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1 ELECTRIC CLOTHES



Physicists at Wake Forest University have developed a fabric that doubles as a spare outlet. When used to line your shirt — or even your pillowcase or office chair — it converts subtle differences in temperature across the span of the clothing (say, from your cuff to your armpit) into electricity. And because the different parts of your shirt can vary by about 10 degrees, you could power up your MP3 player just by sitting still. According to the fabric's creator, David Carroll, a cellphone case lined with the material could boost the phone's battery charge by 10 to 15 percent over eight hours, using the heat absorbed from your pants pocket. **Richard Morgan**



Chris Nosenzo



2 The New Coffee

Soon, coffee isn't going to taste like coffee — at least not the dark, ashy roasts we drink today. Big producers want uniform taste, and a dark roast makes that easy: it evens out flavors and masks

flaws. But now the best beans are increasingly being set aside and shipped in vacuum-sealed packs (instead of burlap bags). Improvements like these have allowed roasters to make coffee that tastes like Seville oranges or toasted almonds or berries, and that sense of experimentation is trickling down to the mass market; Starbucks, for instance, now has a Blonde Roast. As quality continues to improve, coffee will lighten, and dark roasts may just become a relic of the past. **Oliver Strand**



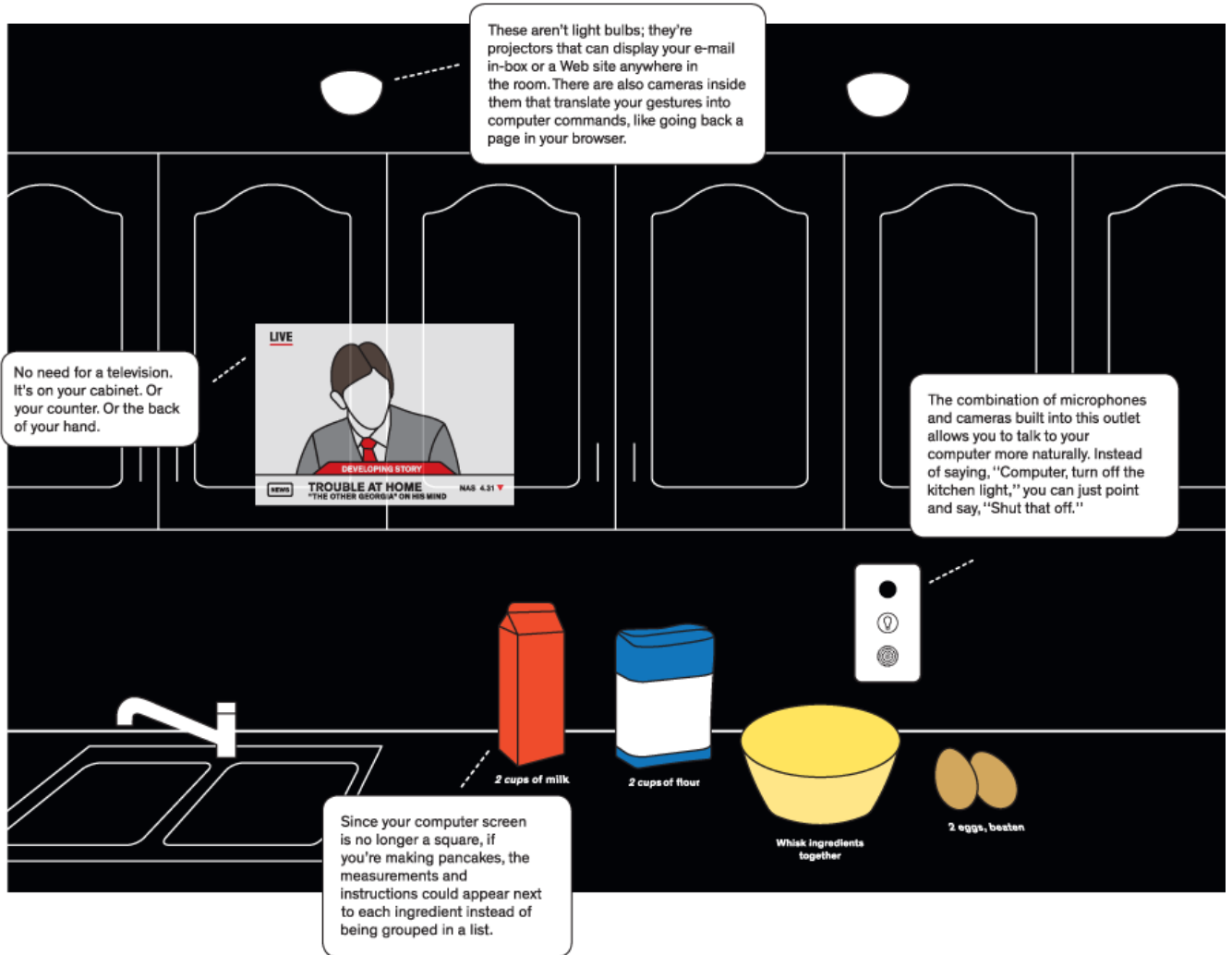
3 Analytical Undies

Your spandex can now subtly nag you to work out. A Finnish company, Myontec, recently began marketing underwear embedded with electromyographic sensors that tell you how hard you're working your quadriceps, hamstring and gluteus muscles. It then sends that data to a computer for analysis. Although the skintight shorts are being marketed to athletes and coaches, they could be useful for the deskbound. The hope, according to Arto Pesola, who is working on an advanced version of the sensors, is that when you see data telling you just how inert you really are, you'll be inspired to lead a less sedentary life. **Gretchen Reynolds**



4 The Morning Multi-Tasker

The problem with laptops and tablets, says Mark Rolston of the design firm Frog, is that they're confined by a screen. He wants to turn the entire room into a monitor, where you can have the news on your kitchen table while you place a video call on your fridge. And when you're done, you can swipe everything away, like Tony Stark in "Iron Man." **Clay Risen**



