was introduced into a dog's skin cell; the nucleus was then cloned and transferred to another dog's egg cell, which was then fertilized and eventually became Ruppy. In what is perhaps a stab at genetic humor, his name is also a hybrid, having been formed by combining "Ruby" and "Puppy."



Scientists performed the experiment to demonstrate the feasibility of cross-species implants of genes that control for a specific trait (in this case, fluorescence). The hope is that transgenic dogs can now be created to acquire specific human diseases, which will make them valuable biomedical research subjects. Transgenic mice are already in widespread use, but because rodents are so different from humans, they can be difficult to conduct tests on.

CheMyong Jay Ko, a fertility researcher at the University of Kentucky in Lexington and one of the team members responsible for Ruppy's creation, says there is another reason he would rather use transgenic dogs in his studies than mice: he can measure the hormones of the dogs without having to kill them. "I use more than 1,000 mice each year," Ko says, explaining that his team has to kill the mice in order to draw their blood for research. Unlike the rodents, Ruppy can provide useful scientific knowledge without necessarily having to sacrifice his life. EMILY BIUSO

Good Enough is the New Great

"Cheap, fast, simple tools are suddenly everywhere," Robert Capps of Wired magazine wrote this summer in an essay called "The Good-Enough Revolution." Companies that had focused mainly on improving the technical quality of their products have started to notice that, for many consumers, "ease of use, continuous availability and low price" are more important.

High-definition televisions have turned every living room into a home cinema, yet millions of us choose to watch small, blurry videos on our computers and our mobile devices. Cameras capture images in a dozen megapixels, yet Flickr is filled with snapshots taken with phone cameras that we can neither focus nor zoom. And at war, a country that has a fleet of F-16 fighter jets that can cover 1,500 miles an hour is now using more and more remote-controlled Predator drones that are powered by snowmobile engines.

Lo-fi solutions are now available for a range of problems that couldn't be solved with high-tech tools. Music played from a compact disc is of higher quality than what comes out of an iPod — but you can't easily carry 4,000 CDs with you on the subway or to the gym. Similarly, a professional television camera will produce a higher-quality image than a phone, but when something important happens, from the landing of a jet on the Hudson River to the murder of an Iranian protester, and there are no TV cameras around, images recorded on phones are good enough.

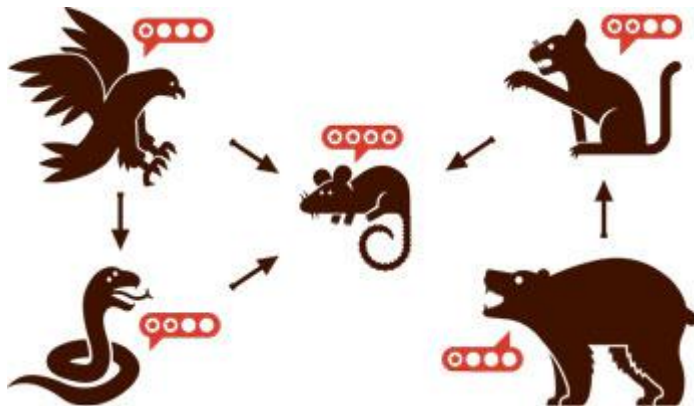
In February, a music professor at Stanford, Jonathan Berger, revealed that he has found evidence that younger listeners have come to prefer lo-fi versions of rock songs to hi-fi ones. For six years, Berger played different versions of the same rock songs to his students and asked them to say which ones they liked best. Each year, more students said that they liked what they heard from MP3s better than what came from CDs. To a new generation of iPod listeners, rock music is supposed to sound lo-fi. Good enough is now better than great. ROBERT MACKKEY

Google Algorithm as Extinction Model, The

Every species — be it earthworm or great white shark — is entwined in a vast and complicated system of predator and prey called a food web. To determine which species in a food web are most important to the survival of the larger ecosystem, scientists design computer programs to model how the extinction of a given species would affect the other species in the system. This year, two scientists announced that they had found an unexpectedly useful tool for this purpose: the seminal Google search algorithm.

Stefano Allesina of the University of Chicago and Mercedes Pascual of the University of Michigan began with a simple hunch. Google's search engine uses an algorithm called PageRank to identify the most important Web sites on a given topic by analyzing links: a Web page is important if other important pages link to it. How different is this, really, Allesina and Pascual wondered, from an ecosystem, in which a species is important if other important species eat it?

Alllesina and Pascual borrowed Google's PageRank algorithm and modified it to model ecosystems in the natural world. As they explained in September in the journal *PLoS Computational Biology*, the modified algorithm was more efficient than existing ecosystem-extinction models at identifying which species' extinction would cause the greatest number of other species in the food web also to go extinct. "Our algorithm is faster and computationally simpler," Allesina says.



The PageRank algorithm could be useful in analyzing other networks too. The world features countless interconnected systems ranging in size from the minuscule (metabolic networks within a single cell) to the immense (international financial markets). After publishing the paper, Allesina received e-mail messages from dozens of researchers interested in adapting the PageRank algorithm.

"PageRank is a technique for finding hidden flows in huge quantities of data," says Yonatan Zunger, a Google software engineer who used to work on search technology and who contacted Allesina after seeing his research.

"There are all kinds of networks. PageRank is enormously applicable beyond the Web." MALIA WOLLAN

Gourmet Dirt

Laura Parker, an artist and agricultural activist based in Northern California, asked a friend late last year to raise a 320-pound pig on his farm to see if its flavor would match that of the dirt it grew up on. In May, Parker and her friends butchered, slow-cooked and ate the pig while smelling soil from the same farm. At first, they were skeptical that they would recognize similarities between the dirt and the pig, which had been fed strictly local produce, bread and goat whey. But "it was harmony," Parker says. Just to be sure, they tasted the pork while smelling soil from other farms, and it was obvious: in those other cases, there was no match. "Grassy" and "creamy" are common terms for wine tasting, but now they're being used to describe flavors of soil. Parker has held many similar tastings — primarily in art galleries, free to the public — with fresh dirt from local farms. "Soil is the basis of everything we eat," she says.

During the tastings, Parker spoons dirt into stemmed wineglasses and adds a small amount of water — essentially making mud — to release the soil's aroma.

Tasters bury their noses in the wineglasses and sniff deeply. The dirt's vapor molecules fall on the backs of tasters' palates, and they taste what they smell. "It's just like when you walk out after it rained," Parker says, "and you say, 'Oh, my God, that smells vibrant.'"

After the soil smelling, she pairs the dirt with food from the same farm — collard greens, squash, radishes, even eggs and goat cheese. The tasters are quizzed to see if they can isolate the same flavors they savored in the dirt — earthy, peppery, citrusy — to demonstrate the connection between what people eat and where it's grown. Next year, Parker will still hold her traditional tastings, but looking to this year's pig as an example, she wants to think of new ways to eat dirt.

DARA KERR



Guilty Robots

Wars are increasingly being fought by machines. Since 2004, the number of unmanned systems deployed in Iraq, for example, has gone from less than 200 to more than 18,000. Considering how difficult it is for human soldiers to reliably make rational, ethical and legal decisions in the heat of combat, the rise of battlefield robots may seem a cause for concern.

But imagine robots that obey injunctions like Immanuel Kant's categorical imperative — acting rationally and with a sense of moral duty. This July, the roboticist Ronald Arkin of Georgia Tech finished a three-year project with the U.S. Army designing prototype software for autonomous ethical robots. He maintains that in limited situations, like countersniper operations or storming buildings, the software will actually allow robots to outperform humans from an ethical perspective.

"I believe these systems will have more information available to them than any human soldier could possibly process and manage at a given point in time and thus be able to make better informed decisions," he says.

The software consists of what Arkin calls "ethical architecture," which is based on international laws of war and rules of engagement. The robots' behavior is literally governed by these laws. For example, in one hypothetical situation, a robot aims at enemy soldiers, but then doesn't fire — because the soldiers are attending a funeral in a cemetery and fighting would violate international law.



But being an ethical robot involves more than just following rules. These machines will also have something akin to emotions — in particular, guilt. After considering several moral emotions like remorse, compassion and shame, Arkin decided to focus on modeling guilt because it can be used to condemn specific behavior and generate constructive change. While fighting, his robots assess battlefield damage and then use algorithms to calculate the appropriate level of guilt. If the damage includes noncombatant casualties or harm to civilian property, for instance, their guilt level increases. As the level grows, the robots may choose weapons with less risk of collateral damage or may refuse to fight altogether.

