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Third Culture

## Year in Science: Icons

Introducing 15 people who have shaped the global conversation about science in 2005.

by *Edit Staff* • Posted December 27, 2005 02:09 PM

*From the DEC/JAN 2006 issue of Seed:*

**LISA  
RANDALL**  
**Theoretical  
Physicist/  
Author**



Lisa  
Randall is  
currently  
among the  
most-cited  
theoretical

physicist in the world, with two of her scientific papers among the five most influential theoretical works of the past 10 years. She is the first female theoretician to receive tenure at MIT and at Harvard, where she currently works, as well as the first woman to be tenured in physics at Princeton. Atop this list of accomplishments is a new book detailing the 20th century's most fascinating concepts in physics.

The 43-year-old native of Queens, NY, has published widely on fundamental problems of the universe, often using simple yet elegant approaches that have eluded other physicists in their search for answers. She has the rare distinction, along with her coauthor Raman Sundrum of Johns Hopkins University, of having founded a new vein of research: the brane-world scenarios. At the heart of this work is the idea that the observable universe is merely a three-dimensional membrane-like object—called a brane—residing in a larger extra-dimensional space. It was a concept so novel, she says, that “we were a little afraid we were presenting something that not only defeated conventional wisdom, but also showed that we were crazy.”

Randall's work was largely out of the public's earshot until the fall, when she published her first popular science book, *Warped Passages: Unraveling the Mysteries of the Universe's Hidden Dimensions*.

Complete with pop lyrics, thoughtfully crafted metaphors and a string of fictional vignettes that illustrate difficult physical concepts, Randall has written an accessible account from the leading edge of physics.

Through her writing, she hopes to motivate a new generation of scientists and to contribute a female voice to the popular discourse on physics: “I thought it was important that the world, and young people in particular, know that not everyone doing physics is male, which you wouldn’t necessarily deduce from the popular literature.” In 2005, she also lent her voice to the Task Force on Women in Science and Engineering, created by Harvard President Larry Summers in the wake of his comments on gender differences in the sciences.

Despite her remarkable ability to illuminate the complex phenomena at play in the universe, it is clearly the act of tackling the big questions in physics—the problem of the cosmological constant; the idea of extra dimensions—that Randall most relishes. “The most enjoyable part is when you lose yourself in a problem, particularly those moments when ideas suddenly click and you know you’ve really made some advance in understanding.”

-- Joshua Roebke

## **ANETTE ASP**

**Coolhunter/Design Enthusiast**

**&**

**STEVEN QUARTZ**

**Philosopher/Neuroscientist**

Steven Quartz and Anette Asp are not your typical coolhunters. Rather than trend-spotting along city streets, the Los Angeles-based team is probing the concept of “cool” at Caltech’s Social Cognitive Neuroscience Laboratory. By understanding cool, they’re hoping to eventually combine cognitive science and product design.

In 2005, Asp and Quartz’s project, Coolscan, was linked to neuromarketing by news media attracted to its headline appeal. However, the team believes that an understanding of cool can also explain our needs and desires, telling us something about what it means to be human. “The needs [that] a consumer society instills in us are not artificial. Consumerism is about our social needs, which are deep-rooted,” says Steven Quartz, 42, who teaches neuroscience and philosophy at the West Coast institution.

Originally from Sweden, Asp, 28, was hired by Caltech to bridge the university with the Art Center College of Design, also in Pasadena. She engaged design students to make science projects at Caltech more accessible to the public. Quartz noticed her work and invited her to manage CoolScan. They utilize functional magnetic resonance imaging (fMRI) to capture the brain activity of participants looking at objects that have been rated for “coolness” by a team of design students. “What

we measure is identification. What an iPod, a Mini Cooper and a Louis Vuitton bag have in common is the influence they have on the consumer's sense of self," says Asp.

More broadly, Quartz and Asp are using a combination of sociology and neuroscience to understand how brain



development is affected by culture. To describe this field, they've coined a new term, "cultural biology," to capture their belief that social culture and biology define our basic needs. "We identify with things. In a profound sense, we are what we buy," says Asp. She and Quartz are currently collaborating on *Cool: Inside the Brain's Hidden Quest for Cool and How It Shapes our Desires, Why We Buy and Who We Become*, to be published in 2006.

Naturally, the initial interest in CoolScan came from the marketing industry. So far, Asp and Quartz's findings have reinforced current knowledge of consumer behavior: that we crave what we identify with and that novelty excites us. But what CoolScan brings to marketers is a tool for enhancing the accuracy of focus group research. The impulses of participants, who are often unconscious of, or unwilling to, reveal their true motives for buying, can be disclosed by brain imaging.

A startling number of products fail in the marketplace. So Quartz and Asp are also investigating what brain science could do for design. While they recognize that fMRI is still a limited tool, they expect that as the technology improves, product design could benefit greatly from their work. "Our insights from brain science will be the guide in pursuing creations aimed at triggering our senses and evoking awe-inspiring experiences that have yet to be discovered," said Asp, noting that their research addresses the quality of design and the needs of the consumer. "By giving products personalities, making them more humanlike, we will create products that are more socially engaging," adds Quartz.

The products the team has in mind would easily fit into a story by Philip K. Dick, who famously asked what happens when boundaries between humans and machines blur, when the toaster has opinions and the video camera is a real eye watching you. Wouldn't truly socially engaging products erode the value of human relationships? Optimistically, Quartz predicts quite the opposite. "We buy products because they define us socially. More engaging products will lead to more engaging interactions with other people". Asp adds, "In this sense, brain science

will become part of enhancing everybody's lifestyle and happiness."