5 Clean Hair, No Hands

This 15-minute shampoo treatment begins when you lean your head back into a machine that looks like a sink at the salon. First it maps your scalp, then it shoots streams of warm water and



foam shampoo from its 28 nozzles before 24 silicone “fingers” work up a lather. One conditioning mist, scalp massage and light blow-dry later, you’re done. **Nathaniel Penn**



Q&A



Tim Wu
Author of “The Master Switch: The Rise and Fall of Information Empires”

What are your two best million-dollar ideas?

The first is permanent sunblock. No one likes putting the stuff on, so there should be a one-time treatment that embeds the skin with a permanent level of S.P.F. 30, akin to having Lasik eye surgery once and then forgetting about it. Sunburn vanquished like smallpox. The other is the “brain map” — a technology that maps out every neural connection in your mind and then, effectively, stores your brain on your hard drive. That information — more than your DNA even — is you.



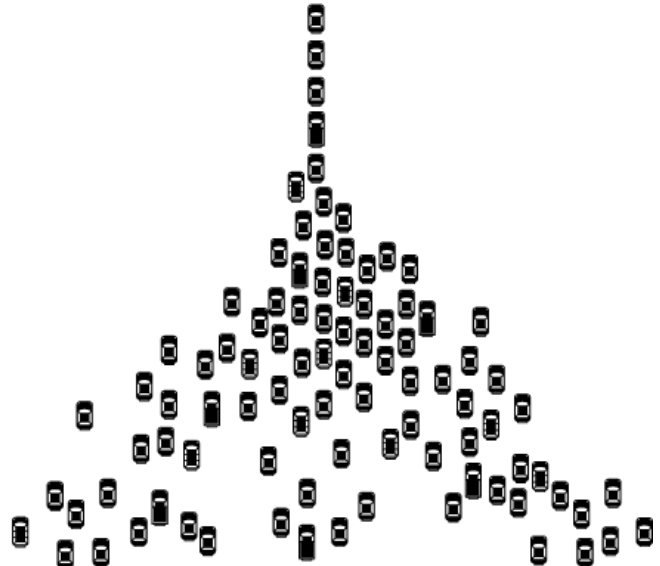
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THE CONGESTION KILLER



Traffic jams can form out of the simplest things. One driver gets too close to another and has to brake, as does the driver behind, as does the driver behind him — pretty soon, the first driver has sent a stop-and-go shock wave down the highway. One driving-simulator study found that nearly half the time one vehicle passed another, the lead vehicle had a faster average speed. All this leads to highway turbulence, which is why many traffic modelers see adaptive cruise control (A.C.C.) — which automatically maintains a set distance behind a car and the vehicle in front of it — as the key to congestion relief. Simulations have found that if some 20 percent of vehicles on a highway were equipped with advanced A.C.C., certain jams could be avoided simply through harmonizing speeds and smoothing driver reactions. One study shows that even a highway that is running at peak capacity has only 4.5 percent of its surface area occupied. More sophisticated adaptive cruise control systems could presumably fit more cars on the road. **Tom Vanderbilt**

- When a quarter of the vehicles on a simulated highway had A.C.C., cumulative travel time dropped by 37.5 percent.
- In another simulation, giving at least a quarter of the cars A.C.C. cut traffic delays by up to 20 percent.
- By 2017, an estimated 6.9 million cars each year will come with A.C.C.



