

# Colloquy

A stylized illustration of a hand holding a solar panel with leaves, set against a blue background with a yellow sun. The hand is purple and reaches up from the bottom left. The solar panel is orange and rectangular, filled with green and yellow leaves. The sun is a large yellow circle with rays, positioned in the upper right. The word 'Colloquy' is written in a large, white, serif font across the top.

*The* GRADUATE SCHOOL *of* ARTS AND SCIENCES | HARVARD UNIVERSITY

storing  
energy  
from  
the sun

Harvard researchers are developing ways to generate and capture energy from renewable sources that could transform energy use throughout the world p. 12



## 12 Storing Energy from the Sun

HOW HARVARD RESEARCHERS WILL CHANGE THE WORLD

## 17 The 2014 Centennial Medalists

HONORING SCIENCE ADVOCATE BRUCE ALBERTS, MUSEUM CURATOR KEITH CHRISTIANSEN, SOCIOLOGIST JUDITH LASKER, AND AMERICAN STUDIES PIONEER LEO MARX

## 20 Intellectual Engagement

ALUMNI DAY 2014 BRINGS THE GSAS COMMUNITY TOGETHER

## 22 Physics Reunion

PHYSICS GRADUATE ALUMNI RETURN FOR REUNION

## 24 363

THE 2014 GRADUATES JOIN THE ANCIENT AND UNIVERSAL COMPANY OF SCHOLARS





# Colloquy

An alumni publication of Harvard University's  
Graduate School of Arts and Sciences

## 3 FROM UNIVERSITY HALL

## 4 NEWS & NOTES

*The 2014 Harvard Horizons Scholars, success in grant funding and admissions, and Real-Life Stories from the academic job search.*

## 8 Q&A WITH RAY JAYAWARDHANA

*Telling stories of the very large and the very small.*

## 10 SHELF LIFE

*Nicholas Carr warns of overreliance on digital technology, Suzanne Keen delves into Thomas Hardy's brains, and more.*

## 26 NOTED

*News from our alumni.*

## 28 ALUMNI CONNECTIONS

*Investigating nonacademic careers, the Davis Center turns 65, and "Your Harvard" visits NYC.*



summer

14

Cover illustration: Heads of State

Facing image: Bagpipers lead the traditional Commencement parade to Tercentenary Theatre. Photograph by Neal Hamberg

# Colloquy

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**Margot N. Gill** administrative dean  
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**Ann Hall** editor  
**Visual Dialogue** design

*Colloquy* is published three times a year by the Graduate School Alumni Association (GSAA). Governed by its Alumni Council, the GSAA represents and advances the interests of alumni of the Graduate School of Arts and Sciences through alumni events and publications.

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Access current and back issues of *Colloquy*, as well as a range of other alumni services and information, at [www.gsas.harvard.edu/alumni](http://www.gsas.harvard.edu/alumni).

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## Letters to the Editor

*Colloquy* does not print letters, but we welcome your feedback and story ideas. Write to: *Colloquy*, Harvard University Graduate School of Arts and Sciences, Suite 350, 1350 Massachusetts Avenue, Cambridge, MA 02138-3846; or e-mail [gsaa@fas.harvard.edu](mailto:gsaa@fas.harvard.edu).

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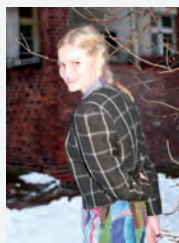
## CONTRIBUTORS



**Ann Hall** joined GSAS as director of communications in April. A twenty-year veteran of Harvard University, she has developed and written diverse content for alumni and other marketing publications and authored top level communications. Ann wrote this issue's feature about the work Harvard researchers are conducting to change how energy is generated and stored.



For over 10 years, Jason Kernevech and Dustin Summers have been working together as **The Heads of State**. They've created award winning posters, book covers, branding, and illustration for a diverse and impressive list of clients. In 2012, they launched Pilot and Captain, a design venture focused on creating t-shirts, posters, and products inspired by the golden age of travel. They lecture frequently about their work and process and teach graphic design and illustration at Tyler School of Art where they both studied.



**Elisabeth Moch**, who illustrated portraits of the 2014 Centennial Medal winners, contributes to international publications such as the *New York Times* and *Esquire*, as well as to Swedish fashion labels Acne and Minimarket. She has drawn on the terrace of a colonial villa in China, in the State Library of Victoria in Melbourne, in various crammed cafés in New York City, and under the eucalyptus trees in Sri Lanka. She now works from a studio in Berlin.



