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**BRIEFING**

THE  
FUTURE OF  
ELECTRICITY  
p91

# Technology PUBLISHED BY MIT SINCE 1899 Review

35 INNOVATORS UNDER 35

## The Next Generation of Technology

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Meet  
Simon,  
page 48

Smarter technology for a Smarter Planet:

## How to manage thousands of things you can't touch.

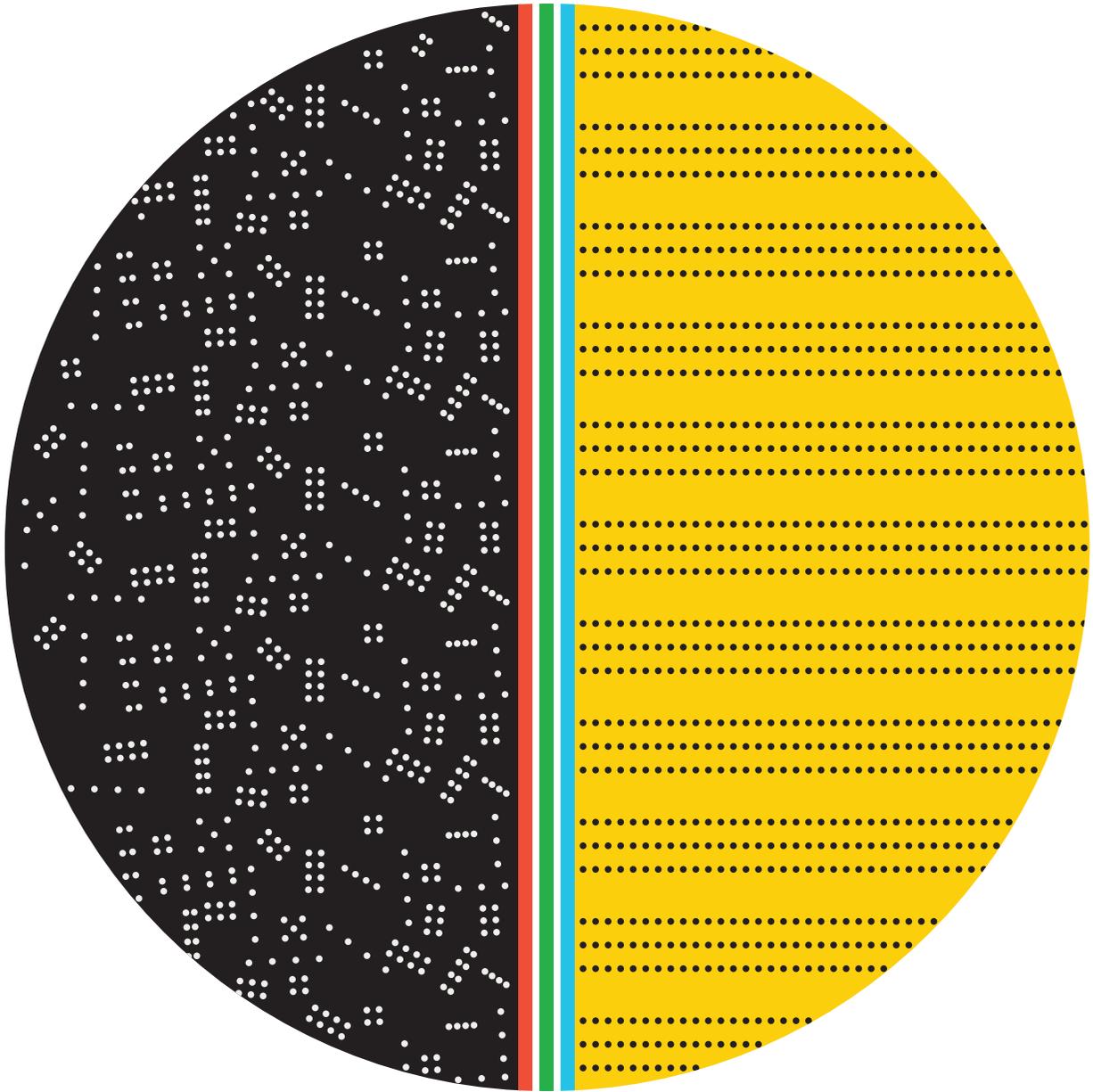
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This year's ninth annual list of innovators under the age of 35 showcases the world's smartest young scientists, technologists, and entrepreneurs. Get a preview of the future of technology.