Chris Nosenzo



BUILDING A BETTER BIKE

Rob Vandermark of Seven Cycles imagines his dream commuter bike. **Alex French**



Anti-theft handlebars

Here’s an old idea whose time has come again. The bearing system that allows the bike to turn can be locked so that a thief can’t steer his stolen bike. The lock is internal, meaning that he’d have to destroy the bike to ride it away.

No more greasy chains

An updated shaft drive — which replaces the chain with a rod and internal gear system — would be perfect for urban riders. They’re popular in China right now, but new versions will be lighter and have more sophisticated gearing.

One-piece plastic and carbon-fiber frames

Plastic frames were tried back in the '90s, but they were too heavy. The materials and technology have improved. Thermoplastics are cheap and practically impervious to the elements.



Chris Nosenzo



10 Doctor on Board

Your car is already able to call for help when an accident occurs, but within a few years, it'll tip paramedics off to probable injuries too. E.M.T.'s would know the likelihood of internal bleeding or traumatic head injury, for example, before arriving on the scene, which would help them decide whether to move you to a Level 1 trauma center or a standard emergency room. Researchers at the University of Michigan International Center for Automotive Medicine have created the predictive models by cross-referencing the crash data provided by sensors on cars, like speed and location of impact, with 3-D scans of accident victims. **Tamara Warren**



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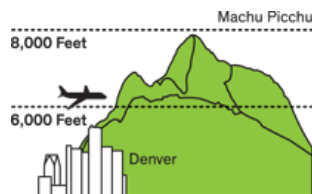
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Chris Nosenzo

markedly stronger by weight than the aluminum used for most existing planes, which means that the interior air pressure can be adjusted to more comfortable levels without the risk of damaging the fuselage. Airlines also keep humidity levels low now to prevent the plane's metal skin from corroding, but carbon fiber doesn't rust. That will allow a new system to maintain humidity at a more comfortable 15 percent (up from around 5 to 10 percent). Japan Airlines and Nippon Airlines bought the first crop of these new planes. They're currently in service between Tokyo and Boston. **Jad Mouawad**



Attitude Adjustments

The new planes maintain a more comfortable cabin pressure, which feels more like the altitude of Denver than that of the Andes.



12 THE ROLLING ARCADE



The industrial designer Jiang Qian has conceived of a subway strap that's also a video game. It has a button on each side that you push with your thumb as you hang on; instead of a joystick, you control movement by twisting the handle from side to side. Jiang imagines that new types of games could be created, where keeping your balance while the train is in motion is part of the challenge. And unlike Angry Birds on your phone, Strap Game (that's the official name) will alert you when your stop is approaching. **Jenna Wortham**



Q&A



Peter Schwartz
Futurist and film consultant

What technology that you wanted to put into a film were you not able to because it seemed too far-fetched?

In "Minority Report," Tom Cruise gets into a car that drives itself. We considered giving him neural control of that car, but we deliberately held back on how far biology could go. It would have overwhelmed the story. And here we are today with real neurological control of machines. It's transformative technology. In 50 years, you'll be able to drive cars with your mind.



13 The Anti-Slouch Screen

If you slump down when you're typing on an ErgoSensor monitor by Philips, it'll suggest that you sit up straighter. To help office workers avoid achy backs and tired eyes, the device's built-in camera follows the position of your pupils to determine how you are sitting. Are you too close? Is your neck tilted too much? Algorithms crunch the raw data from the sensor and tell you how to adjust your body to achieve ergonomic correctness. The monitor can also inform you that it's time



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2. If you're not up to ergonomic snuff, the monitor will tell you to straighten up.