**Visual Dialogue** is the Boston-based firm that designs *Colloquy*. Creative Director Fritz Klaetke won a Grammy Award in 2013 for his album design for *Woody at 100*, a boxed set from Smithsonian Folkways Recordings. The firm recently completed an ad campaign for the city of Cambridge ("Cambridge Is for Squares"), celebrating its diverse neighborhoods.



*Colloquy* is printed by PrintResource/DS Graphics.





Commencement is bittersweet for all of us at the Graduate School of Arts and Sciences. While it is inspiring to stand on the stage of Sanders Theatre and look out at the sea of crimson robes—and at enthusiastic friends and family—it is hard to say goodbye to the talented women and men with whom we connected during their years here. It is a time of endings and new beginnings, when our graduates go on to make their own special contributions to their chosen fields.

While Commencement marks the culmination of our students' work at GSAS, it by no means signals an end to our efforts to ensure that all graduates possess the skills to flourish in their chosen professions. Students can easily become so absorbed in their disciplines that they lose sight of the importance of communicating their research. We continue to foster new professional development opportunities, which range from courses on proposal preparation and finance career workshops during January@GSAS to public speaking training led by the Derek Bok Center for Teaching and Learning. I am particularly happy to report that our alumni, via the Alumni Council, play a critical role in organizing and offering courses during January@GSAS and beyond, a testament to the "Harvard Forever" experience that extends from entering GSAS students to engaged alumni.

For the second year, Harvard Horizons has demonstrated the value of these professional development opportunities. The Horizons Scholars' inspiring and absorbing presentations showcased the impressive scholarship of our PhDs, as well as the importance of providing training on oral and multimedia communications skills. Most important, the need to present complex ideas in the simplest ways—and within five minutes—compels scholars to think deeply and

Xiao-Li Meng,  
PhD '90, Dean,  
Graduate School of  
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Professor of Statistics

**Our mission  
at GSAS is to  
attract the  
best talent  
from around  
the globe**

critically about the essence of their scholarly work. This thought process has made "the dissertation itself richer as well as clearer," as the thesis advisor of one scholar wrote to me, a sentiment echoed by many Horizons Scholars. We are working with the Bok Center to develop programs that will provide similar experiences to many more graduate students.

To excel as communicators, graduate students must also possess advanced writing skills, so that they can craft the ideal dissertation, draft a compelling proposal, or convince readers of the strength of their arguments. That is why we are moving forward with a new initiative, the creation of a writing center located on the second floor of Dudley House. Construction is already under way and will continue through the summer. Plans are in place to hire a director and discipline-specific tutors, who will mentor their respective students in the art of conveying their thoughts and scholarly work clearly and effectively.

As dean, I want to ensure that our graduates exit the Sanders Theatre stage with both advanced scholarly training and well-developed personal and interpersonal skills so that they can launch a fulfilling career, not merely land a job. After all, our mission at GSAS is to attract the best talent from around the globe, provide them with world-class academic instruction and professional development, and help them to launch careers that embrace their passion and training. ♣

# Concentrated Scholarship

The second annual Harvard Horizons symposium, held at Sanders Theatre in April 2014, demonstrated how the complex concepts that fuel a dissertation can be distilled into compelling and illuminating summaries. This year's eight Horizons Scholars shared research that ranged from the science of pain to ancient Assyrian social networks, in the process highlighting the importance of clearly communicating ideas. Their success as Horizons Scholars came thanks to in-depth mentoring from the Derek Bok Center for Teaching and Learning, whose staff provided training in best practices for mastering the communication skills that all graduate students need to describe their topic to funders, hiring committees, interviewers, and the general public.

In addition to Dean Xiao-Li Meng, who hosted the event, several Harvard luminaries spoke: President Drew Faust, Provost Alan M. Garber, FAS Dean Michael Smith, Professor Shigehisa Kuriyama, and Professor Stephen Blyth.

PhD students were invited to submit their most essential research ideas in the form of written synopses of their work and short videos of themselves presenting it. The eight scholars chosen by a cross-disciplinary committee received in-depth mentoring from faculty members and other experts over a ten-week period. The experience ultimately enriched their professional development and enhanced their research while preparing them to deliver their talks, but it also had the effect of strengthening their writing. The search for the 2015 Harvard Horizons Scholars will begin later this year.