DARA KERR

[AC: Ronald C. Arkin, "Governing Lethal Behavior: Embedding Ethics in a Hybrid Deliberative/Reactive Robot Architecture", Technical Report GIT-GVU-07-11, Mobile Robot Laboratory, College of Computing, Georgia Institute of Technology]

Heritage Chic

The Great Depression inspired American fashion this year, from men's wear by John Bartlett that looked like a stylized version of Lewis Hine's New York to frocks by Ralph Lauren that wouldn't feel out of place in a Dorothea Lange photograph. Meanwhile, off the runways, many sturdy American outerwear and workwear brands that were actually around during the Depression were enjoying their own unlikely upscale revival. Call it heritage chic.

The progressive clothing boutique Opening Ceremony, which was already using for its own house line fabrics from Pennsylvania's Woolrich, America's oldest continuously operating wool-clothing manufacturer (est. 1830), sought this year to further reimagine classic American clothing. It designed new collections in collaboration with Pendleton, the hundred-year-old Oregon company famed for its woolen shirts, and with the venerable footwear companies Keds (est. 1916) and Timberland (est. 1952).

Humberto Leon, a founder of Opening Ceremony, recalls that executives at Pendleton were at first taken aback by his store's interest in their wares. "They said, 'This is very different from a lot of the clothing you carry,'" he remembers. "And we said: 'We know. It's perfect.'"



Eventually, Opening Ceremony's desire to relate the Pendleton tradition to its fashion-forward customer led to a partnership that translated Pendleton's trademark Navajo jacquards and madras prints into slim urban cuts. The Timberland collaboration also yielded a contemporary interpretation of a classic — a convenience boot that combines Timberland's preppy three-eyelet lug and six-eyelet wheat construction boot.

A similar impulse recently prompted the whimsical New York men's wear designers Duckie Brown to mine the archives of the Wisconsin-based shoe company Florsheim (est. 1892) to create a new laceless wingtip and star-spangled Patriot boot. The Japanese designer Daiki Suzuki, who has been creating modern updates on the Woolrich catalog as head of the firm's upscale men's wear label Woolrich Woolen Mills, says that some credit for these new takes on old styles goes to Europe and Japan, where Americana has been fashionable for a generation. "It's not a trend," he insists. "It's more like a style. It's basics." JESSE ASHLOCK

Hourglass Surfboard, The

The classic longboard is an elongated, slightly concave ovoid, a shape that has changed little since surfing was invented by the ancient Hawaiians. But the Swedish designer Thomas Meyerhoffer's longboard, introduced in the spring, has a corseted waist and a narrow tail, with a bottom that is more deeply contoured than a typical board. All that curvaceousness is meant to lend the maneuverability of the shortboard, typically ridden by skilled surfers, to the more stable longboard.

Curves have always come naturally for Meyerhoffer, who created the biomorphic eMate laptop, Apple's predecessor to the iBook, and the beanbaglike Chumby, the first "soft" computer. After leaving Apple in the late '90s, Meyerhoffer embraced surfing. He started with longboards but soon began wanting a more agile ride, so he tried alternatives like the fish, a shortboard with a swallowtail. None could match the momentum he felt cresting a wave with the big plank of a longboard beneath him, however. His designer's curiosity piqued, he began wondering how he could make the longboard do more.

The answer came through subtraction. Since the longboard is ridden from the front or the back, Meyerhoffer reasoned that he could reduce mass from its midsection, giving his board its sinuous hourglass shape and making it lighter and easier to pilot while paddling for a wave.



He tried eliminating the tail entirely but found he needed it to balance the rounded nose; instead he tapered it to a point, preventing the tail from getting caught so the rider doesn't lose speed on a turn. He also slimmed the rails — the board's edges — from soft and thick at the hips to a thin, sharp line at the tail, helping to draw water over the planed surface while gripping the wave from the back. For the longboard, Thomas Meyerhoffer reduced mass from the midsection, tapered the tail to a point and slimmed the rails (the board's edges).

Many seasoned surfers initially rejected Meyerhoffer's board on sight. But former pros have since championed it, younger riders have won competitions with it and several production runs sold out quickly. "I hope it will be the ignition for more new ideas coming from other shapers," Meyerhoffer says. JESSE ASHLOCK

Infant Sleep Is Destiny

Attention, anxious parents with sleepless newborns: It's even worse than you think! You already know that a baby with poor sleep habits means misery for you and doesn't seem like much fun for him or her. But this year, evidence emerged that those sleepless nights may also be a sign of bigger troubles to come. According to a new study, erratic sleep patterns in the first 18 months of life correlate at age 2 with reduced "executive functioning" — the term psychologists use to refer to the ability to focus your thoughts, control your impulses and avoid distractions. And executive-function abilities in childhood, recent research has determined, predict future success in school and in life.

Annie Bernier, a psychologist at the University of Montreal; Stephanie M. Carlson, a psychologist at the University of Minnesota; and two colleagues followed 60 families with new babies, and at 12 and 18 months asked them to keep a "sleep diary" tallying how many hours the babies slept at night and during the day. (They decided not to use total hours slept as their measure of sleep quality, because babies gradually need less sleep as they grow. Instead, the researchers postulated that sleeping more hours at night and fewer during the day, as older children do, was a sign of better, more "mature" sleep patterns in infants.)



Earlier research showed that sleeplessness hampers cognitive skills in the short term for both children and adults — an all-nighter before a big exam is almost always a bad idea. But no one had measured the long-term effect of early sleep deficits. So Bernier and Carlson followed the same families over an extended period, and when they tested the children's executive-function abilities at 26 months, they found lingering effects of early sleep troubles.

Bernier and Carlson theorize that early sleep problems may be caused in part by certain parental behaviors, but precisely which behaviors and how they correlate to sleep isn't yet clear. Which is more comforting news for desperate parents to contemplate while singing lullabies and sipping coffee at 3 a.m.: your baby's sleep troubles are quite possibly your fault, but no one can tell you what you're doing wrong. Sweet dreams! PAUL TOUGH

Killer Earth

The Gaia hypothesis, proposed by the British scientist James Lovelock in the 1970s, states that life preserves the conditions for its own survival. Just as plants breathe out oxygen and humans breathe it in, the whole biosphere keeps the chemistry of air, oceans and soil in a balance that allows life to flourish. The entire planet works together as a giant living organism.

Peter Ward, a paleontologist at the University of Washington who specializes in mass extinctions, this year expressed a dimmer view of life on earth. He sees not a self-optimizing biosphere but a tangle of organisms that have evolved to starve their competitors and pollute their surroundings, behaving in ways that are "inherently selfish and ultimately biocidal." In his book "The Medea Hypothesis," named after the Greek mother who slaughtered her own children, Ward argues that for billions of years the biosphere has been its own worst enemy. "Life seems to be actively pursuing its own demise," he wrote recently in *New Scientist*, "moving earth ever closer to the inevitable day when it returns to its original state: sterile."

According to Ward, the mayhem started soon after the emergence of bacteria billions of years ago, which choked the earth's atmosphere first with a heat-reflecting haze of methane and then, a billion years later, with dangerous levels of oxygen, which at the time was toxic to life. Soon after, plants sucked up so much carbon that temperatures plummeted, creating a pair of deep ice ages. Of the five great extinctions since the rise of animals, Ward claims, four were caused not by volcanoes or by meteors but by life itself. To top it off, biomass has been declining for the last billion years.

After the current round of man-made global warming, both Ward and Lovelock predict that our descendants will eventually confront a long-term drop in carbon dioxide that threatens to wipe out all plant life within roughly a billion years. Grim as it may seem, a Medean perspective could help us avoid environmental guilt and nostalgia as we face these crises. "We must overcome nature," Ward writes, and later continues, "We do not want to go 'back to nature.'" JASCHA HOFFMAN



Kitchen Sink That Puts Out Fires, The

Animation by Nick Kaloterakis

House fires are most likely to begin in the kitchen. Yet aside from expensive sprinkler systems, the only tool for fighting kitchen conflagrations is the common fire extinguisher, which some risk assessors consider a fire hazard itself, because it encourages untrained people to battle the blaze rather than to evacuate. What's more, over the last two decades many countries have phased out one of the most effective extinguishers because it uses the ozone-depleting chemical halon.

