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Technology AN MIT ENTERPRISE Review

Special Issue

The TR35

The Young
Innovators
with This Year's
Best Ideas

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- **Martin Sadler**, Director, Trusted Systems Laboratory, HP Labs
- **Sebastian Thrun**, Director, AI Laboratory, Stanford University; DARPA Grand Challenge Winner
- **Iqbal Quadir**, Founder, Grameen Phone; Telecommunications Innovator
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Sebastian Thrun, DARPA Grand Challenge Winner

TR35 - Young Innovators Under 35

Meet the next generation of technology leaders and discover how they will change the way we live. Past recipients include Sergey Brin and Larry Page of Google; Marc Andreessen, co-founder of Netscape; Jonathan Ive, Apple Computer designer of the iMac; and Max Levchin, co-founder of PayPal (now part of eBay).



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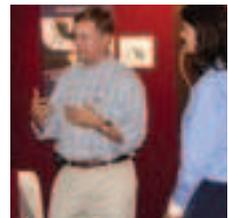


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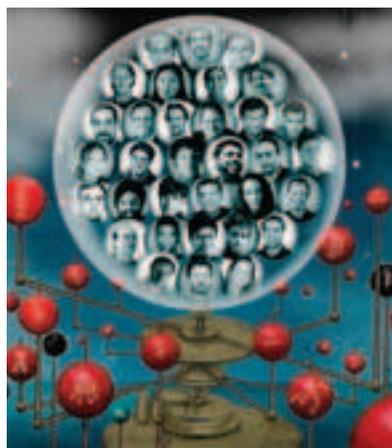


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Our annual selection of 35 innovators under the age of 35 (the awards began in 1999 as the TR100) is a celebration of the young scientists, computer programmers, and engineers inventing the future of technology. These are people who are radically changing their disciplines: a neurobiologist devising a way to make particular neurons fire at will; a chemist creating a new route to protein drugs; an electrical engineer building electronics that stretch like rubber bands; a neuroscientist deciphering the signals from the brain; a chemical engineer cleaning up toxic waste with nanoparticles. Two of the TR35 receive special awards: Joshua Schachter is the Innovator of the Year for his popularization of tagging on the Web; and Christina Galitsky is Humanitarian of the Year for her relentless efforts to bring useful technologies to some of the world's poorest communities.

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Contributors



Horace Freeland Judson wrote the profile of Edward Boyden (p. 52), who graduated from MIT with perfect grades at the age of 19,

and who has created a protein that allows neuroscientists to find specific types of neurons and activate them on cue. “His ambitions are vaulting, his vision romantic,” says Judson of Boyden, one of this year’s TR35. “Yet he loves the practical application, loves devising inventions.” Judson is the author of *The Eighth Day of Creation*, a history of molecular biology whose first three chapters appeared in the *New Yorker* in 1978. He has held academic appointments at Johns Hopkins and Stanford, and he founded George Washington University’s Center for History of Recent Science. He recently signed contracts for two books: one will include a chapter expanding on an article on gene therapy to appear in an upcoming issue of this magazine; the other will expand on the article he wrote for this magazine on China and science (“*The Great Chinese Experiment*,” December 2005/January 2006).



Jon Cohen wrote a brief profile of one of this year’s TR35: Alice Ting (p. 55), an assistant professor of chemistry at MIT, who has devel-

oped a way of observing the minute inner workings of a living cell. “Imagine,” says Cohen, “seeing a movie of the neurons in the brain as they learn something new, à la *CSI* showing you the inside of an aorta as it bursts. It’s such a fantastical idea that it sounds like something a Hollywood screenwriter would cook up after drinking too many shots of cheap tequila. I

heard it from Alice Ting whose lab can’t do that yet, but give her time. She’s only 31.” Cohen, a correspondent for *Science* who has written for a number of other publications, specializes in reporting on biomedical research. He is the author of two books, *Shots in the Dark: The Wayward Search for an AIDS Vaccine* and *Coming to Term: Uncovering the Truth about Miscarriage*.



Douglas McGray wrote the profile of Christina Galitsky, our Humanitarian of the Year (p. 60). Galitsky works at Lawrence Berke-

ley National Laboratory, where she advises companies on ways to save energy, but she has also taken on projects outside the scope of her job, such as an energy-efficient outdoor stove for refugees. “She’s tackling some tough scientific challenges, but I appreciated that these aren’t just intellectual puzzles for her,” says McGray. “There’s something simple and humane in the way she talks about science. She’ll drop into technical lingo, but it’s never long before she brings the conversation back to the people and communities who will benefit from her research—or live with science’s failures.” McGray is a San Francisco-based writer and a fellow at the New America Foundation. He has written for the *Atlantic Monthly*, the *New York Times Magazine*, *West*, and *Wired*.



Simson Garfinkel, in reviewing the new Q phone from Motorola, argues that users want software that understands the context in

which they are operating and uses as simple an interface as possible (see

“*Q Is for Quixotic*,” p. 74). “I was hoping that the Q would be a really amazing phone that I could use for my day-to-day activities, instead of the Treo 700p,” he says. “The Treo is big and bulky and the Q is small and sleek, and I was really excited about it. The hardware is amazing, but I was worried about the fact that it was running Windows Mobile. Apparently I was right to be worried.” Garfinkel is a postdoctoral fellow at the Center for Research on Computation and Society at Harvard University and a consulting scientist at Basis Technology, which develops software for extracting meaningful intelligence from unstructured text. He is also a founder of Sandstorm Enterprises, a computer security firm that develops advanced computer forensic tools used by businesses and governments to audit their systems. Garfinkel has published articles about information policy and terrorism since the late 1980s.