Watch videos of the Horizons Scholars in action at [www.gsas.harvard.edu/harvardhorizons](http://www.gsas.harvard.edu/harvardhorizons). Profiles by Nicholas Nardini.



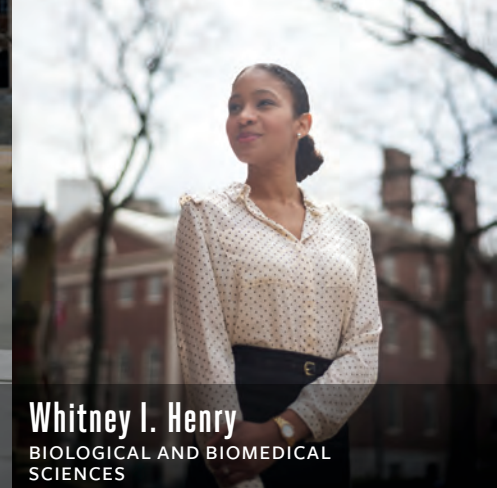
**Adam Anderson**  
NEAR EASTERN LANGUAGES  
AND CIVILIZATIONS

## **“The Old Assyrian Social Network: An Analysis Based on the Texts from Kültepe (Kanesh), Turkey”**

Adam Anderson takes a big-data approach to social networks, but not the ones you're thinking of. The people he studies were friending each other some 2,000 years before Facebook, in the ancient Middle Eastern kingdom of Assyria, and their tweets were inscribed in cuneiform on baked clay tablets.

In college, Adam worked his way backward through linguistic time, studying German, Greek, Arabic, Hebrew, and Akkadian. Early on, he began compiling digital databases of the texts he was reading, using software that allowed him to perform complex morphological and syntactic analyses. In Germany, Cambridge, and Copenhagen he continued his study of the earliest written languages, learning cuneiform in its many permutations across Sumerian, Assyrian, and Babylonian. After passing his examinations, he decided to focus his attention on a large group of Old Assyrian Bronze Age merchant texts, discovered in Central Anatolia.

As he studied these texts, one problem came to stand out above all others: ponymy, the Assyrian naming practice by which sons were named after their fathers or, more commonly, grandfathers. Because of this practice, a major task of Assyriology is disambiguating the thousands of people who share the same name in over 2,000 texts across 200 years. With the help of friends in computer science, Adam was able to use this mass of correspondence to assemble a graphical database of the old Assyrian letter-writers, clearly depicting both individuals and where they stood in relation to each other: a map of Bronze Age society.



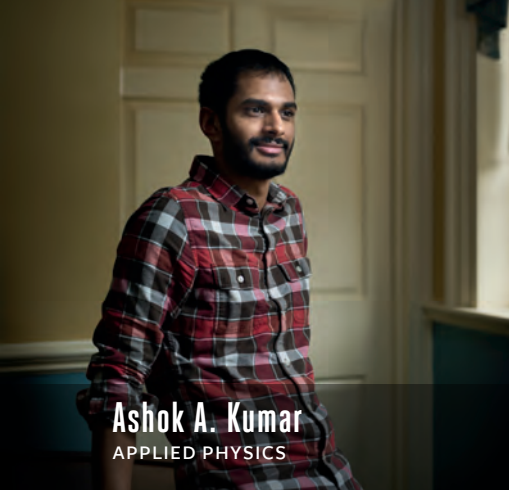
**Whitney I. Henry**  
BIOLOGICAL AND BIOMEDICAL  
SCIENCES