Yusuf Muhammad and Paul Thomas, industrial-design students at London's Royal College of Art, learned this after a school assignment prompted a conversation with members of the Chelsea Fire Station. The firefighters mentioned water mist, a firefighting technology used on oil rigs and cruise ships because of its advantages in a confined space. After picking the brains of specialists at the conference of the International Water Mist Association, the duo began prototyping a low-cost means of taking water mist into the family kitchen.



Their patent-pending product, Automist, consists of a ceiling-mounted heat detector that triggers a pump under the sink that sends water to a special unit at the base of the kitchen faucet. There, six high-pressure nozzles emit jets of mist that rapidly turn to steam, creating an inert atmosphere that starves the fire of oxygen and reduces the heat of the room. "It's almost like being in a wet sauna," Muhammad says.

In tests conducted in a roughly 13-foot-by-13-foot space, the duo found the system could contain any type of blaze (including oil fires) in less than five minutes. After winning the James Dyson Award for emerging designers in September, Muhammad and Thomas are now working to get to market by summer a commercial version of Automist, which a licensed plumber will be able to install with any standard faucet. JESSE ASHLOCK

Literary Alzheimer's

Did Agatha Christie, who wrote several dozen mystery novels during her 53-year career, suffer from Alzheimer's-related dementia? Though some of her biographers have suspected as much, actual evidence was advanced in March by a research team led by Ian Lancashire and Graeme Hirst, professors at the University of Toronto, in a paper called "Vocabulary Changes in Agatha Christie's Mysteries as an Indication of Dementia."

The professors digitized 14 Christie novels (and included two more available in the Gutenberg online text archive), and then, with the aid of textual-analysis software, analyzed them for "vocabulary size and richness," an increase in repeated phrases (like "all sorts of") and an uptick in indefinite words ("anything," "something") — linguistic indicators of the cognitive deficits typical of Alzheimer's disease. The results were statistically significant; Christie's lexicon decreased with age, while both the number of vague words she employed and phrases she repeated increased. Her penultimate novel, "Elephants Can Remember," exhibits a "staggering drop in vocabulary" — of 31 percent — when compared with "Destination Unknown," a novel she wrote 18 years earlier. For Agatha Christie fans, the findings may be proof of a truth they have long recognized: the author's final two books, written in her early 80s, do not hold up against her earlier ones.



Christie's body of work lends itself to such analysis because it spans the bulk of an adult life, from age 28, when Christie wrote her first novel, to age 82, when she wrote her last. Still, Hirst cautions, "the question is not early style versus late style, but the late style of someone who is elderly but healthy versus the late style of someone who is elderly but not cognitively healthy." To contextualize their evidence, Lancashire and Hirst plan to analyze the work of P.D. James, a still-healthy writer who has continued to publish into her 80s, as well as the writings of authors like Ross Macdonald who are known to have had Alzheimer's.

AGATHA CHRISTIE

Lithium in the Water Supply

America has been adding fluoride to its public water supplies for decades, based on overwhelming evidence that even low levels of the substance can significantly reduce tooth decay, with no major side effects. Now research from Japan suggests expanding the list of aqueous additives — namely, to lithium.

Lithium often occurs naturally, in trace amounts, in water supplies, particularly in areas with a high concentration of granite. In *The British Journal of Psychiatry* earlier this year, the neuropsychiatrist Takeshi Terao and other researchers showed that communities in Japan's Oita Prefecture with higher levels of naturally occurring lithium in their water supplies had fewer suicides than those with lower levels. The amounts range between 0.7 and 59 micrograms per liter. Lithium in prescription doses (say, 600 to 900 milligrams) helps reduce mood swings in patients with bipolar disorder, but Terao and his colleagues speculate that drinking even small amounts over time has a cumulative effect, building up a resistance to the onset of mood swings in the first place. The researchers note that more work is needed before public-policy makers can consider adding lithium to water supplies. Lithium, after all, can be



toxic, and though the levels in the Oita study are too low to have an immediate effect, the element can affect kidney function and cause long-term health problems. "I think we need to be wary of introducing something across the board, because it does take time to work out what the side effects are," says Sophie Corlett, director of external relations at Mind, a British mental-health organization.

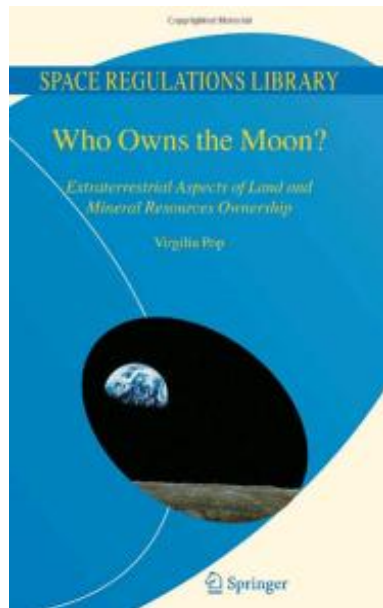
Nevertheless, Terao and his team contend that the lithium levels in their study are low enough not to cause significant side effects, and that in any case the benefits outweigh the risks. In a follow-up paper, they even posited that adding lithium to drinking water could "potentially offer an easy, cheap and substantial strategy for worldwide suicide prevention." But Corlett remains wary. "Mass inoculations of one sort or another always seem to be the easy answer, but we shouldn't assume that's the case," she says — especially because "lithium isn't a very friendly drug." **CLAY RISEN**

[AC: Hirochika Ohgami, , Takeshi Terao, Ippei Shiotsuki, and Nobuyoshi Ishii, "Lithium levels in drinking water and risk of suicide", *The British Journal of Psychiatry* (2009) 194: 464-465. doi: 10.1192/bjp.bp.108.055798]

Lunar Legalism

Can you own property on the moon? The earth's satellite became abruptly more economically valuable this year, when a NASA probe crashed into the lunar surface and discovered copious amounts of frozen water, a crucial precondition for anyone who wants to establish a base there. There would be military benefits to a moon base, but perhaps more important, there would be commercial ones too: the moon now offers tantalizing mining opportunities, including huge quantities of helium 3, which could be used to generate energy on earth.

Many countries and for-profit firms are eyeing the moon. China crashed a probe into the moon's surface in March, and Richard Branson plans to take tourists there on Virgin Galactic.



But if you set up shop on the lunar surface, what are your legal rights? Last winter, Virgiliu Pop, a researcher at the Romanian Space Agency, began circulating his book, "Who Owns the Moon?" Technically, the moon is covered by what is known as the Outer Space Treaty, which has been signed by spacefaring nations; while the treaty prohibits "national appropriation" of the moon, it is silent on private-sector property rights. The so-called Moon Treaty, another legal instrument, outlaws private property on the moon — but it hasn't been ratified by any of the major spacefaring nations. The upshot, Pop argues, is that the moon is currently a commons: anyone can use it, but nobody can own it or any part of it.

Pop predicts that the commons approach will erode as soon as someone starts digging into the lunar soil for profit. Indeed, he favors this: he suspects the likeliest way for humanity to unlock the value of the moon is via the "frontier" approach. As in the Wild West, private explorers could stake a claim and work their plot of land, and governments would come along later to enforce property rights.

"Where the text of the law is silent, custom is bound to develop," Pop writes. We're in for some deeply weird legal skirmishes in the decade to come. Whoever gets to the moon next could be the one to own it. CLIVE THOMPSON

Man-Made Greenery

Nature may well be the art of God, but that isn't keeping mere mortals from trying their hand at it. This year, a group of British engineers recommended building a forest of artificial carbon-filtering "trees" across the United Kingdom to combat climate change; and a Brooklyn designer completed a working prototype of leafy-looking solar panels that could one day replace ivy on buildings.

The treelike devices, which were created by Klaus Lackner, a Columbia University geophysicist, resemble giant fly swatters in one design. They use carbon-capture and storage technology similar to the kind that will be deployed at large power plants, but they aim to absorb carbon from dispersed emissions sources, like vehicles and residences, whose mobility or small size makes individual filters impractical or inefficient. This summer, the Institution of Mechanical Engineers estimated that a forest of 100,000 such trees could mop up half the United Kingdom's carbon emissions, making the forest thousands of times more effective than its natural counterparts.

Down the botanical scale from tree to vine is the designer Samuel Cochran's Grow system, a set of leaflike modules that harness both solar and wind energy. Solar panels aren't typically used, as Cochran's are, on the sides of buildings, because they work best when the sun hits them at a 90-degree angle; but Grow's foliagelike shape is designed for capturing oblique light.