-- Eva Wisten

## JUSTINE COOPER

### Carbon-based Artist

Looking at the art of Justine Cooper, one might feel transported to the blue-ribbon aisle of a fantastical science fair. There are MRI scans reborn as sculpture, vascular sonograms set to music, and blood smears enlarged into strange weather maps. To explore the nature of identity, Cooper once sequenced the genes of a dozen people; in still another piece, she rigged a vial of synthetic DNA to record a gallery's light.

It is tempting, given her repertoire, to label Cooper a "science-based artist." Yet she resists the taxonomy. "What is this about being a 'biological artist?' What does that mean?" she laughs, shaking her head. "Everyone's a 'biological artist' if they're carbon-based!" In 2003, Cooper cofounded WetLab, a collective that hosts dinner parties in New York. The events feature dialogue between scientists and artists, precisely to lead us past the notion that science in art is just a novelty act. Cooper is a carbon-based artist who makes carbon-based art.

A 37-year-old Australian native living in Brooklyn, Cooper completed a master's in visual arts



at Sydney University in 1998. By 2004, she had been awarded a prestigious two-year new-media fellowship by the Australia Council for the Arts. "At first I was interested in the technology of science—all the great toys [scientists] had," she says. Cooper was particularly charmed by MRIs and electron microscopes. "I was using science as a vehicle to talk about something else. But then I began to look at how the science actually affects us, how it represents us. How science tries to explain why we are who we are."

That shift in perspective has produced perhaps Cooper's finest work to date. "Saved by Science," a show now touring after a well-reviewed debut this spring at New York's Kashya Hildebrand Gallery, is the result of a year Cooper spent exploring the vast archives of the American Museum of Natural History with an antique wooden camera. The 65 large-format photographs she produced depict a Noah's Ark in naphthalene and arsenic: There are drawers full of finches, a closet of elephant feet, and a heap of T. rex toe-bones delicately wrapped in old

newspaper. The specimens are compelling, but our eyes are drawn past them to the long halls of storage lockers in which they reside.

The rows of unopened doors conceal a jumble of memories, hand-me-downs, and discoveries waiting to be made.

One afternoon, as Cooper was rearranging jars of preserved eels to set up a shot, a passing scientist stopped her. She couldn't take the picture like that, he said, putting the jars back in place, because that wasn't where the eels "belonged." In her photographs, Cooper eloquently captures this scientific drive: the need to impose a recognizable order on the world and the hope that, once so ordered, the specimens will whisper their secrets to us. "In the beginning, this is what scientific desire is, a sort of sexy, obsessive thing," Cooper says. "It's so powerful to have so much stuff. It's about having more. More stuff, more information, more knowledge. More facts. More hypotheses. More discoveries. More truth."

-- Dan Keane

**GREGORY  
RYAN**  
**Sculptor/  
Elephant  
Tagger**

Gregory  
Ryan's  
sculptures,  
cast from  
sheets of  
polished



aluminum and blocks of weathered bronze, are monumental. But Ryan, a 38-year-old American living in Paris, does not create the abstract structures common to contemporary art. Instead, his work is a literal translation of scientific fact. "We live in an age of unprecedented beauty," Ryan says. "And the most poetic work being done right now—the really sublime stuff—is not being done by artists. We have so many tools with which to gaze at nature and all these artists are busy gazing at their belly button. The fact is, the most beautiful things right now are being made and seen by the sciences."

Ryan works in an industrial foundry, a vaulted and grim space on the edge of the city. There, he re-creates his panorama of natural forms—forms as rare as the endangered flora in the Gabon rainforest or as common as the undulating surface of water. He has cast the geology of the Grand Canyon in bronze and taken silicone molds of elephant skin. He wants to capture the spiraling form of a hurricane in a block of marble. "Right now, science is giving us access to everything from the surface of Mars to the inside of cells," he says. "Science has changed the way we see. I want to express the physicality of these new landscapes, to describe the skin of these things."

Skin, of course, is always shed, just as the surface of water is ever-changing. Ryan's sculptures serve as a stay against this ceaseless conversion. "Bronze lasts," he says. "It endures. I think sculpture is ultimately a way of making something permanent."

Ryan's embrace of scientific imagery has taken him around the world. In New York, he worked with Dr. Marvin Jones on a new algorithm that would give Jones a more realistic model of waves. "Gregory wasn't looking for simplicity," remembers Jones. "He wanted authenticity." In Kenya, he helped Save the Elephants founder Dr. Iain Douglas-Hamilton attach radio collars to migrating elephants; while they were anesthetized, Ryan modeled the elephants' deeply creased skin. "The amazing thing about elephant skin," he recalls, "is that it looks geological. When you juxtapose that skin against the landscape of the area, you see all these visual connections. The shifting of scales lets you glimpse the repetition of forms throughout nature." Now Ryan is designing a self-charging radio tag for the pachyderms.

In 2005, Ryan had his first American exhibition, at the Briggs Robinson Gallery in New York City. The brochure quoted biologist E.O. Wilson, from *Consilience*: "The greatest enterprise of the mind has always been and always will be the attempted linkage of the sciences and humanities." In a way, Ryan's art is the embodiment of consilience. In his metallic forms, our two cultures are melted into a single form; fact and beauty seem inseparable. "Raw scientific data will never get your rocks off," he says. "But as an artist I can make that data beautiful. Scientists have to know their specific thing. They have to work within a relatively narrow field of vision. What's interesting about being an artist is that you can leapfrog from one field to another. You can bring different theories together. You can see new things."