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CHARLES GRAEBER profiles Kevin Fu, the TR35 Innovator of the Year (p. 44). Fu, an assistant professor at the University of Massachusetts, Amherst, studies ways to prevent hacking of credit cards and medical devices that use radio frequency identification. Says Graeber: "I was interested to learn that implanted defibrillators are tested by essentially triggering a heart attack in the operating room. It makes sense, and yet it's somehow shocking. I think Fu found this as surprising as I did. After his surprise wore off, he took that information and tested whether a bad guy could use it against the patient to create heart attacks rather than correct them. It's just another example of how his observational skills and his curiosity dovetail into his work as a technological innovator." Charles Graeber is a National Magazine Award-nominated writer and a contributing editor for *Wired* and *National Geographic*

*Adventure* magazines. He writes for the *New Yorker*, *New York*, the *New York Times*, *GQ*, *Vogue*, *Outside*, *Men's Journal*, and others.

ELIZABETH SVOBODA writes about TR35 innovator Michelle Khine (p. 54), who came up with a deceptively simple idea that could lead to faster, cheaper medical tests: she uses a children's toy to make serious devices designed to be used in medical diagnostics. "I was especially intrigued when I heard I'd be interviewing Khine, a researcher who figured out a way to make complex micro-



fluidic devices out of Shrinky-Dinks," says Svoboda. "Khine proved to be as down-to-earth as her practical invention makes her seem. When I visited her lab at UC Merced, she was in the midst of moving to UC Irvine, but she managed to keep a few of the Shrinky-Dink chips out of storage to show me. Khine's innovation proves that there's a lot to be said for good old-fashioned ingenuity as

well as the use of practical workarounds—even in the most rarefied of disciplines." Svoboda is a freelance science writer based in San Jose, CA. She contributes to *Popular Science*, *Discover*, *Psychology Today*, and *Salon*.



CORBY KUMMER writes about the newest trend in California winemaking: biodynamic farming (*In Vino Veritas*, p. 102). "I had no idea *biodynamic* was more than a fancy name for *organic*. And I certainly didn't know how strongly people would feel about whether biodynamic farming was actually better or just another California fad," says Kummer, who visited Sonoma County and Napa Valley to talk to winemakers. "A lot of what I heard is easy to make fun of," he says. "The fertilizers that biodynamic farmers use—they call them 'preparations'—sound like they're out of some medieval apothecary, or *Macbeth*. But the underlying principles—rebuilding the soil, and

thinking of it as a kind of base crop you have to replenish and feed—are sound, even if some of the jargon sounds ridiculous." Does the wine taste any better? "Maybe," he says. "But the wineries certainly look lusher." Kummer is a longtime editor and writer for the *Atlantic* and the author of *The Pleasures of Slow Food*.

STEVE MOORS photographed Fu and Humanitarian of the Year (José Gómez-Márquez, p. 58), whose work on simple yet novel devices could improve health care in poor countries. "My shoots tend to be a little unconventional, and a few subjects will draw a line," says Moors. "Not these guys: they wanted to have fun. They bravely embraced the



adventure and made themselves very much a part of the process." Moors is British but has lived and worked in New York since 2000. His work has appeared in *Face* magazine, *Tatler*, *Blueprint*, and the *Sunday Times* magazine.