14 THE SHUTUP GUN



When you aim the SpeechJammer at someone, it records that person's voice and plays it back to him with a delay of a few hundred milliseconds. This seems to gum up the brain's cognitive processes — a phenomenon known as delayed auditory feedback — and can painlessly render the person unable to speak. Kazutaka Kurihara, one of the SpeechJammer's creators, sees it as a tool to prevent loudmouths from overtaking meetings and public forums, and he'd like to miniaturize his invention so that it can be built into cellphones.

"It's different from conventional weapons such as samurai swords," Kurihara says. "We hope it will build a more peaceful world."

Catherine Rampell



Chris Nosenzo



15 The Kindness Hack

Researchers at Wharton, Yale and Harvard have figured out how to make employees feel less pressed for time: force them to help others. According to a recent study, giving workers menial tasks or, surprisingly, longer breaks actually leads them to believe that they have less time, while having them write to a sick child, for instance, makes them feel more in control and "willing to commit to future engagements despite their busy schedules." The idea is that completing an altruistic task increases your sense of productivity, which in turn boosts your confidence about finishing everything else you need to do. **Catherine Rampell**



16 Your Body, Your Login

A team of Dutch and Italian researchers has found that the way you move your phone to your ear while answering a call is as distinct as a fingerprint. You take it up at a speed and angle that's almost impossible for others to replicate. Which makes it a more reliable password than anything you'd come up with yourself. (The most common iPhone password is "1234.") Down the line, simple movements, like the way you shift in your chair, might also replace passwords on your computer. It could also be the master key to the seven million passwords you set up all over



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Jonathan Zittrain
Harvard professor of law and computer science

The Internet is not merely connecting computers together for the benefit of humans; it's connecting humans together to reinvent labor. This opens terrific opportunities along with real worries. Soon we'll have to question whether an earnest-looking group of protesters with hand-lettered signs is genuine or simply rapidly convened as a paid flash mob: a crowdsourced crowd. We'll be able to one-click shop for cheering throngs or protests at a particular location on a moment's notice, indistinguishable from genuine collective sentiment. A house can be surveilled and a spouse tailed because an online bounty has been put out for anyone nearby to take a photo of the building at a particular address, or to "follow that car."



17 TERRIFYING PLAYGROUNDS

Two Norwegian psychologists think that modern playgrounds are for wimps. Instead of short climbing walls, there should be towering monkey bars. Instead of plastic crawl tubes, there should be tall, steep slides. And balance beams. And rope swings. The rationale is that the more we shield children from potential scrapes and sprained ankles, the more unprepared they'll be for real risk as adults, and the less aware they'll be of their



surroundings. Leif Kennair and Ellen Sandseter's ideas have won the support of playground experts on both sides of the Atlantic; one company, Landscape Structures, offers a 10-foot-high climbing wall that twists like a Möbius strip. **Clay Risen**



Chris Nosenzo



18 The Liar's Workout

What's the new psychological trick for improving performance? Strategic lying. When amateur golfers were told, falsely, that a club belonged to the professional golfer Ben Curtis, they putted better than other golfers using the same club. For a study published in March, human cyclists were pitted against a computer-generated opponent moving at, supposedly, the exact speed the cyclist had achieved in an earlier time trial. In fact, the avatars were moving 2 percent faster, and the human cyclists matched them, reaching new levels of speed. Lying is obviously not a long-term strategy — once you realize what's going on, the effects may evaporate. It works as long as your trainer can keep the secret. **Gretchen Reynolds**



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A WORLD WITHOUT HANGOVERS

Researchers at Imperial College London are closing in on a formula for a new kind of booze — synthetic alcohol, it's called — that would forever eliminate the next morning's headache (not to mention other problems associated with drinking). The team, led by David Nutt, a psychiatrist and former British drug czar, has identified six compounds similar to benzodiazepines — a broad class of psychoactive drugs — that won't get you rip-roaring drunk but will definitely provide a buzz. According to Nutt, the alcohol substitute would be a flavorless additive that you could put in a nonalcoholic drink. And when you want to sober up, all you'd have to do is pop a pill. **Clay Risen**



Chris Nosenzo



Q&A

What tech problem needs to be addressed most urgently?