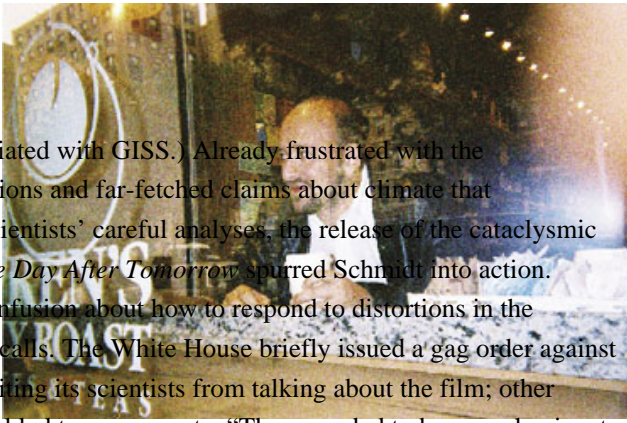
-- Jonah Lehrer

## **GAVIN SCHMIDT**

### **Climate Modeler/Blogger of Record**

Armstrong Hall, a decades-old building in the Morningside Heights area of New York City, is best known as the location of Tom's Restaurant—Jerry Seinfeld's favored haunt. It is also home to NASA's Goddard Institute for Space Studies (GISS), a leading laboratory in the study of atmospheric science and climate change. In 2005, its scientists published more than 70 papers—and a blog.

Climate  
modeler  
Gavin  
Schmidt  
started the  
blog,  
RealClimate,  
in



December 2004. (It is not otherwise affiliated with GISS.) Already frustrated with the misrepresentations and far-fetched claims about climate that overshadow scientists' careful analyses, the release of the cataclysmic action film *The Day After Tomorrow* spurred Schmidt into action. "There was confusion about how to respond to distortions in the science," he recalls. The White House briefly issued a gag order against NASA, prohibiting its scientists from talking about the film; other agencies scrambled to compensate. "There needed to be a mechanism to give credible responses." Blogging provided the perfect tool. It could be instantly updated as often as necessary and allowed the contributors, Schmidt says, "to be very reactive."

RealClimate, which is maintained with the help of a handful of experts scattered across the globe, avoids political and economic issues; it strives to set the scientific record straight. Within two days of the book's release, Schmidt debunked the manipulation of science in Michael Crichton's novel *State of Fear*. He also proffered up background on Rep. Joe Barton's (R-Texas) attacks on climate scientists, presenting letters from Barton to climatologists Michael Mann, Ray Bradley and Malcolm Hughes, along with their replies. He also posted a stack of links to statements, commentaries, and editorials from leading science organizations, other scientists and politicians, all stressing their objection to the congressman's campaign.

In less than a year, Schmidt, who is 38, has become a prominent voice representing climate science in the popular media. He has appeared on CNN's *Lou Dobbs Tonight* and written for the online environmental magazine *Grist* and the French popular-science magazine *La Recherche*. His calendar is peppered with speaking engagements at the New York Academy of Sciences, as well as museums and universities. Communicating the finer points of his field in a way that's understandable to a broad range of people was already familiar to Schmidt; running the model development group at GISS, he relays the needs of the cloud physicists to the atmospheric chemists to the programmers, and so on, until aerosols, clouds, oceans, sea ice, land surface cover, vegetation change, etc., are interwoven into a virtual earth that behaves like the climate and offers confident predictions. "I am stuck in the middle and making sure that everyone is doing things that are consistent," he says. "It puts me in a good position to explain things to people at parties."

As he's commenting on the controversies of the day for television and the press, Schmidt's research makes its own headlines: A recent report in *Science* showed that the earth may well absorb more energy from the sun than it releases into space, and a 2003 study linked a massive release of methane to an increase in average temperatures—as much as 8°C in some regions—55 million years ago. He recently led the

development of ModelE, a global climate model that will be used as part of the Intergovernmental Panel on Climate Change's Fourth Assessment Report (2007). In 2005, he co-authored seven papers and had two others in press as lead author.

To top it all off, on October 3, RealClimate surpassed 500,000 unique visitors—an impressive milestone given its age. “We are having an influence outside of just talking to our friends,” says Schmidt. “You do get a sense of satisfaction from that.”

-- Hannah Hoag

**JEFF  
HOFFMAN**  
**Microbiologist/  
Oceanographic  
Explorer**



Microbiologist  
Jeff  
Hoffman  
holds the  
enviable  
position of

crew scientist with the Sorcerer II expedition, a global oceanographic voyage led by geneticist J. Craig Venter. On board a 95-foot luxury yacht, which has been outfitted to serve as a research vessel, Hoffman is retracing part of Charles Darwin's epic journey on the HMS Beagle and collecting some of the species that Darwin couldn't see: the countless microorganisms and bacteria living in the world's oceans. Every 200 miles, he samples the salty waters for undiscovered specimens. Their genomes will be sequenced, analyzed and added to an open database as part of an attempt to catalogue the oceans' bounty. In a preliminary sample alone, from the Sargasso Sea, 1800 new species were identified, and 1.2 million new genes were found.

“It's pretty far from a normal lab job,” says Hoffman, who learned to sail to pursue his Ph.D. aboard the vessel. “You're on a sailboat, heeled over and constantly moving. It is physically and mentally challenging, and you have to be ready for anything at any time.” In other words, it was exactly the type of environment he was looking for: “I wanted a job that would keep me on my toes, always make me think for myself. Microbiology was the answer for me—the field is always changing and growing.”