Jonathon Rosen illustrated this month’s cover. “I’m a huge fan of engineering and technology,” he says, “so I was completely

thrilled to be invited to interpret the ‘35 under 35’ idea for the magazine. I decided to mix biology (cells multiplying in an embryo) and cosmology—an orrery of the embryo as the center of a mechanical universe.” Rosen’s work is in the permanent collection of the Metropolitan Museum of Art in New York and has appeared in *Rolling Stone*, the *New York Times*, *World Art*, *I.D.*, *Eye*, and many other publications. He is also the author of the books *Intestinal Fortitude* and *The Birth of Machine Consciousness*. Rosen teaches the history of anatomy and medical illustration at the School of Visual Arts in New York.



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Letters

Our July/August 2006 issue centered on energy—as did most of the letters we received after publication.

The Nuclear Option

Matthew Wald did a great job reviewing the current state of nuclear power (“The Best Nuclear Option,” July/August 2006). I know how complex the subject is; I spent 13 years in the naval nuclear-power program, 10 years working on spent-fuel recycling and production of breeder-reactor fuels, and 10 years consulting for the U.S. Departments of Energy and Defense.

Yes, nuclear power is an obvious choice for production of electricity as an alternative to fossil fuels. The required technology is available, as indicated by the more than 400 nuclear power plants operating in 31 countries. The next step in our country will be to recycle the spent-fuel discharges. The technology to do that is also available and is being used around the world.

Another step will be to use breeder reactors, in which more fuel is produced than charged. Breeders will be used to accommodate depletion of uranium ore and the need to mine it.

*Bill Frankhouser
Elizabethtown, PA*

A New Way to Get Ethanol Cheaply

In his article on the production of ethanol (“Redesigning Life to Make Ethanol,” July/August 2006), Jamie Shreeve writes, “Processing ethanol from cellulose—wheat and rice straw, switchgrass, paper pulp, agricultural waste products like corn cobs and leaves—has the potential to squeeze at least twice as much fuel from the same

area of land, because so much more biomass is available per acre.”

Instead of using “waste products” to restore the fertility, improve the texture, and increase the water-retaining capacity of land, the policies advocated by Jamie Shreeve would degrade our land. You cannot “squeeze” land for long before it becomes infertile.

*Irma Esrig Cohen
Ottawa, Ontario*

Editor's Letter

In his July/August editor's letter, Jason Pontin writes that “it is now settled fact that our industries are changing the weather.” His statement creates the impression that the MIT community is substantially in agreement with the belief that industrial emissions are “quickly and ruinously” changing the climate, with only the rate in doubt. But within the MIT community there is not unanimity in the fear of catastrophic climate change due to industrial emissions. I refer readers to a July 2 *Wall Street Journal* article titled “Don't Believe the Hype.” The writer, Richard S. Lindzen, Alfred P. Sloan Professor of Meteorology at MIT, effectively demolishes the campaign to convince the public of scientific unanimity on the severe imminent danger of greenhouse-gas emissions.

*Stanley Kasper
Pawleys Island, SC*

Jason Pontin is right to advocate Pigovian fees, which are paid to governments for the use of scarce public resources (fish in the sea, the environment's tolerance for carbon dioxide, etc.). They enforce a constraint with a minimum of central planning.

Pontin briefly describes another remedy for pollution: capping emission limits, then allowing polluters to trade emission credits. He rightly says that such “cap and trade” schemes don't work very well. I'd like to add that they aren't fair and can amount to a land grab. For hundreds of years, common

resources from acreage to radio bandwidth have been given away. Even if cap-and-trade does not encourage industrialists to pad their emissions now, it is unjust to give such property rights to polluters.

*Jorgen Harmse
Austin, TX*

Jason Pontin writes that “the rich world will *never* voluntarily accept any reduction in its accustomed manner of living, nor will the poor world surrender its legitimate aspirations to wealth.” That's one way to look at it, but is it not possible that we will simply run out of certain resources if we don't use less of them? The slowly growing practice of “voluntary simplicity” attests to the fact that individuals can unilaterally decide to live simply and consume less.

*Shahzeen Attari
Pittsburgh, PA*

“Homo Conexus”

I read with interest James Fallows's piece on the new wave of Web-based applications sometimes called Web 2.0 (“Homo Conexus,” July/August 2006). In using these new programs, he sometimes found that while a new online service was impressive, he was just too old to enjoy it. Unfortunately, I often feel quite the same way. I enjoy reading about exciting technological innovations, but—nose pressed to glass—cannot really participate.

I also liked Fallows's observation that trust, in general, is important to Web 2.0, but would like to add that Web 2.0 demands a specific kind of trust between a given application's makers and users. Desktop software, such as Microsoft Word and the Thunderbird e-mail client, is the same day-to-day. Not so with Web 2.0. One can log on to Gmail or Yahoo Mail and find that the interface has radically changed and that the arrangement and filtering of one's e-mail has been altered.

*Mark Gerstein
New Haven, CT*

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