## **“Understanding the Chemotherapeutic Benefit of Aspirin in Mutant PIK3CA Breast Cancer”**

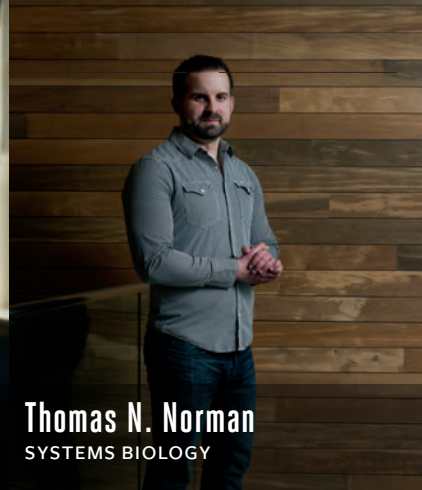
Since her years working with a cancer biologist as an undergraduate at Grambling State University, Whitney Henry had been looking for a way to combine cancer biology with cell biology, and to translate laboratory research into specific treatment recommendations for patients. Two years ago, she read an article in the *New England Journal of Medicine* that described research demonstrating how regular doses of aspirin were associated with higher survival rates for colon cancer patients with a mutation in the gene PIK3CA. She designed a course of research to investigate whether the same positive correlation might hold for breast cancer, which afflicts around one in every eight women in the US. Of those with breast cancer, some 25 to 30 percent carry the PIK3CA mutation.

Whitney's research now involves dissolving aspirin in solution and applying it to cell lines derived from breast cancer patients. Her data seem to indicate that the solution decreases the growth of breast cancer cells, too. Much remains to be learned about this effect, including its specific biochemical mechanism, and whether aspirin is preventing the growth of new cancerous cells, or only delaying it. But the positive results suggest a clear course of future research, and Whitney is already engaged in an epidemiological study comparing cancer patients on and off regular doses of aspirin. And although her work focuses on a specific mutation, she's beginning to look into whether aspirin might be paired with other drugs to create advanced combination therapies for breast cancer sufferers.





**Ashok A. Kumar**  
APPLIED PHYSICS



**Thomas N. Norman**  
SYSTEMS BIOLOGY



**Heather C. Olins**  
ORGANISMIC AND EVOLUTIONARY BIOLOGY

### “Simple Technology to Tackle Sickle Cell Disease”

Some acts of innovative engineering occur at the frontiers of technological advancement. But others come about through the elegant recombination of long-familiar principles. Ashok Kumar plans to revolutionize the treatment of sickle-cell anemia, making a diagnosis for the disease possible in parts of the world without easy access to large facilities for the analysis of blood samples. And he’s doing it with some simple centrifuges and car batteries.

“We took two different pieces of knowledge, both decades old, and put them together,” says Ashok, a member of George Whitesides’s research group in the Department of Chemistry and Chemical Biology. “We knew that aqueous polymers with different densities can form stable, self-sorting layers. Like oil and water. And we knew that sickle-cells have a different density than healthy red blood cells.” When spun in a centrifuge with such polymers, then, a blood sample’s revealed density can serve as a quick and easy visual diagnosis for the disease. “We’re down to a cost of about fifty cents and a time of twelve minutes from pinprick to reading.”

In the US, newborns are routinely screened for sickle-cell at birth. In Sub-Saharan Africa, though, no widespread screening is possible, and most of those born with the disease die before the age of five. Ashok recently finished a six-month trial of his rapid-test hematology in Zambia and hopes that his simple system will make sickle-cell diagnosis possible for small clinics across the rural developing world.

### “Decisions, Decisions: The Eclectic Lives of Individual Cells”

When Thomas Norman first joined Harvard’s Department of Systems Biology, he had never taken a biology course or worked in a lab. His background was in pure math and engineering. “But cells,” Thomas says, “face many of the same broad tasks that engineers face. They have to control certain components with high accuracy, necessitating feedback, and they need to monitor the effects of their environment. But unlike human technology, with cells we don’t necessarily know how their logic operates.”

We don’t, for instance, know how cells make what Thomas calls “lifestyle decisions” on whether to live independently or in a cluster of neighbors, when to settle down and when to strike out on their own. They don’t, of course, have brains, so “decisions” on questions like these are made using logic encoded in complex networks of gene interaction. Compounding the problem, though, is the fact that these interactions occur at such small scales that they inevitably include a significant degree of randomness from environmental noise, which makes the cells’ behavior often look random, too.

Thomas captures populations of cells in tiny traps made of microfluids and studies them over the course of their life cycle. The data from these observations allow for careful statistical characterization of the behavior of the bacteria, allowing Thomas and his collaborators to begin to define the rules by which they operate. Thomas adds that the experimental methods he is developing are not specific to bacteria, so his pioneering methods might eventually apply to other systems.

### “Life Without Light: Microbes at Deep Sea Volcanoes”

Heather Olins studies organisms that thrive around the deep-sea hydrothermal vents found on the Juan de Fuca Ridge, 200 miles off the coast of Oregon and 2,500 meters beneath the surface of the Pacific Ocean. This might not seem like the most fruitful place for biological research, but the biomass surrounding deep-sea vents can rival that of tropical rainforests. The difference is that while the circle of life on the surface begins with photosynthetic organisms, where the sun doesn’t shine it starts with microbes that derive their energy from chemical reactions, a process called chemosynthesis.