Hoffman, who is 32 years old, tanned with shoulder-length hair and typically dressed in shorts and a crew shirt, looks like he belongs on the water. In keeping with the tradition of oceanographic explorers of the past, he is keeping a journal and kaleidoscopic photo log, in which he has captured everything from a perfect sunset on Christmas Island to a close-up of a whale shark in the Seychelles. He distributes them



regularly, creating buzz about the expedition. “It is important for younger people to know that not all scientists sit around microscopes with white coats and pocket protectors,” says Hoffman. “You can be part of cutting-edge science and have a really exciting, challenging job.”

That job for Hoffman includes access to some of the most advanced equipment in science and to one of the most iconoclastic scientists alive, his mentor and friend J. Craig Venter. Under Venter’s guidance, Hoffman is trailblazing in the nascent discipline of environmental genomics. By identifying and cataloguing the genes belonging to communities of microorganisms, they hope to create an arena of knowledge that can eventually be used to solve environmental problems. More specifically, Hoffman is comparing the microbial diversity of two hyper-saline ponds, one in the Galapagos Islands and one in Victoria, Australia. Using a variation of the shotgun sequencing technique Venter developed to map the human genome, Hoffman can compare genes from the two sites and produce an environmental overview of these extreme environments. “In the past, microbial diversity was measured using a single gene.” He explains. “Now, by using all DNA extracted from a site, we can get a more detailed picture of the environment.”

With the two-and-a-half-year tour coming to an end this December in Saint Barthelemy, Hoffman will be concentrating on finishing his Ph.D. work at the University of Queensland. “But this is much bigger than my Ph.D.” he insists. “The idea of looking at the whole genomic environment is the next generation of science.”

-- Eva Wisten

## **JONATHAN FARLEY**

### **Mathematician/Counterterror Entrepreneur**

Most of the time, the tidy abstractions of pure math have no place in a messy world away from the blackboards or the pages on which they were proved. So says Jonathan Farley, a 35-year-old award-winning mathematician at MIT. “But there’s a small part of it, maybe 0.001%,” he says, “which is useful. It just so happens, that percentage is very useful.” With this in mind, he decided, a few years ago, to apply his mathematics to fighting terrorism.

Farley, who from time to time consults for cinema and TV shows involving math, was inspired by the film *A Beautiful Mind*, which tells the story of Nobel Prizewinner John Nash, whose theories helped the US military during the Cold War. After watching the movie, Farley attended a talk at MIT given by Gordon Woo, a risk-management specialist who was modeling terrorist networks using simple graphs. Woo’s graphs used dots to represent individuals and lines connecting two dots to represent a relationship between two terrorists. The problem with the model, says Farley, was that it didn’t address the impact of

rank, the difference between leaders and foot soldiers, on a network. He realized that a good way to answer Woo's question—how many terrorists need to be captured before a graph becomes disconnected and a terrorist cell can be labeled inert—was to use lattice theory, the abstract study of order and hierarchy.

This idea, which Farley published in a 2003 issue of the journal *Studies in Conflict and Terrorism*,



attracted attention from intelligence agencies and the military. Farley went on to found Phoenix Mathematical Systems Modeling, which is developing software the authorities can use to foil terror attacks. (Stefan Schmidt, a fellow lattice theorist, and Vladimir Lefebvre, a Russian who worked for the Soviets during the Cold War and is famous for his work modeling enemy behavior, were also instrumental in the new venture.) Such software would incorporate data provided by law enforcement agents and return probabilities on how successfully they had disrupted terror cells. Farley disavows 100% accuracy with such modeling. “But,” he says, “it does...give you a rational basis to consider the likelihood of whether you’ve succeeded in your past counterterrorism operations, so that you can make decisions about how you should allocate resources for the future.” This could prove invaluable to the Department of Homeland Security, which will spend over \$30 billion on counterterrorism next year.

In November, Farley hosted the 2nd Conference on Mathematical Methods in Counterterrorism and hopes to soon open an institute dedicated to studying the field. Shortly beforehand, he moved to California to assume the position of Science Fellow at Stanford University’s Center for International Security. His work there includes describing a “perfect” terrorist cell—in other words, the most robust or difficult cell to disrupt—as well as modeling terrorism as a contagious virus that spreads from person to person. Although his research is intended to help law enforcement officials in the war on terror, Farley is careful to distance himself from any partisan disputes on how it is being fought. “This is about studying terrorism and terrorist groups,” he says. “It’s not about politics. It’s about saving lives.”

-- Yohannes Edemariam

**ZHANG JINGJING**  
**Lawyer/Environmental Crusader**

Shortly after the government constructed 13 chemical plants near the southern Chinese town of Huaxi in 2001, villagers noticed that the number of stillborn babies increased and the river running through their village turned brown. Then, last April, after petitioning the government several times to reclaim the land, which they say was illegally seized, villagers took matters into their own hands, barricading the road to the factories. When police arrived to remove the blockade, they found at least 20,000 angry townspeople waiting. The villagers beat the police, overturned their cars and ultimately drove them out of town. The central government quickly forbade press coverage of the incident and stepped up its security presence in Huaxi.

Normally, in China, the story would end there. But the villagers' case against the government has been taken on by Zhang Jingjing, a lawyer with Beijing's Center for Legal Assistance for Pollution Victims and a pioneer in Chinese environmental law. Last year, she obtained China's first public hearing for an environment case—a milestone in a country struggling to develop a legitimate judiciary—for villagers protesting a power project connected to the 2008 Olympics in Beijing. She spent the fall on a fellowship at Columbia University's law school, gathering knowledge of U.S. public interest law that she could later apply at home.