In one design, the "trees" contain rows of filtration boxes that capture CO₂ in the air. 2. An automated process removes the CO₂-saturated filtration boxes and lowers them underground. 3. The carbon is removed by an underground cleaning facility and stored elsewhere, while the clean filtration box is returned to its slot in the tree.

And when a breeze rustles Grow's leaves, tiny piezoelectric generators in their "stems" create a small charge.

Neither project presumes to replace nature with Franken-forests. Because of the limits of carbon storage, artificial trees might be effective for only about a hundred years — long enough, according to Tim Fox of the Institution of Mechanical Engineers, to buy time as we wean ourselves off fossil fuels. And Cochran, nostalgic for the creeping vines of his childhood neighborhood, hesitates to claim Grow's superiority over ivy. "We haven't been bad-mouthing the actual plant," he says. MICHAEL SILVERBERG

Massively Collaborative Mathematics

In January, Timothy Gowers, a professor of mathematics at Cambridge and a holder of the Fields Medal, math's highest honor, decided to see if the comment section of his blog could prove a theorem he could not.

In two blog posts — one titled "Is Massively Collaborative Mathematics Possible?" — he proposed an attack on a stubborn math problem called the Density Hales-Jewett Theorem. He encouraged the thousands of readers of his blog to jump in and start proving. Mathematics is a process of generating vast quantities of ideas and rejecting the majority that don't work; maybe, Gowers reasoned, the participation of so many people would speed the sifting.

The resulting comment thread spanned hundreds of thousands of words and drew in dozens of contributors, including Terry Tao, a fellow Fields Medalist, and Jason Dyer, a high-school teacher.

It makes fascinating, if forbiddingly technical, reading. Gowers's goals for the so-called Polymath Project were modest. "I will regard the experiment as a success," he wrote, "if it leads to anything that could count as genuine progress toward an understanding of the problem." Six weeks later, the theorem was proved. The plan is to submit the resulting paper to a top journal, attributed to one D.H.J. Polymath.

By now we're used to the idea that gigantic aggregates of human brains — especially when allowed to communicate nearly instantaneously via the Internet — can carry out fantastically difficult cognitive tasks, like writing an encyclopedia or mapping a social network. But some problems we still jealously guard as the province of individual beautiful minds: writing a novel, choosing a spouse, creating a new mathematical theorem. The Polymath experiment suggests this prejudice may need to be rethought. In the near future, we might talk not only about the wisdom of crowds but also of their genius. JORDAN ELLENBERG

[AC: <http://gowers.wordpress.com/2009/01/27/is-massively-collaborative-mathematics-possible/>]

Music for Monkeys

When David Teie, a cellist with the National Symphony Orchestra, wanted to test his ideas about where our emotional response to music originates, he decided to try them out on monkeys. He figured that if his theories were right — namely, that our response to the "emotional vocalizations," pulses and heartbeats that we first hear in the womb establishes our sense of music — then he should "be able to write music for another species that's effective for that species." He contacted Charles Snowdon, a psychology professor who ran a colony of cotton-top tamarins in Madison at the University of Wisconsin, who sent him recordings of tamarin calls that demonstrated fear and calm. The fear-based calls "showed evidence of tritones and minor seconds," Snowdon says, and the calming calls had "long slow notes with some nice harmonic structure."



Teie wrote four pieces for cello and voice based on the tamarin vocalizations, two "threat-based" and two "affiliative." So that the tamarins could hear the compositions on their own terms, he sped them up three octaves. Even at human tempo, the threat-based music sounds martial and alien. Teie also chose four pieces originally designed for human listeners and played them to the tamarins for comparison, including bits of Barber's "Adagio for Strings" and Metallica's "Of Wolf and Man." Over two months, seven pairs of adult tamarins heard all eight pieces of music. Monkeys "really don't care much for human music," Snowdon says, and they showed very little response to it, with the weird exception of excerpts from Metallica and "The Grudge," by Tool, both of which soothed the monkeys slightly.

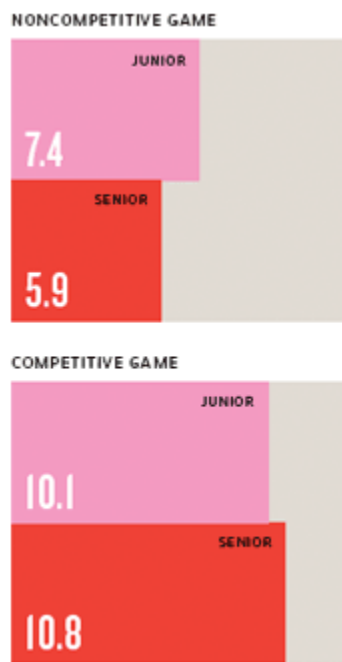
The monkeys responded more profoundly to Teie's music. The threat-based pieces led to "tongue-flicking, head-cocking, scratching," and other signs of anxiety, Snowdon says. The calming music "increased foraging behavior, eating and drinking." As he composed, Teie was careful not to replicate any of the tamarins' natural vocalizations; otherwise the animals might simply respond to what they already knew. Snowdon and Teie published their results online in September in the journal *Biology Letters*. Teie has since written other examples of "species-specific music" for cats and mustached bats. "It's certainly music," he says. "It's patterned. If I hand it off to other cellists, they can play it." AARON RETICA

[AC: National Symphony Orchestra Blog <http://kcblogger.kennedy-center.org/sites/NSOBlog/Lists/Posts/Post.aspx?ID=49>]

Myth of the Deficient Older Employee, The

Although workers who were 45 and older had lower unemployment rates in 2008 than younger workers, they stayed unemployed for longer periods, according to the Bureau of Labor Statistics. This is not surprising. Employers are often reluctant to hire older workers, not only because they have higher health care costs and sometimes command higher salaries but also because of their reputational stigma. Older workers are commonly thought of as being less productive and less willing to learn than younger workers, as well as overly cautious. But this year economists presented a more nuanced picture than the above stereotypes suggest.

In *The American Economic Review* in June, Gary Charness, an economics professor at the University of California, Santa Barbara, and Marie Claire Villeval, a colleague from the University of Lyon, published the results of a study in which they pitted "seniors" (those over 50) against "juniors" (those under 30) in three different decision-making tasks. These were formulated to test risk taking, competitiveness and cooperation.



As it turns out, the "seniors" more than hold their own. The seniors were also more cooperative, contributing more to their group during the cooperation test. The seniors outperformed the juniors on one competitive word game — and were only "very slightly less" competitive overall, Charness says. "Older workers," he stresses, "don't suffer from the deficiencies that a lot of people think they do."

In risk-taking, which the researchers assessed via an investing game, the seniors invested slightly more than the juniors. Seniors (50 and over) performed better than juniors (30 and under) in several tests, including a competitive word game.

Another welcome finding of the study came during the cooperation portion, when Charness and Villeval found that groups with a mix of ages outperformed homogeneous groups. For an optimum work force, Charness says, it is best to have a range of ages in the office.

LIA MILLER

Obama Effect, The

In 1995, two Stanford psychologists, Claude Steele and Joshua Aronson, demonstrated that African-American college students did worse on tests of academic ability when they were exposed beforehand to suggestions that they were being judged according to their race. Steele and Aronson hypothesized that this effect, which they labeled stereotype threat, might explain part of the persistent achievement gap between white and black students. In the years since, this idea has spread throughout the social sciences. Experimental studies have detected the negative effect of stereotype threat on a wide variety of groups, including women, old people, student-athletes at Swarthmore College and Ecstasy users.

Last year, a week before the Democratic National Convention, David M. Marx, an assistant professor of psychology at San Diego State University, was sitting at a conference with a couple of colleagues when talk turned to the presidential election. What would the rise of Barack Obama, they wondered, do to the stereotype threat experienced by African-Americans? Their idle contemplation quickly turned into a research project, and they quickly designed an experiment to measure what they called the Obama effect. At a series of moments during the 2008 campaign, Marx and his colleagues gave tests of verbal ability to selected black and white students after first priming them to focus on racial stereotypes of academic performance.

BARACK OBAMA



In a paper published this year in *The Journal of Experimental Social Psychology*, Marx and his colleagues reported that there was indeed an Obama effect, though it had certain limitations. Right after Obama's speech in Denver accepting the Democratic nomination, for instance, the negative effect of stereotype threat was significantly reduced for black students — but for only those who had actually watched the speech. Right after the election, black students again scored better, but at another point in the campaign, there was no measurable effect on their scores.