Heather studies the oxidation of sulfur by the microbes surrounding these hydrothermal vents, specifically what temperatures are most conducive to their metabolism. Shipping out on research cruises and using the robotic submersible *Alvin*, Heather’s team collects samples of dirt from the undersea volcanic “chimneys,” brings them to the surface in a biobox, blends them into a slurry, and exposes them to variable temperatures. Biochemical processes tend to happen faster at higher temperatures, but Heather’s research shows that the most productive microbes live at a distance from the chimney, where temperatures are cooler. Although they represent some of the most thermophilic organisms on Earth, it appears even they take a “not too hot, not too cold” approach to life.

Through her deep-sea microbes, Heather is not only exploring the outer limits of life on Earth, but possibly of life beyond it, too. “If there is life on other planets, it’s less likely to be photosynthetic than chemosynthetic.”

Concentrated  
Scholarship  
*continued*



**Danny Orbach**  
HISTORY

**“Culture of Disobedience: Rebel-  
lions, Defiance, and Assassinations  
in the Japanese Army, 1858–1931”**

Military disobedience has become the major preoccupation of Danny Orbach’s scholarship. In high school he wrote a thesis on German resistance to Hitler that eventually evolved into a book-length project, and when after college he won a traveling scholarship from the Japanese government, he tried to apply the theoretical tools he had developed to that country’s history. “It didn’t work,” he says. “In both cases there were military assassinations, but the reasons were completely different.” Through diaries, court and police transcripts, press accounts, letters, memoirs, and diplomatic documents, he began to develop a new perspective on 20th-century Japanese military history.

Danny’s research concerns events that led to a pervasive acceptance in Japan of military disobedience. With the collapse of the old system of legitimacy after the revolution of 1868 and the installation of the child emperor as the figurehead of those now in power, almost any decision could be justified by appeal to this political empty center. Untethering the military from governmental control, in this unstable situation even the most calamitous decisions were treated with leniency.

“This created a situation in which Japanese politicians couldn’t make diplomatic concessions to other countries, because they were so afraid of upsetting the army,” says Danny. “They couldn’t go back, only forward. So Japan had to expand into China.” And so, he continues, much of the history of a world war originates with the private culture of Japanese army officers, and their proclivity for very uncivil disobedience.



**David P. Roberson**  
NEUROSCIENCE

**“A Magic Bullet for Pain and Itch”**

While in his first year of medical school at the Technion in Haifa, Israel, David Roberson learned that his mother and stepfather had been critically injured in an airplane crash. On his flight back to the States, he began to experience an extreme pain in his lower back. It was a kidney stone, and David spent the next ten hours passing the stone in the worst pain imaginable. Consequently, he became interested in learning everything he could about the mechanism and treatment of pain.

“The cost of chronic pain in the US is over \$600 billion every year,” David says. “But the treatments currently available are largely ineffective for most people. And the opioid drugs that work well for some can also cause devastating addiction.”

David is investigating a method for blocking pain signals using a combination of lidocaine and capsaicin, the “hot” ingredient in chili peppers. Both pain and itch are signaled by the same bundles of nerve fibers, and David is currently building on the lab’s previous work by advancing the treatment of chronic itch, a condition often just as miserable as chronic pain. In the process, David has settled a century-old debate by demonstrating that the nerves responsible for pain and itch are actually distinct from each other. Now, he is at work on therapies targeting the itch nerves specifically. After finishing his medical training and his PhD in neuroscience, David plans to continue developing novel therapies for nervous system disease and injury.



**Sarah MacGregor Rugheimer**  
ASTRONOMY

**“Spectral Fingerprints of Another  
Earth”**

Sarah Rugheimer wasn’t looking for a career in astronomy. Born into a family of physicists, she was determined not to study the subject. Bored by an accounting class, though, she switched into the only alternative—physics—and loved it. Still, she knew she wouldn’t become an astronomer: she had a friend who studied quasar spectra by spending all day looking at squiggly lines, and the work seemed too tedious. But sure enough, a series of research projects brought her eventually to stellar spectral analysis, and now she spends her days looking at squiggly lines, too.