Before leaving for New York, Zhang, 35, spent months collecting evidence to support the Huaxi case, working against seemingly insurmountable odds. The local government denied her requests for environmental



reports and because security is so high, she had to sneak into the village at night to conduct interviews. Once there, she says, it was difficult to get people to open up. "The villagers are very scared," Zhang says. "They don't want to discuss the pollution situation or the April confrontation anymore." But Zhang is determined. "If the Center and I can use the law to raise their spirits, bring them some justice, and pave the way for legal rights, then we reduce the chance of there being another clash."

## At this critical stage in China's development, lawyers like Zhang Jingjing could be major catalysts for political and social change.

Personal experience makes Zhang particularly sensitive to

the threats faced by her Huaxi clients. Her parents worked in a chemical factory in the western city of Chengdu—her father as an electrical engineer, her mother as dean of the factory hospital—and Zhang grew up on the grounds of the vast facility. At a young age she noted that the river in the area, which was called Qing Bai Jiang, meaning “crystal clear river,” was anything but. “What I saw was dirty red water being discharged from the factory. The odor of chemical gas was common as well,” she says. “But we were all told that our factory had the most advanced equipment, so this red water and stinking air couldn’t have toxins in it. After I became an environmental lawyer, I started to think, Were there really no toxins?”

At a time when deplorable environmental conditions are causing significant social unrest and the influence of lawyers like Zhang is growing, her group’s work is becoming increasingly dangerous. In September, a colleague was arrested for aiding villagers involved in a new incident in southern China. As of October, he was still in detention. But for Zhang, the importance of her work outweighs the risks. At this critical stage in China’s development, lawyers like Zhang could be major catalysts for political and social change, much as activist lawyers in 1950s America were. Indeed, when talking about the Huaxi case, Zhang cites Justice Thurgood Marshall’s remarks on America’s public interest crusaders: “By helping to open the doors to our legal system, they have moved us a little closer to the ideal of equal justice for all.” One day, perhaps, a Chinese jurist will say the same thing about Zhang.

-- Mara Hvistendahl

### ALEX DEGHAN

#### Biologist/Envoy to Iraq

When the State Department charged Alex Dehgan with finding Saddam Hussein’s former weapons scientists and redirecting them toward civilian work in Iraq, he was given a gleaming white Suburban with Texas plates. The vehicle could not have been a more conspicuous target for insurgents in an area where attacks on Americans, and the Iraqis who work with them, occur as frequently as the sun sets over the Tigris and Euphrates. “So [instead] we had an Iraqi car registered,” says the 36-year-old field biologist, “and decorated it with Iraqi air fresheners, quotations from the Koran, and stickers in Arabic that said ‘I Love Iraq.’”

Dehgan was a diplomacy fellow at the American Association for the Advancement of Science (AAAS) when he was assigned to the State

Department's Bureau of Near Eastern Affairs. He is passionate about using science to influence policy, and the Department hoped Iraqi scientists would respond better to someone fluent in their professional vernacular. "Science and technology further our foreign policy development objectives," Dehgan says. "You can use [them] to start a dialogue, because they are a shared culture and a shared language between countries—the physical laws of science don't change when you cross political boundaries."

He already had experience working under duress: In 1992 and 1993, as an idealistic law student



at the University of California Hastings College of the Law, he rewrote portions of Soviet environmental laws, even as Boris Yeltsin's tanks were firing upon the Russian parliament. Later, working on his Ph.D. in ecology and evolution at the University of Chicago, he led a team into a Madagascar jungle, where, several days' walk from the nearest road, he studied the effects of tropical rainforest decline on 12 species of lemur.

All this served as initiation for the six months he spent in 2004 setting up the Iraqi International Center for Science and Industry, an advisory council with a mandate to improve Iraq's infrastructure.

Headquartered in a small house in an undisclosed location in Baghdad, it counts more than 100 former weapons scientists among its members. Dehgan managed to slowly win their trust through long visits in their homes and neighborhood cafes, most outside the safety of the Green Zone. His original aim was non-proliferation—to engage those scientists who may otherwise have ended up working for regimes the United States considers hostile. But he quickly realized a more holistic approach to rehabilitation was needed: After three wars and years of economic sanctions, there wasn't much of a civilian science sector left for anyone to work in. So Dehgan collaborated on projects like the Iraqi Virtual Science Library, an electronic repository of journals that will be available on the Internet, to update the country's scientific literature. ("One person asked me what [had] happened in ecological modeling in the last 15 years," he recalls.) He also helped recruits get funding for several projects they had drafted, such as setting up Iraq's own nuclear regulatory body and developing plans for the nation's water supply.

In 2005, Dehgan received the State Department's Superior Honor Award for his efforts. Though his tenure at the State Department is up, he continues to work on issues critical to science in Iraq, and he's studying the threat new strains of infectious disease pose to U.S.

national security. Through such work, Dehgan hopes to continue using science to promote clear-headed policy. “As scientists, we have an obligation to participate in our government,” he says. “I worry about irrationality in the United States as much as I worry about irrationality abroad, and the way to support moderation is through supporting science and science education.”