David Pogue
New York Times tech columnist

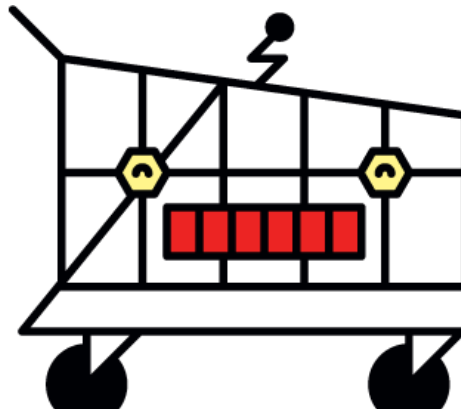


That we're heading for a bandwidth crunch. We're saddling the Internet with amazing new features — movies on demand, streaming TV, Siri voice recognition, whole-house backup — but they're starting to overwhelm the existing Internet's capacity, especially on cellular networks. The Internet and phone companies respond by imposing monthly limits, and the F.C.C. is trying to make more wireless frequencies available. But unless something gives, "high-speed Internet" will soon become an oxymoron. You'll just have to get used to pauses in your streaming video.



21 The Mind-Reading Shopping Cart

In February, Chaotic Moon Labs began testing a robotic shopping cart that acts a bit like a mind-reading butler. To start it up, you can text message the cart's built-in tablet computer. Now it knows who you are and what you need for dinner. The cart uses Microsoft's Kinect motion-sensor technology to track and follow you through the store, pointing you — in a synthy voice reminiscent of a G.P.S. navigator — toward products on your list. The system will also warn you if you've added something that violates your dietary restrictions. Still only a prototype, the cart isn't nearly as nimble as its human-powered cousin, but it does have one main advantage. Items you add to the cart can be automatically scanned, and you can finalize your purchase from the device, skipping the checkout line entirely. **Farhad Manjoo**



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MOVIES

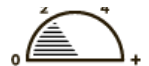
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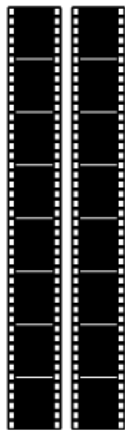
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motion — kind of like a storyboard. The directors James Cameron and Peter Jackson propose kicking that number to 48 or even 60 frames per second. It'll change the way we experience movies: colors will appear brighter, images sharper, motion smoother. Steven Poster, president of the International Cinematographers Guild, says the effect can be "almost holographic in quality." Proponents say it's what 3-D was supposed to feel like — a kind of immersive reality. Still, the image quality takes some getting used to. At an industry conference where Jackson previewed scenes featuring higher-frame-rate hobbits, critics complained that the hyperclarity made the scenes look like live television rather than cinema. It will doubtless take some getting used to. "When sound came out, a lot of people said this will last about three years," says cinema-studies professor Tom Gunning of the University of Chicago. "Instead it became totally dominant and wiped silent film off the map." **Addie Morfoot**

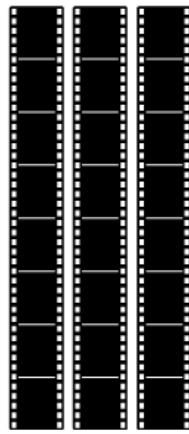
A Short History of Frame Rates

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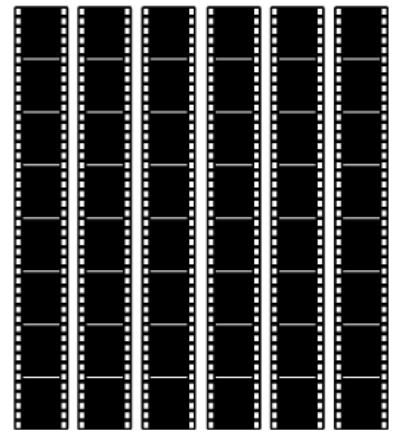
1894 "Record of a Sneeze," the first copyrighted silent movie, was filmed at 16 frames per second (f.p.s.).

— 1 SECOND —



1928 The first full-length talkie, "Lights of New York," came out at 24 f.p.s., which is still the industry standard.

— 1 SECOND —



2012 Peter Jackson's "Hobbit" is the first major motion picture to be shot at 48 f.p.s.



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TEETH THAT THINK



Scientists at Princeton and Tufts are working on a superthin tooth sensor (a kind of *Stomachcam*) that could detect tooth decay before it starts.