Other scholars have doubts about the phenomenon. In a separate study published in the same issue of the journal, Joshua Aronson, one of the original Stanford psychologists, found no Obama effect at all. "As much as I believe in the power of role models," Aronson concluded, "I suspect that the greatest contribution Obama will make to narrowing the achievement gap will be his policies, not his persona." PAUL TOUGH

Predictive Smiles

Say cheese and stay married? Yes, according to Matthew Hertenstein, a psychology professor at DePauw University in Greencastle, Ind. He and three colleagues recruited more than 600 people for a review of their college yearbook photos. The researchers rated the yearbook smiles by coding muscle movements around the mouth and the eyes.

The researchers found a surprising correlation: the less people smiled, the more likely they were to later divorce. The effect was statistically significant, though not huge. But when Hertenstein compared the top 10 percent of brightest smilers with the bottom 10 percent of weakest smilers, the "lowest were five times more likely to be divorced than the top."



The researchers also recruited 51 people to submit photos of their choosing. The relationship between smiling and staying married held even for the photographs this group submitted — posed and candid shots from when the subjects were, on average, 10 years old. "I'm more confident in the smiling effect because it held even with a) childhood and b) candid photos," Hertenstein says. Studying smiles in photos is only the latest in what has come to be called

"thin slice" research, popularized in the book "Blink," a couple of best sellers ago from Malcolm Gladwell. For example, from very short video clips, research volunteers have determined with surprising accuracy the personality, socioeconomic status and sexual orientation of those on camera. A still photograph is merely an extremely wafer-thin slice.

The why of the smiling effect remains elusive. Hertenstein acknowledges potentially "dozens" of possible explanations, going with perhaps the most straightforward and benign. He says his "gut inclination is that people who smile on average in their photos have a positive disposition that serves them well in life and relationships."

He cautions that his study is "not destiny." Readers who frowned in their yearbook photos are not putting off the inevitable if they fail to rush to court to file for divorce. "There are plenty of people who defy the odds," offers the professor, only slightly reassuringly. JEFF STRYKER

[AC: Hertenstein, M. J., Hansel, C., Butts, S., Hile, S. (2009). Smile intensity in photographs predicts divorce later in life. *Motivation & Emotion*, 33, 99-105. [Download](#)]

Printable Batteries

Though you may not be aware of it, the technology already exists to create a video screen thin enough — and flexible enough — to fit seamlessly into the pages of this magazine.

Ultrathin electronic devices can be built using a special inkjet printer that squirts fine layers of complex compounds instead of ink. When the compounds dry, they leave behind sheer metallic films, which in the right combination could act as thermometers, light sensors, even computer chips. So why haven't you seen these gadgets yet? In part because they are hard to power: even the smallest lithium-ion watch battery is too bulky.



The solution is to print batteries too. This year, a research team at the Fraunhofer Research Institution for Electronic Nano Systems revealed a 0.6-millimeter-thick battery.

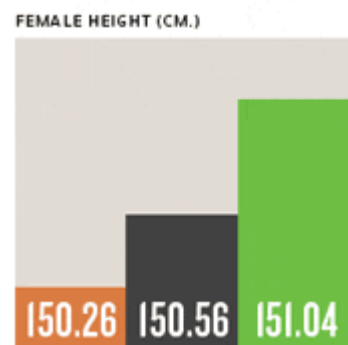
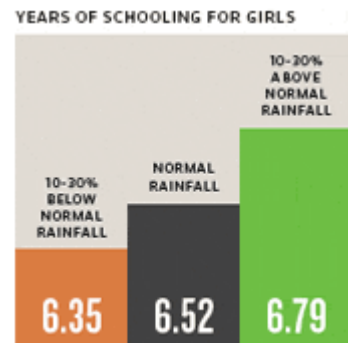
It consists of a stack of metal pastes that act as anode, cathode and electrolyte, bound on top and bottom by carbon layers that collect electricity and deliver it to the attached device. This product can be built right into the device it's powering, as part of the production process, so there's no need for an additional assembly line. And the battery can be made as large or as small as needed, simply by printing more of it. The list of possible applications is endless — from bandages that release medication when they sense an increase in body temperature to wallpaper that changes color at the flick of a switch.

We're not talking megawatts, of course. According to Andreas Willert, one of the researchers, it takes about 15 square centimeters of printable battery to provide the same power as a single watch battery. But 15 square centimeters could be enough to power, say, a blinking magazine cover for a month. The Fraunhofer Research Institution introduced its battery at a nanotech expo in Japan in February. The next step is to open a small production line, which Willert expects will be ready next year. Which means that soon, instead of reading these pages, you might be watching them. CLAY RISEN

[AC: http://www.eurekalert.org/pub_releases/2009-07/f-pb070209.php]

Rainfall Theory of Development, The

The amount of rain that fell during your first year of life has affected your education, your health and even how much money you can put your hands on — at least if you are a woman who grew up in the countryside in postwar Indonesia. In 2000, for example, rural women between the ages of 26 and 47 who were born in areas with 20 percent higher rainfall than normal the year after they were born were, on average, more than half a centimeter taller than their luckless (and drier) counterparts. These women also went to school for 0.22 grades longer and had more assets. That may not sound like a lot more education, but it means a year more of schooling for every five girls in those rain-enriched areas. And for every five girls in an area with 20 percent less rainfall than usual, a year of school was lost, compared with women who were born into a year of average precipitation. Just as notable, the Indonesian men who were surveyed showed no rainfall effect either way. Sharon Maccini and Dean Yang, a married pair of economists who teach at the University of Michigan, published their mash-up of local rainfall data with life outcomes in June in *The American Economic Review*. They point out that "our finding of significant impacts for women and not for men is consistent with gender bias in the allocation of nutrition and other resources, particularly in times of unusual hardship."



Dry times are hard times in poor countries, especially for girls.

Maccini and Yang also demonstrate that rainfall shocks that occurred when children were in utero had no long-term effect on adult men or women in Indonesia, suggesting that the nutritional bias began only when the sex of the child was revealed after birth. Less rice in this critical period can lead to worse health, followed by less schooling and, finally, fewer assets.

Economic growth and better irrigation have probably begun to diminish the rainfall effect in Indonesia, Yang says, but in other areas of the world like sub-Saharan Africa, where "income levels are still very low and people's ability to nourish their kids is almost certainly affected by rainfall fluctuations," it is most likely still going strong. AARON RETICA

Random Promotions

In 1969, the Canadian psychologist Laurence J. Peter posited the "Peter Principle": people in a workplace are promoted until they reach their "level of incompetence." This happens, Peter argued, because we wrongly assume that people who are good at their jobs will also be good at jobs that are one rung up on the corporate ladder — so we promote them. But often the new job is so different from the previous job that the employee can't handle it. Now performing incompetently, the employee stays in place, dragging the efficiency of the firm downward. Eventually the entire economy becomes like the paper company Dunder Mifflin in "The Office" — clogged with incompetence.

Is there any way to avoid this trap? Yes, by promoting people at random. That's what a trio of Italian scientists discovered this year. They created a computer model of a 160-person corporation and programmed it with Peter Principle-like logic: the best performers were promoted, but they had only a random likelihood of being good at their new jobs. Sure enough, the firm was soon cluttered with incompetents, and its efficiency plunged. But then the researchers tried something different: they reprogrammed the firm so that it promoted people entirely randomly, and the overall efficiency of the firm improved.

They also tried alternately promoting the absolute best and absolute worst performers. That, too, worked out better than promoting on merit. The scientists say these strategies work because they harness "Parrondo's Paradox," a piece of game theory in which you win by alternating between two losing strategies. "In physics or game theory, this isn't new," says Andrea Rapisarda, a physicist at the University of Catania in Italy and a co-author of the study, which was recently published in the journal *Physica A*.

As Rapisarda points out, if you could know for sure that the people being promoted would excel in their new jobs, that would be the best strategy of all. But if you aren't sure — and in the real world, we rarely are — then random works better. CLIVE THOMPSON

[AC: Alessandro Pluchino, Andrea Rapisarda and Cesare Garofalo, "The Peter principle revisited: A computational study" ["Physica A: Statistical Mechanics and its Applications Volume 389, Issue 3, 1 1 February 2010, Pages 467-472 \]](#)

attitude
+ dedication
+ results
- attitude
- dedication
- results

promotion

Resomation

The cremation rate has been on a brisk rise in the United States, in part because cremation is cheaper than burial and saves land. But powering a crematorium requires an enormous amount of gas and also sends carbon dioxide and other pollutants skyward. Enter resomation, an alternative to cremation for the eco-conscious cadaver.