-- Yohannes Edemariam

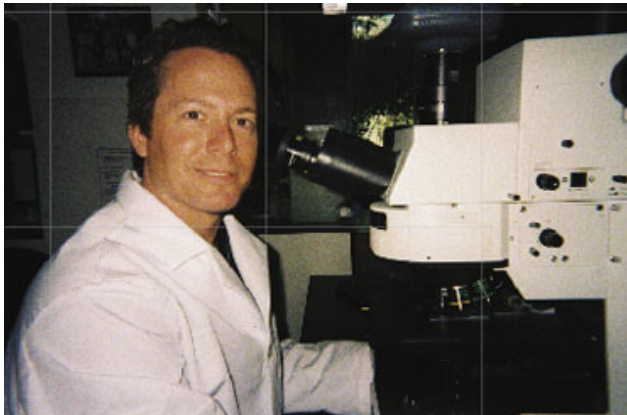
## **HANS KEIRSTEAD** **Neuroscientist/Statesman**

In late 2004, Hans Keirstead, a leading stem cell researcher, found himself at the center of a debate that had polarized Californians. It was nearly the end of the campaign for Proposition 71, California’s \$3 billion stem cell initiative. His support for embryonic stem cell research had already taken him to political battlefields across California. It would soon lead him to Washington, D.C.

Keirstead had served as a scientific advisor to the interest groups that came together to draft Prop. 71. When the bill was introduced, he found himself on the floor of the California Senate briefing legislators on his research. Later, he hit the campaign trail, speaking at schools, universities and every conceivable type of meeting from corporate finance councils to Rotary Clubs.

The campaign couldn’t have had a better scientific spokesperson: He was young and articulate. Just 38, he headed the spinal cord research center that Christopher Reeve had helped to found. More importantly, he and his lab had made paralyzed rats walk again. In fact, the procedure they devised for repairing acute spinal cord injuries is likely to become the first embryonic stem cell treatment to enter clinical trials.

The opposition to Prop. 71 came primarily from religious conservatives. Despite seeing an intractable



argument on the horizon, Keirstead was eager to engage his opponents in debate. “I’ve never sat down with somebody who’s against my research and not had a very interesting discussion and turned their views to an extent. It’s an intellectual challenge,” he says. Furthermore, he is comfortable discussing religion. “My father was a reverend. My grandfather was a reverend. My great grandfather was a reverend. In

college, I studied Hinduism and Buddhism...So that aspect of it I also find quite interesting.”

Opponents played up the years of difficulties that lay ahead for researchers trying to apply embryonic stem cell treatments to complex disorders. Keirstead answered back, holding up his research as an example of what could be accomplished in the near future.

“Acute spinal cord injury is just a very good example of how stem cells can be used in the clinic. So I wanted to make sure that people knew of that, so that the public could clearly make up their minds from an educated perspective,” he says, with typical passion. “The antagonists are out there in full force and I think there are not a lot of scientists who are willing to get out and face the media and politicians to make their point.”

Conscious of the dual roles he has taken on, Keirstead is careful to ensure his research takes precedence over his public image—and to accurately portray the promise of embryonic stem cell research in the media. Furthermore, his experiences talking to patients with spinal cord injuries, including many who are severely depressed as a result, continue to convince him that outreach is a necessity in science.

”I don’t know that I would coach scientists to campaign for their research in order to keep it funded. There are not a lot of areas of research that have a \$3 billion opportunity in front of them. But I would encourage scientists to get out there and talk to patients,” Keirstead enthuses. “The value of research is twofold. One, that it may eventually lead to treatment. But number two is that it can lead to hope now. You know, why am I so ready to publicly discuss my work? Information changes people’s lives. Your body is one thing—but your brain is more.”

-- Josh Braun

## **CARRIE TIFFANY** **Novelist/Tiny Warrior**

“As a child, I was always looking to form hypotheses,” says Australian writer Carrie Tiffany. “The idea of hypothesis, the word itself, seemed so poetic. And I was very attracted to the concrete idea that science was a search for truth.”

The protagonists in her award-winning debut novel, *Everyman’s Rules for Scientific Living*, are likewise attracted to this concept. The book tells the story of Jean, a seamstress, and Robert, a soil expert, who meet and fall in love while traveling through 1930s Australia on the Better Farming Train.

“People at that time really thought that science was the answer,” Tiffany says, “in terms of farming, raising children, marital relations, all of the

questions of mankind.” But in trying to impose a regime for scientific living on the inhospitable outback, her characters quickly learn the dangers of assuming they can control the elements.

The book was published in Australia in July, where reviewers praised its originality, honesty and rich sensory detail; *The Courier Mail* of Queensland called it “a vividly drawn depiction of the search for certainty through science in a time of instability.” It will be published by Scribner in the US and the UK in 2006.

Like her characters, Tiffany has come to realize that the answers science provides are not always



simple. Scientific complexities and unknowns “turn upside-down the beliefs I used to have,” she says. “And they take a safety net away. But then they let other things make more sense.”

The novel’s outback setting is one its author knows well. At 19, she took a job as a park ranger in Australia’s central desert, not far from Uluru (Ayers Rock). Cultural strictures prohibited the Aboriginal women in the region from speaking to white male rangers on staff. A woman was needed, and Tiffany stepped in. Standing just over five feet, she was nicknamed “Tulko,” or “Tiny Warrior,” by the Anangu people, after they watched her struggle to move garbage bins taller than she.

Assigned to fire management for the park, Tiffany found that tribal elders could glean a sense of how dry the landscape was, even “through the soles of their feet.” This experience challenged her steadfast belief in scientific rationalism backed up by finely-tuned instruments: “I knew that I would not be able to understand the place in such a sensual and organic way.”