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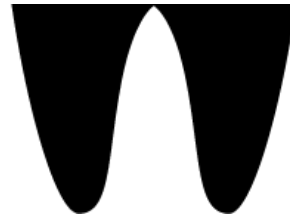
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Chris Nosenzo



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Sleep Mining

Wearing a small sensor on your head, at home, while you sleep, could be the key to diagnosing diseases early and assessing overall health. "This tech," says Dr. Philip Low, the founder of a medical technology firm called NeuroVigil, "enables us to look for faint signals of, say, schizophrenia, Parkinson's, depression or Alzheimer's in the brain, even though there may be no obvious symptoms." Thus far, Low's device has found a number of applications: evaluating children with autism, studying the efficacy of trial-phase drugs and assessing traumatic brain injury in soldiers. Currently, Low is working on a newer version of the device, which will be the size of a quarter and will transmit brain scans directly to smartphones and tablet computers. "We're using sleep," Low says, "as the gateway to the brain." **Howie Kahn**



Q&A

What innovation are you clamoring for?

Jacqueline Barton



2010 National Medal of Science winner

What I'd really love to see is full genomic sequencing at moderate costs that individuals can do at home. When taking a given drug or even deciding what to eat or how much to exercise, wouldn't it be good to know what you really need to be concerned about and what you don't? If you had high cholesterol, you could know if you should really be taking a statin, which, based on your particular genomics, could have limited benefit and some associated risk.



25 A Blood Test for Depression



This year, Eva Redei, a professor at Northwestern's Feinberg School of Medicine, published a paper that identified molecules in the blood that correlated to major depression in a small group of teenagers. Ridge Diagnostics has also started to roll out a test analyzing 10 biomarkers linked to depression in adults. "Part of the reason there's a stigma for mental illness, including depression, is that people think it's only in their heads,"

Redei says. "As long as there's no measurable, objective sign, we're going to stay in that mind-set of 'Just snap out of it.'" Blood tests will take mental illness out of the squishy realm of feelings. And as Lonna Williams, C.E.O. of Ridge Diagnostics, says, they'll help people understand "it's not their fault." **Elizabeth Weil**



26 CSI: Bathroom

Researchers at the Wyss Institute for Biologically Inspired Engineering at Harvard are working on a technology that would make household cleaning supplies much smarter — almost like a sprayable forensics team. When the spray hits a surface where there are pathogens present, like your bathroom sink, it would bind to the bad stuff and turn a color — orange, say, for E. coli. Then you could knock it out with a stronger disinfectant. **Nathaniel Penn**



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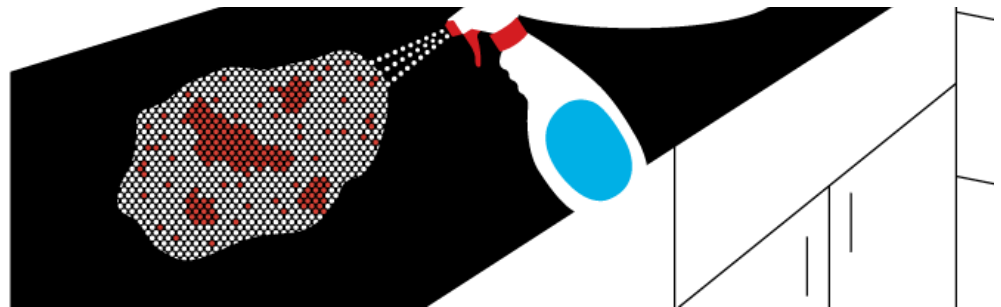
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27 A New Firefighter



Chris Nosenzo

You need a lot of water to put out a sizable blaze, and the chemicals used in fire extinguishers can be toxic (halons, the most effective chemical fire suppressant, create holes in the ozone layer). So the Defense Advanced Research Projects Agency at the Pentagon has developed a hand-held wand that snuffs out fires, without chemicals. According to the program's manager, Dr. Matt Goodman, an electric field destabilizes the flame's

underlying structure rather than blanketing the fire to smother it. Eventually, the technology could be used to create escape routes or extinguish fires without damaging sensitive equipment nearby. **Nathaniel Penn**



28 Michelin-Star TV Dinners

Frozen food may soon be on par with anything you can get at a three-star restaurant. Sous vide — a process in which food is heated over a very long period in a low-temperature water bath — has been used in high-end restaurants for more than a decade. (Thomas Keller and Daniel Boulud were early proponents.) But the once-rarefied technique is becoming mass market. Cuisine Solutions, the company that pioneered sous vide (Keller hired it to train his chefs), now supplies food to grocery stores and the U.S. military. Your local Costco or Wegmans may sell perfectly cooked sous vide lamb shanks, osso buco or turkey roulade. Unlike most meals in the freezer aisle, sous vide food can be reheated in a pot of boiling water and still taste as if it were just prepared. And because sous vide makes it almost impossible to overcook food, it's perfect for the home cook. Fortunately, sous vide machines are becoming more affordable. "It's like the microwave was 30 years ago," Keller says. **Michael Ruhlman**