Resomation is a process that liquefies rather than burns body tissues. It uses about a sixth of the energy of cremation and has a much smaller carbon footprint, according to Sandy Sullivan, the managing director of Resomation, a company in Scotland that has designed a resomation machine. The Mayo Clinic in Minnesota has been using a similar system since 2006 to dispose of donated bodies, but this year the first commercial Resomator is being installed at a funeral home in Florida, one of three states where the process is legal.



SANDY SULLIVAN

Resomation (a neologism meant to suggest rebirth) was first proposed for use in Europe as a method of disposing of cows infected by bovine spongiform encephalopathy. The corpse is placed in a pressurized chamber. The vessel is then filled with water and potassium hydroxide, creating a highly alkaline solution, and heated to 330 degrees. After about three hours, all that's left are a soft, white calcium phosphate from bone and teeth and a light brown primordial soup of amino acids and peptides. Bodies buried underground decompose in the same way, albeit over many years and aided by microorganisms.

Unlike cremation, resomation doesn't vaporize the toxic mercury of dental fillings and doesn't char joint implants, leaving them clean, shiny and potentially recyclable. The bone and tooth material can be ground into a fine ash, as with traditional cremains. The brown liquid, because it's sterile, can go down the drain. "There's no genetic material in it at all; it's just basic organic materials," Sullivan assures. "You might get some people who say they want the fluid as well, but at the end of the day, it's best to send it to the water treatment plant so it ends up back on the land, as nature intended it to." RUTH DAVIS KONIGSBERG

Reverse-Engineering Social Security Numbers

Keeping your Social Security number (S.S.N.) secure is key to preventing identity theft and fraud. But there have always been bugs in the system. People have known for decades about the conventions that the Social Security Administration uses when issuing S.S.N.'s, and not long ago, scientists figured out how to use this information to determine from a given S.S.N. the birth date of the applicant and the state in which the number was issued. Thankfully, though, the reverse was not true: an unknown S.S.N. could not be determined from that data.

Until now. This year, Alessandro Acquisti, an economist, and Ralph Gross, a computer scientist, both at Carnegie Mellon, announced in The Proceedings of the National Academy of Sciences that they had figured out how to predict a person's S.S.N. Their work was made possible, paradoxically, by steps the government took to prevent identity theft and fraud. Years ago, for instance, the administration decided to make public its Death Master File — the list of every S.S.N. taken out of circulation, together with the name, birth date and state in which the deceased originally applied for a number.

The release of the file was supposed to make it harder for criminals to hijack dead people's S.S.N.'s, since those numbers could be easily cross-checked. But it provided Acquisti and Gross with a data set that they could analyze for patterns in how the numbers are assigned. In addition, starting in 1989 the government encouraged parents to register children with S.S.N.'s at birth — instead of registering them anytime between birth and when they started a job. The intention, in part, was to prevent the theft of numbers that hadn't yet been claimed. One consequence, however, is that S.S.N.'s issued since then are even less randomly assigned than before — and thus easier to crack.

Given a state and birth date, Acquisti and Gross were able to predict correctly all nine digits in an S.S.N. in 1,000 attempts or fewer, 8.5 percent of the time, which renders a sizable percentage of S.S.N.'s about as easy to crack as a three-number PIN. From there, it is possible to use publicly available tools like online instant credit-card approval sites to try combinations until the right number is confirmed. MARK VAN DE WALLE

[AC: [Alessandro Acquisti](#) (Heinz College, Carnegie Mellon University), [Ralph Gross](#) (Heinz College, Carnegie Mellon University), Proceedings of the National Academy of Science, July 7, 2009. See <http://www.heinz.cmu.edu/~acquisti/ssnstudy/>]

Social Networks as Foreign Policy

In August, after the suppression of Iran's pro-democracy protests, officials in Tehran accused Western governments of using online social networks like Twitter and Facebook to help execute a "soft coup." The accusation wasn't entirely off-base. In Iran and elsewhere, this year showed the growing importance of social networks to U.S. foreign policy.



ROBERT GATES

Long before the protests in Iran started, the Broadcasting Board of Governors, which oversees U.S. civilian international broadcasting, had in place software to counter censorship in countries like Iran, so people could better access the blogosphere. And the State Department financially supports agencies that make it easier for Iranians and others to surf the Web. After the protests began, the State Department asked Twitter to reschedule a maintenance outage so the activists could continue to spread the word about their movement.

The United States has long disseminated information to people living under repressive regimes — think of Radio Free Europe. The difference here is that the content of the information isn't the important thing; the emphasis is on supporting the technical infrastructure and then letting the people decide for themselves what to say. Communication itself erodes despots' authority. "The very existence of social networks is a net good," says Alec Ross, a senior adviser on innovation to Secretary of State Hillary Clinton.

Outside of Iran, the State Department recently underwrote the establishment of Pakistan's first mobile-phone-based social network, Humari Awaz ("Our Voice"). More than eight million text messages were sent over it in a little over two weeks. And Ross recently traveled to Mexico with the Twitter chairman Jack Dorsey and other technology executives to help build an electronic system for anonymously reporting drug crimes, which they say they hope will undermine narcotics kingpins.

Defense Secretary Robert Gates, who has written about the efficacy of samizdat in undermining the Soviet Union, sees a similar dynamic at work here. "The freedom of communication and the nature of it," he has said, "is a huge strategic asset for the United States." NOAH SHACHTMAN

Sound Cannon, The

The Long-Range Acoustic Device (LRAD) is a powerful loudspeaker that can also emit a sirenlike noise at a volume of up to 152 decibels. According to national regulatory agencies, even seconds-long exposure to sound greater than 140 decibels brings risk of permanent hearing loss. Some people, like the demonstrators who heard it used by police officers this year at the G-20 meeting in Pittsburgh, call the LRAD an acoustic weapon. A spokesman for its manufacturer, American Technology Corporation, calls it a "communication device." But all agree: It's loud.

The LRAD has been on the market since 2003 and has been used by private companies and foreign governments, but it gained new attention this year when the Pittsburgh Police Department used it in what is believed to be the first public deployment of the siren in the United States. (The department says it did not turn the mechanism up to its highest volume.) The LRAD also made a cameo this year on the documentary television show "Whale Wars," when Japanese whalers deployed it against Sea Shepherd, a group of environmental protesters. Despite these controversial uses of the device, Robert Putnam of American Technology maintains that the LRAD is a tool for the public good.



The portable Long-Range Acoustic Device (LRAD) can be mounted on a vehicle and used to issue vocal commands or to emit a piercing sound that acts as a crowd deterrent.

In addition to the siren function, he says, the LRAD can amplify voices, like a supersize bullhorn. He says that the National Guard used the LRAD to communicate with flood victims stranded by Hurricane Katrina, and that

it has also been used by wind farmers to keep birds away "to allow us truly renewable green energy without blood-stained turbines."

Putnam says that "there's no denying that there's some bite to that deterrent tone" but maintains it is more humane than rubber bullets or billy clubs. He says that the company knows of no substantiated cases of LRAD-related hearing damage, though he adds, "I don't doubt that someone will claim it." EMILY BIUSO

Stiletto Claws



There are many theories about sartorial behavior as an economic indicator. In dark times, hemlines go down. Lipstick sales go up. And high heels grow ever higher, an attempt to lift our collective spirits by elevating women a few extra inches off the ground. So it was, perhaps, that during Paris fashion week in October, Alexander McQueen sent down the runway lobster-claw ankle booties that were the highest, and probably the strangest, shoes we have seen since the disco footwear of the 1970s. "I don't think it makes sense to play safe in these times," McQueen said in an interview, adding: "The world needs fantasy, not reality. We have enough reality today."

The boots — 12 inches tall, and so arched that the models who wore them appeared to be walking on pointe, like alien ballerinas — were part of McQueen's Spring 2010 collection, "Plato's Atlantis," a dystopian aquatic vision.

The surrealistic clothing, digitally printed with reptilian patterns, was itself something to behold, but as the models teetered along, it was difficult to focus on anything but the footwear. (Miraculously, there were no spills.)

Though a shoe like this would usually provoke the typical feminist debates about high heels, this one stands outside of such human considerations. Dubbed "the armadillo" by McQueen in a Twitter post, the boot transformed the models' feet into hooves, or the claws of some futuristic crustacean. Appropriately so: McQueen, influenced by "On the Origin of Species," presented a kind of evolution in reverse: from the sea we emerged; to the sea we will return.