After several years working with and learning from the Anangu, Tiffany moved on to the Department of Natural Resources in the state of Victoria, where she helped farmers write salinity-management plans; then she began freelancing as an agricultural journalist. Her interest in fiction, she says, was partly inspired by the stories she was told by scientists and farmers in the course of her work. Now 39, Tiffany is working on her second novel, *Freud in the Bush*, in which she imagines a visit by the founder of psychiatry to Australia, and talk of a film adaptation of *Everyman’s Rules* is in the air.

Ultimately, Tiffany hasn’t given up on the idea that science yields truth—unlike Jean and Robert, whose faith in science crumbles as their dreams of working the land succumb to drought and other factors. “I am still really excited by science,” she says, “but, especially with the



agricultural sciences, I think that how humans interact with the land is too complex to be parceled off and directed by the pedologists, agronomists, hydrologists, climatologists, biologists and botanists. A more holistic approach is crucial.” This, she says, would help us better address what we can—and cannot—dictate in our environments. “Why are we always astounded when huge natural events occur?” she asks. “Hurricanes, tsunamis, earthquakes are part of the repertoire of the planet. It is the way we treat each other, the way we live together and divide up the resources, that we can and should control.”

-- Pamela Grossman

## **SAM HARRIS**

### **Philosopher/Neuroscientist**

For Sam Harris, nothing is more sacred than reason.

After studying philosophy at Stanford University, Harris spent 11 years learning about meditation, Eastern spirituality and, in his words, “generally reinventing the 1960s for myself.” Now, at 38, he is pursuing a Ph.D. in neuroscience at UCLA. He drew from all of these disciplines to produce his controversial book, *The End of Faith: Religion, Terror, and the Future of Reason*, which won the 2005 PEN/Martha Albrand Award for First Nonfiction and launched his career as a “professional heretic.”

Harris writes about the conflict of scientific rationality and religious faith at a time of evangelical



populism and asks how we might “ground our search for meaning and even the most rarified mystical experiences in a genuinely rational worldview.” At UCLA’s Ahmanson Lovelace Brain Mapping Center, he uses functional magnetic resonance imaging (fMRI) as a tool to explore the neural basis of belief, disbelief and uncertainty, including the question of whether religious beliefs are different from mundane ones. “Science is the domain where we try to be hard-headed and intellectually honest about what the facts are,” he says. “In that sense, there’s no contradiction in principle between science and spiritual experience, or intellectually honest mysticism.”

Harris made the transition from philosophy to neuroscience because he wanted to be closer to the action: “If a person wants to understand the human mind, he must at least be up to speed with the last hundred years

of brain science. While there is interesting work to be done in the philosophy of mind, philosophers are now very much beholden to the work of neuroscientists.”

But what most interests Harris is not the apparent divide between philosophy and neuroscience; it’s the potential for unity between the two disciplines and, ultimately, for the emergence of a worldview untarnished by religious dogma. He is trying to employ scientific methodology to achieve that unity. “We need a discourse on ethics and spirituality that is every bit as unconstrained by dogma and cultural prejudice as the discourse on science,” he says. “What we need is a contemplative science, a modern approach to exploring the furthest reaches of psychological well-being. Teaching scientists a rigorous approach to introspection is a necessary part of this process.”

A lesson in rigorous introspection is the motivation behind a week-long meditation retreat that Harris is organizing, this January, under the aegis of the Mind and Life Institute. “One hundred scientists will gather and be shown how to meditate for up to eighteen hours per day,” says Harris, who himself practices between dashes from lab to lectern. With religion off the table, there may be more room for such hybrid scientific and spiritual experiments, allowing for the development of a nonsectarian way of discussing human nature. One day, Harris believes, we will understand the range of brain states that underwrite optimal human psychology and “be able to induce those states in a very precise way.” Furthermore, he says, “I suspect that meditation will be useful for exposing these states to the light of scientific study. At present, it seems to be a necessary tool for experiencing them.”

-- Jennifer Leonard

## **JAMES MOLLISON** **Photographer/Ape Man**

James Mollison was watching a BBC documentary on apes when he was “struck by how the face structure resembled that of humans.” An obvious realization, perhaps, but one with special meaning to a portraitist such as Mollison. It inspired a project that would represent a departure for him, having never photographed animals before: to complete a set of close-up pictures of the great apes. After much cajoling, Mollison convinced the Berlin Zoo to let him into the habitat with Shanga, a young gorilla, and as soon as he saw the results, he knew he was on to something: “It was something about the intensity of the eyes. It was a confrontation of the viewer, those eyes looking at you; I thought they were asking me questions in a way.”

Mollison spent the next three years traveling through Europe, Africa, Asia and the US, photographing 50 chimps, gorillas, bonobos and orangutans in zoos and sanctuaries. Most of the animals had been orphaned by bushmeat hunters or abandoned by the illegal pet trade.

But they were equally threatened by the fact that their natural habitats are being eradicated—a fact that gave the project a certain urgency. “These are our very close relatives,” says Mollison of his subjects, “and we’re destroying their environment.”

He published the portraits in *James and Other Apes*, a book *Time* magazine called “one of the most



detailed and revealing studies ever made of the great apes.” Jane Goodall wrote the introduction; in return, Mollison convinced Benetton, his employer, to donate €€150,000 to the Jane Goodall Institute and €€20,000 to sanctuaries housing four of his subjects. This year the photographs were exhibited for nearly four months at London’s illustrious Natural History Museum.

Born in Kenya and raised mostly in Oxford, Mollison, 32, currently lives in Venice and works with the Benneton creative laboratory, Fabrica. His major photography projects prior to *James* included illustrating poverty and famine for the World Food Programme and photojournalism assignments for several issues of *Colors*.