29 Reduce, Reuse, Masticate



Chris Nosenzo

It's depressing to think how much food packaging there is in your kitchen right now — all those juice cartons, water bottles and ice-cream containers. But what if you could eat them? "We've got to package in the same way nature does," says a Harvard bioengineer named David Edwards. And so he has devised a way to convert foods into shell-like containers and films that he calls Wikicells. Yogurt will be encased in a strawberry pouch, for instance. You could wash and eat the packaging, like the skin of an apple, or you could toss it, like the peel of an orange, since it's biodegradable. The newly wrapped ice cream and yogurt will be available later this month at the lab store in Paris, with juice and tea coming within the next year or two.

Nathaniel Penn



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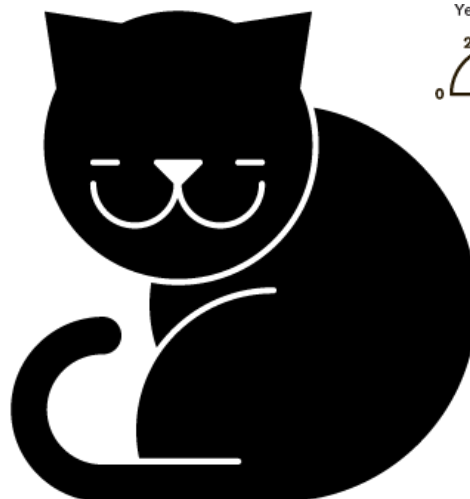
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sprinkler system when your lawn is dry. It's a good start, but Sanjay Sarma, of the Field Intelligence Lab at M.I.T., is working to produce tiny, inexpensive sensors that you scatter across your lawn by the dozens and that will track everything from bug infestations to mineral deficiencies. Then they'll tell you what to do about it: three spritzes of pesticide to the tomato plants, stat. **Howie Kahn**



31 ROBO-PETTING

Petting a living animal has long been known to lower blood pressure and release a flood of mood-lifting endorphins. But for various reasons — you're at work, or you're in a hospital, or your spouse is allergic to dogs — you can't always have a pet around to improve your mental health. So researchers at the University of British Columbia have created something called "smart fur." It's weird-looking (essentially just a few inches of faux fur) but its sensors allow it to mimic the reaction of a live animal whether you give it a nervous scratch or a slow, calm rub. Creepy? Yes. But effective. **Clay Risen**



Chris Nosenzo

32 Sleep Better

Researchers at Merck have created a pill called suvorexant that essentially makes you a narcoleptic for a night. It turns out that might be the best cure for insomnia. Unlike existing sleep aids, the drug (which will likely be reviewed by the F.D.A. later this year) works by turning off wakefulness rather than by inducing sleep. “There’s good reason to believe this pill brings on more R.E.M. sleep and better rest,” says Dr. Emmanuel Mignot of Stanford University. “It’ll be less of a hammer on the brain.” **Howie Kahn**



Q&A



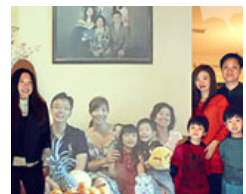
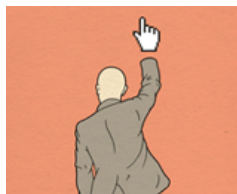
Margaret Atwood
Novelist

Is there any invention you find particularly sinister?

A smaller, even stealthier drone — something called the Cyberbug Drone, currently under development. In this model, a microsystem is embedded in an insect larva, and when the adult emerges — whether bee, butterfly or ant — a “bug” really will be a bug, and the proverbial fly on the wall will be actual. Tiny winged avengers can hunt down invasive beetles, cabbage whites can snoop on destructive raccoons and six-legged nanospies can insert themselves into the air-conditioning systems of even the most impenetrable buildings. As for bedbugs, they’ll wedge themselves under mattresses to snoop on errant spouses. The hive mind really will be the hive mind! Coming soon to a crevice near you.



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