But the message may also have been more mundane. These are shoes in which form topples function, an extreme version of the increasingly vertiginous — and nearly unwearable — heels that designers have offered for the past year. Indeed, "Can you walk in them?" was the question asked by many women on the Internet. The answer would appear to be: not easily. Though fashion creatures like Daphne Guinness and Lady Gaga have worn them, editors at British Vogue, who test-drove the boots, blogged that they "miserably failed to make it further than the Vogue fashion cupboard." AMANDA FORTINI

Subscription Artists

This summer, Allison Weiss, a 22-year-old singer who writes melodic songs about "hopeless hope," wanted to produce a 1,000-CD run of a new album she was recording, but she wasn't sure how to get the money to do it. Then she heard about Kickstarter, a Web site unveiled in April. At Kickstarter, creative types post a description of a project they want to do, how much money they need for it and a deadline. If enough people pledge money that the artists reach (or surpass) their financial goals, then everyone is billed, paying in advance as you would for a magazine subscription. For goals that aren't reached, nobody is charged.

In essence, Kickstarter offers a form of market research for artists. For perhaps the first time, an artist can quickly answer a nagging question: Does anyone actually want my art badly enough to pay for it? If the goal is reached, the artist now has a list of subscribers to her vision. And if the goal isn't reached? "It's painful, but it's better to find out early," rather than spend precious time and money on a project nobody wants, says Yancey Strickler, who helped found Kickstarter. More than 1,000 projects have been started on Kickstarter since April, raising money for projects as diverse as a solo sailboat trip around the world (\$8,142 raised) and a book by Scott Thomas documenting how he developed the graphic design for Barack Obama's presidential campaign (\$84,614 raised).

Weiss picked a goal of \$2,000, and like many Kickstarter users, offered a clever set of tiered benefits for fans: \$40 got someone a signed copy of the album (17 fans paid for that), and for \$500, the donor could pick any subject and Weiss would write a song on it. (Two people bit.) Weiss raised the \$2,000 in less than 10 hours, and eventually amassed \$7,711 from 195 backers, which meant she could pay for more mixing. Perhaps



even more important was the validation of her fan base. Weiss says, "I was surprised to find I had a more dedicated Internet following than I thought." CLIVE THOMPSON

Thirdhand Smoke



Many parents who light up are aware of the dangers of secondhand smoke; they blow it out the window or smoke at home only when the kids are not there. But people rarely account for what is left behind after a cigarette has been extinguished. When smoke dissipates, it does not just disappear. Compounds are left over that settle on walls, furniture and clothes, or become part of house dust. Call it "thirdhand smoke," which is what a team of researchers trying to raise awareness of the dangers of smoking named it in January.

The study, published in the journal *Pediatrics*, surveyed 1,500 smokers and nonsmokers about the hazards of secondhand and thirdhand smoke and found that 84 percent of smokers believe secondhand smoke is dangerous to children, while only 43 percent think

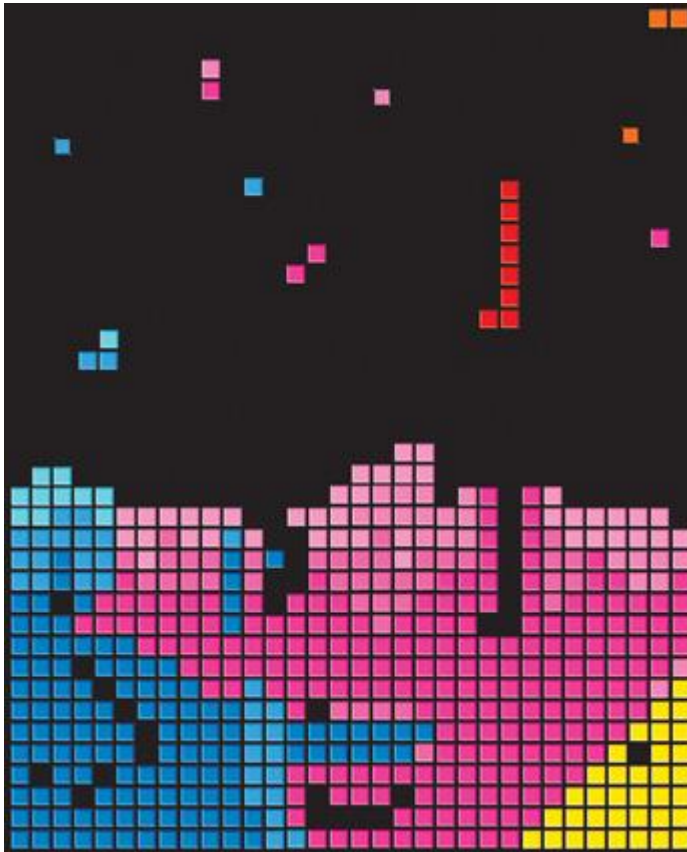
thirdhand smoke is harmful. But the compounds in thirdhand smoke can be ingested or absorbed through the skin, and some give off gases as they deteriorate, says Jonathan Winickoff, an associate professor of pediatrics at Massachusetts General Hospital, who led the research. Many are carcinogenic. "The more you smoke in these locations, the more microlayers of these toxins build up," Winickoff says.

Winickoff is analyzing data on children who live in apartments and encounter thirdhand smoke only from other units in their buildings. He expects to publish his results early next year. LIA MILLER

[AC: Jonathan P. Winickoff, MPH, Joan Friebely, Susanne E. Tanski, Cheryl Sherrod, Georg E. Matt,, Melbourne F. Hovell, and Robert C. McMillen, "Beliefs About the Health Effects of "Thirdhand" Smoke and Home Smoking Bans" *PEDIATRICS* Vol. 123 No. 1 January 2009, pp. e74-e79 (doi:10.1542/peds.2008-2184)]

Treating P.T.S.D. With Tetris

Whether it's caused by a car accident or an assault, post-traumatic stress disorder can result in vivid, incapacitating flashbacks of the traumatic moment.



For decades, doctors have tried to treat P.T.S.D. with everything from drugs to complex "desensitization" regimens. This year, a group of British scientists suggested a simpler therapy: playing the video game Tetris.

In an experiment, the scientists had 40 adults watch a 12-minute film filled with graphic scenes of traffic accidents, surgeries and a drowning — material that often produces mild flashbacks even when viewed only in a movie. Half an hour after the film, half the participants were asked to sit quietly for 10 minutes and the other half were asked to play Tetris for 10 minutes. They were then tested to see whether they had any immediate flashbacks; they also kept a journal for the following week in which they recorded any involuntary revisualizing of the imagery.

The group that played Tetris fared far better — experiencing 42 percent fewer flashbacks over one week. "It was so simple, and it worked beautifully," says Emily Holmes, a senior research fellow at the University of Oxford and an author of a paper published in January on the experiment. She calls Tetris a potential "cognitive vaccine" for P.T.S.D.

The scientists suspect the Tetris vaccine works because flashbacks are registered primarily as visual memories. By playing Tetris right after a trauma, the visual cortex becomes so busy that the brain doesn't encode the horrific visual imagery in the way that it otherwise might. (Tetris addicts report seeing the game's bricks falling in their mind when they try to sleep.) And Tetris is nonverbal, so it doesn't impinge upon other crucial work the brain does to help make sense of — and cope with — a traumatic episode. Holmes isn't yet recommending Tetris as a therapy. But if further tests confirm its value, the game could become a formal treatment: to help ease your mind after a trauma, try to manipulate gently falling bricks. CLIVE THOMPSON

Undead-Austen Mash-Ups

Publishers in search of a marketing hook aren't above trumpeting even their most middling wares as a mix of Dickens, Chekhov and Dan Brown. This year, a small publishing house in Philadelphia hit on a more effective formula: Take some Jane Austen, add a healthy dollop of gore and start counting the money.

The Austen monster mash-up boom began in April, when Quirk Books published "Pride and Prejudice and Zombies," a version of the 1813 classic fortified with "all-new scenes of bone-crunching zombie mayhem," by a Los Angeles television writer named Seth Grahame-Smith. The book is about 85 percent Jane Austen, with copious added references to cracked skulls and ninja swordplay. (The first line: "It is a truth universally acknowledged that a zombie in possession of brains must be in want of more brains.")