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## TECHNOLOGY AND STIMULUS

In his second of two features on technology funding in the federal stimulus bill (“Chasing the Sun,” July/August 2009), David Rotman examined the impact that government spending will have on the future of solar power by reporting on a plan to turn land in Chicago into the nation’s largest urban solar plant.

David Rotman gave a good analysis of large-scale solar energy production, but analyzing only the up-front cost of a new energy production facility doesn’t address whether the investment is sound. The correct method uses life-cycle costing (LCC), which factors in the life of the installation and the ongoing maintenance. The article also overlooks low-temperature geothermal as an alternative energy source. Low-temp geothermal combined with a heat pump is the most efficient form of heating and cooling and could reduce our peak electricity demand. The stimulus bill, which provides for tax credits for both, could make a real difference.

Rick Clemenzi  
Asheville, NC

The article provoked much discussion online. One commenter approved of using solar cells but disagreed with Chicago’s use of land.

**Much better to place solar on all of the roofs in the US that are used solely for keeping the rain out. The trees growing on the site should be measured for their greenhouse-gas sequestration potential!**

Kevin Brown on 7/3/09  
Kimberley, British Columbia

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Another commenter wondered whether the first step toward reducing fossil fuel demand should be energy efficiency.

**The article was a nice overview of solar energy, but isn’t Chicago loaded with older houses that are energy inefficient? A landlord has no economic incentive to increase property cost to lessen the renters’ energy cost. Wouldn’t it be better to upgrade buildings so they use less energy?**

Carl Hage on 6/24/09  
Sunnyvale, CA

## NUCLEAR WASTE IN AMERICA

Chief correspondent David Talbot interviewed Allison Macfarlane, a geologist at George Mason University and a leading expert on nuclear-waste removal, who recently sat on a National Research Council committee evaluating the U.S. Department of Energy’s nuclear-power R&D programs (Q&A, July/August 2009). One reader found Macfarlane’s remarks unhelpful.

To read Ms. Macfarlane’s responses, one would conclude that the entire project was political and the science is bogus. Though politics were involved, many respectable scientists have studied the site and drawn the opposite conclusion from Ms. Macfarlane. And her response when asked to name a more suitable location—“I haven’t studied anything in detail, and I don’t want to get anybody upset”—is the kind of nonanswer mumbled by politicians, not scientists.

Rick Kossik  
Sammamish, WA

Another reader also framed the issue in political terms.

The political realities are simple: President Obama and Senator Harry Reid are trying to preëempt the licensing review being performed by the Nuclear Regulatory Commis-

sion. If the NRC finds that Yucca Mountain is safe for Nevada, why should the country spend billions of dollars and take decades to look for an alternative that may be safer?

Abe Weitzberg  
Woodland Hills, CA

## A POUND OF CURE

Former Wall Street analyst Andy Kessler reviewed stimulus funding for electronic health records (“A Pound of Cure,” July/August 2009) and concluded that the financial structure of the medical industry impedes their progress.

As a physician, I know that medicine’s financing structure is an obstacle to IT benefits. While electronic medical records sound like a solution, most physicians still operate in small businesses. My practice is initiat-

ing an electronic records system, and we’re seeing costs rack up already, making me think I’ve made the worst business decision of my career. Even patients don’t see health IT as being in their best interests, since it can limit expensive tests and raise privacy concerns. Yes, medicine’s financing structure creates impediments for IT, but for

complex reasons, not because of “a misplaced desire to protect the lucrative status quo.” If only the problem were that easy to fix.

David York, MD  
Coeur d’Alene, ID

## APPLES TO ORANGES

David Talbot (“Search Me,” July/August 2009) describes a Wolfram Alpha search revealing that on the day of Sir Isaac Newton’s birth, December 25, 1642, the moon was in the waxing-crescent phase. Alas, it is incorrect. Alpha’s lunar calculation was based on the Gregorian calendar, whereas the December 25 date is Old Style; on that day the moon was nearly full. This error has since been corrected.

Joseph Chapman  
Boston, MA



July/August '09