When Mollison proposed an exhibition based on *James* to the museum, Head of Public Programmes Bob Bloomfield immediately saw the potential for the photos to fulfill his own ambition to curate a project on evolution. “The photos looked fantastic. Visually, they’re very powerful and very on-message in terms of what *James* articulated as his principal concern,” Bloomfield says.

**James Mollison spent three years traveling through Europe, Africa, Indonesia and the U.S., photographing 50 chimps, gorillas, bonobos and orangutans in zoos and sanctuaries.**

Mollison’s moment of revelation had a precursor, it turns out. More than a century before,

Charles Darwin had experienced a similar epiphany looking at a orangutan in the London Zoo. So Bloomfield exhibited Mollison’s photos with a first-edition copy of Darwin’s *The Expression of the Emotions in Man and Animals*, open to a page of Darwin’s observations about the facial expressions of chimps, as well as current editions that visitors could flip through. “By *James* presenting the images face to face,” Bloomfield explains, “we as an audience are put in the position Darwin had been in the first time he sat in front of a primate, seeing the

particular expression of emotion in opposition to himself.”

-- Paul Tullis

## SLAVA TRIGUBOVICH

### Conservation Biologist/Ranger

Vyacheslav “Slava” Trigubovich, a Siberia-based conservation biologist, is used to being threatened. His list of enemies is long: poachers, loggers, local bureaucrats, developers, mafia bosses. At a meeting last March, for instance, a local deputy governor was trying to win approval for lakeside development within a protected reserve. When Slava blocked his efforts, the deputy governor replied, “No problem, you’ll be fired.” He never was. Slava says that one month later his salary was doubled, and that he was awarded a medal from Russia’s Ministry of Natural Resources.

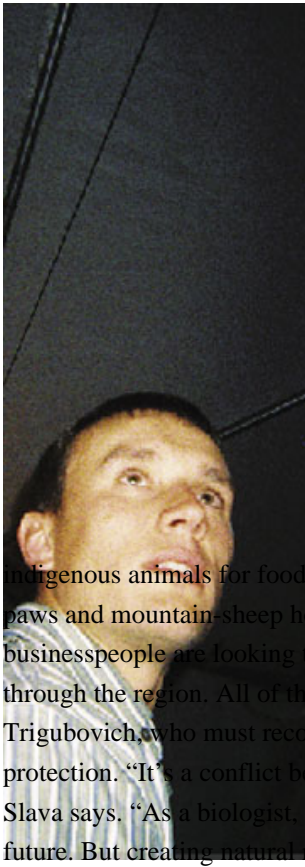
**"As a biologist, I know conservation is imperative for our future. But creating natural reserves will conflict with the short-term economic interests of the local people."**

For more than a decade, Slava has campaigned tirelessly to preserve

Russia’s vast wildernesses and its endangered species. At 32, he is the country’s youngest director of a nature reserve, or zapovednik, located within the Altai Republic in southern Siberia. Covering over two million mountainous acres, the Altai Zapovednik is one of Russia’s largest. It is also the latest front in the battle between environmental protection and economic development.

In addition to Slava’s anti-poaching patrols, which have helped save the Argali sheep, the snow leopard and dozens of other indigenous species, he has blocked a number of large development projects, led numerous field expeditions to find safe breeding areas for endangered wildlife and raised funds for environmental education programs in the Altai region. “We are trying to reeducate people, who are a big part of the system, about the importance of protecting nature,” Slava explains. “We are doing this brick by brick, through public meetings, movies, educating children, and so forth.” His latest project will soon culminate, after five years, in the creation of a new, 500,000 acre reserve, at the crossroads of Russia, China, Kazakhstan and Mongolia, to provide a last sanctuary for the snow leopard.

Not everyone in the region has rallied behind Slava’s conservationist campaign. Local



residents,  
many of  
whom are  
impoverished,  
are under  
severe  
pressure to  
lease their  
lands for  
logging,  
“ecotourism”  
and other  
uses. Others  
kill

indigenous animals for food or to sell the body parts—including bear paws and mountain-sheep horns—on the black market. Well-capitalized businesspeople are looking to construct a highway and gas pipeline through the region. All of them face the same challenge in Slava Trigubovich, who must reconcile their interests with environmental protection. “It’s a conflict between short-term and long-term interests,” Slava says. “As a biologist, I know conservation is imperative for our future. But creating natural reserves will conflict with the short-term economic interests of the local people.”

Slava, who was raised in a family of scientists and holds a master’s degree in biology from Novosibirsk University, says the Russian government fully supports his conservation efforts (the local government less so). After all, Russia’s zapovedniks, which were established in 1916 and expanded during Soviet rule, are among the strictest form of preserve, completely closed off to the public and open only to scientists for ecological research purposes.

Yet Moscow’s conservation laws, while progressive by world standards, are notoriously difficult to enforce. And funding for Russia’s nature preserves has dropped precipitously over the past decade. Slava is often forced to search for funding abroad. He travels to the US frequently and has raised hundreds of thousands of dollars through the Vermont-based Altai Conservancy, partner to a non-profit environmental organization, the Altai Foundation, which Slava cofounded in Russia two years ago. Back home, Trigubovich is a forceful lobbyist, able to cut through Moscow’s notorious thicket of bureaucracy. He says the Russian government, though in transition, is growing more environmentally-friendly. The fact that his new reserve has won its necessary approval shows that Russia, which contains a quarter of the world’s forests and over 100 endangered species, is not a lost cause for conservationist scientists.

-- Lionel Beehner

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