"Pride and Prejudice and Zombies" has spent eight months on the New York Times best-seller list, spawned several imitators and injected some fresh blood — and male readers — into an Austen industry dominated by gauzy romances. Goodbye, "The Private Diary of Mr. Darcy." Hello, "Mr. Darcy, Vampyre," "Sense and

Sensibility and Sea Monsters" and "Dawn of the Dreadfuls," a prequel to "Zombies" that lists Austen as an author despite the lack of what Hollywood types refer to as "participation."

The culture industry has always looked for familiar (and uncopyrighted) works to feed on. But some scholars say it's not such a big leap from Austen's mean-girl wit to real violence. In a way, Austen's novels are already zombie novels, says Brad Pasanek, a specialist in 18th-century literature at the University of Virginia. "They are exercises in what the critic D. W. Harding called 'regulated hatred.' Austen's prose sublimates satire, anger and pain into polite exchange."

Apparently, unexploited veins of horror lurk in other beloved literary genres as well. Next year, Seth Grahame-Smith goes solo with "Abraham Lincoln: Vampire Hunter," an entirely original work parodying the great-man style of popular history. His editor described it as "a presidential biography in the vein of a Doris Kearns Goodwin or David McCullough," with vampires added only "where they could fit in properly to the actual events of Lincoln's life." JENNIFER SCHUESSLER

Waste Tracking

The current system of curbside recycling hasn't kept pace with today's stream of high-tech garbage, which increasingly includes hardware that could be salvaged (like cellphone parts) and products that contain toxic materials that could be more safely disposed of (like some fluorescent light bulbs).

VALERIE THOMAS



But now, a prototype technology called Smart Trash aims to better manage all forms of waste that carry product ID tags. "The whole information system falls off when things are disposed," says Valerie Thomas, a professor of industrial engineering and public policy at Georgia Tech. She is developing the Smart Trash system to fix that. It begins with a garbage can outfitted with a scanner. When an unwanted item is dropped in, its UPC barcode or radio-frequency identification tag is read — as in the checkout line on the day it was purchased.

The scanner tracks important information like the make, model and component parts and, when Smart Trash is fully operational, will send that data to a waste company's Web site or a site like eBay to determine how much the item is worth to recyclers or in the secondhand market. That data can in turn be downloaded by the garbage collector at pickup, or relayed via a WiFi connection to the waste company, which will distribute the items accordingly — to e-waste handlers, recyclers and secondhand dealers. The user would get money for his trash in the form of rebates or sales proceeds.

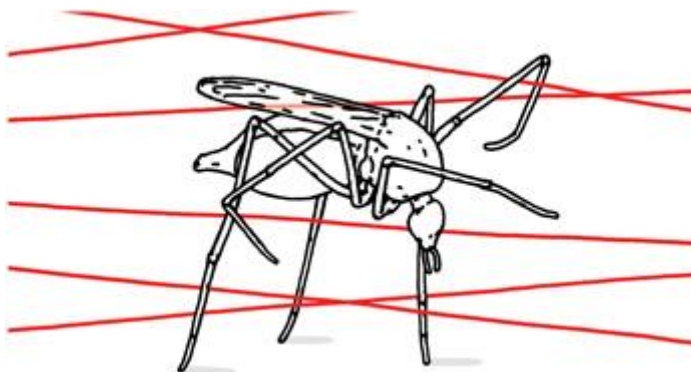
If implemented, Smart Trash's combination of a waste-tracking infrastructure and cash-for-trash incentives could help us rethink the garbage dump as a sorting facility like the post office — rather than a final resting place. DANIEL MCGLYNN

Weapons of Mosquito Destruction

Mosquitoes, though vulnerable as individuals to the swat of a hand, are as a group maddeningly difficult to kill or control. For some of us, this is a source of irritation. But in countries where mosquitoes spread malaria or other diseases, it can be fatal. Though netting and bug sprays offer some help, this year marked the promising advance of higher-tech antimosquito weaponry.

Szabolcs Marka, a Columbia University astrophysicist whose main occupation is searching the universe for black holes, received a grant this year from the Bill and Melinda Gates Foundation to develop a kind of futuristic mosquito net. He and two colleagues are working on a project that creates a "light shield" through which mosquitoes and other airborne insects will not fly. Marka says the project has had promising results. In a series of tests, mosquitoes were released into a box partitioned into halves by a laser beam. The mosquitoes stayed in one-half of the box, treating the laser wall as if it were solid (though it did not constitute an actual physical barrier). Marka envisions his laser shield covering doors and windows or encircling a bed with a cone of invisible light shining down from the ceiling.

Other scientists have also seen the future of mosquito combat in lasers — a field of innovation that this year The Wall Street Journal called "Weapons of Mosquito Destruction," or W.M.D.'s. The company Intellectual Ventures is developing something called the Photonic Fence. Lowell Wood and Jordin Kare, astrophysicists who have worked on the Strategic Defense Initiative, have conceived and developed this scheme, in which mosquitoes are blasted with lasers.



Marka notes that his method has the benefit of not upsetting the ecosystem by killing too many mosquitoes indiscriminately. He says he hopes that before too long he will have "something practical" for sale for around \$10. LIA MILLER

Web Searches in Real Time

When Michael Jackson moonwalked off this mortal coil in June, the outgoing King of Pop unwittingly ushered in a new era on the Internet: the age of real-time search.

If you wanted the scoop on what had just happened that day, the place to look for it wasn't Google News, which featured hours-old stories from The Associated Press and other news wires. The sites to hit were goofy-named start-ups like [Topsy](#), [OneRiot](#) and [Wowd](#). These companies crawl social networks like Twitter and Facebook to show you what people are saying right this second and, just as important, what they're linking to.

Instead of 10 blue links to Web pages, real-time search engines interweave video clips, blog posts, breaking news reports and tweets about what some reporter just said on CNN — or TMZ — plus the occasional old link made newly relevant, like a video clip of Jackson's first public moonwalk in 1983. They rank results by how much social-network buzz each item is getting at the moment.

By the early afternoon of June 25, a top result on most real-time search sites was a repeatedly updated blog post by two Los Angeles Times reporters who had access to gossipy first responders and City Hall staffers dealing with the Jackopalypse. Most people outside L.A. most likely wouldn't have thought to go to [latimesblogs](#).[latimes.com](#) for confirmation of Jackson's death. But once enough social-network users found the post and began linking to it, the real-time search sites floated it to the top.

Six months later, real-time search is one of the hottest subjects in Internet business, despite the field's lack (surprise!) of a proven way to make money. Microsoft includes traffic from popular tweeters into the search results on its heavily marketed Bing site. Twitter is improving its real-time tools at [search.twitter.com](#). And Google, oddly late to the game, says it is working on integrating real-time updates into its search engine. PAUL BOUTIN

[AC: I added the 3 search engines [Topsy](#), [OneRiot](#), and [Wowd](#), as clickable links. Try them as your own risk.]

Zombie-Attack Science

Epidemiologists today worry a lot about swine flu. But earlier this year, Philip Munz got interested in a more devastating possibility: an outbreak of zombies. A graduate student at Carleton University in Ottawa, he was watching a lot of movies about the undead and realized that zombification could be regarded as a classic paradigm of infectious spread: people get bitten by zombies, after which they turn into zombies themselves and start biting others. So Munz decided to use the tools of epidemiology to answer a sobering public-health question: could humanity survive a zombie outbreak?

Working with a professor and two other graduate students, Munz built a mathematical model of a city of one million residents, in which an outbreak occurs when a single zombie arrives in town. He based the speed of zombie infection on the general rules you see in George Romero movies: after getting bitten, people turn into zombies in 24 hours and sometimes don't realize what's happening to them until they change.

When he ran the model on a computer, the results were bleak. "After 7 to 10 days, everyone was dead or undead," he says. He tried several counterattacks. Quarantining the zombies didn't work; it only bought a few extra days of survival for humanity. Even creating a "cure" for zombification led to a grim result. It was possible to save 10 to 15 percent of the population, but everyone else was a zombie. (The cure in his model wasn't permanent; the cured could be rebitten and rezombified.)



There was only one winning solution: fighting back quickly and fiercely. If, after the first zombies emerge, humanity begins a policy of "eradication," then the zombies can be beaten. This is, as Munz points out, what traditionally saves humanity in zombie flicks. "People finally realize what's happened," he says, "and they call the army in." Or as he concludes in his paper on the work, to be published in the collection "Infectious Disease Modelling Research

Progress": "The most effective way to contain the rise of the undead is to hit hard and hit often." CLIVE THOMPSON

[AC: <http://www.mathstat.uottawa.ca/~rsmith/Zombies.pdf>]