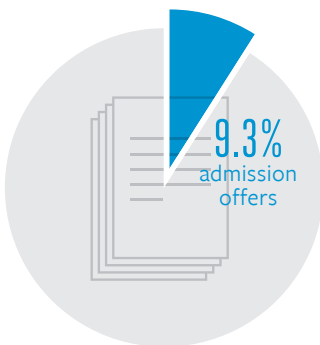
In the process, she’s hoping to find signs of extraterrestrial life. “Even though something like 85 percent of the population believes in UFOs,” she says, “until now we’ve had no radio signals or other obvious ‘we are here’ contact from aliens. But now we don’t have to wait for life to contact us. We can go looking for it.” Sarah studies how the presence of life on another planet might be identified from what we can observe about its atmosphere. Specifically, she’s investigating how the light of stars will affect our ability to read these “biosignatures,” and how to overcome such interference.

For now, Sarah’s work remains theoretical: the first telescope powerful enough to search for these gassy traces of life on faraway planets won’t be launched until late 2018. But her work is already having an impact: recently, a researcher used her datasets to make a case for higher resolutions on a planned telescope. 🍷

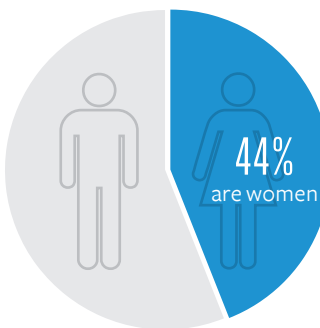


## ADMISSION SUCCESSES

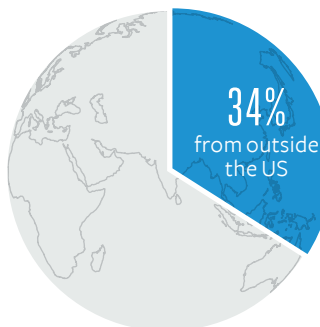
A diverse group of students will join GSAS in the fall, chosen from 12,711 applications, a 5 percent increase over 2013.



PHD APPLICANT POOL



GENDER OF APPLICANTS



INCOMING STUDENTS

# Real-Life Stories

## NAVIGATING THE JOURNEY TOWARD THE TENURE TRACK

PhD students in pursuit of academic careers had the opportunity to hear from fellow scholars at “Real-Life Stories from the Academic Job Market,” a panel offered by the Office of Career Services (OCS) as part of their “Becoming Faculty” series. Covering topics ranging from campus visits and recommendation letters to Skype interviews and job wikis, the candid discussion provided valuable, firsthand accounts and insights on the inevitable ups and downs of the academic job search.

While the four panelists, all current or former GSAS students, had met with varying levels of success on their respective quests for a tenure-track position, each shared stories of euphoric achievement and devastating heartbreak. They urged participants not to take rejections personally and to accept that certain factors would always be out of the job candidate’s control. With competition for academic positions fierce, particularly in the humanities where postdoctoral positions can be scarce, the panelists emphasized the importance of casting a wide net, citing their own efforts to apply to as many jobs as possible—in some cases in quantities reaching the 80s and 90s. They also encouraged the audience to consider interdisciplinary positions slightly outside of one’s area of expertise.

When it comes to the academic job search, there is no magic bullet, but proper preparation can make a world of difference. That’s what makes OCS events like “Real-Life Stories” so important. The hints and tips garnered at such gatherings are incredibly useful, but these events also offer a unique sense of solidarity, reminding candidates that they are not alone—as the search is tough on even the brightest and most determined of scholars. —*Emma Mueller*

## GSAS Students Win Major National Fellowship Competitions

GSAS students won an impressive number of national fellowship competitions this spring, including grants from the National Science Foundation (NSF) and Fulbright Fellowships. Nearly 40 PhD candidates in fields ranging from Earth and planetary sciences to health policy captured NSF funding, while winners of Mellon/ACLS Fellowships and Whiting Foundation awards received support for the study of Russian and Soviet poetry in the early 20th century and literary culture in medieval Japan.

Students who won Fulbright Fellowships not only had to prove the feasibility of their proposed projects but also needed to demonstrate their in-depth knowledge of the destination country. They will travel the world studying, for example, Soviet nationalities policy in Kazakhstan, anti-poverty initiatives in India, and sacred arts in the Democratic Republic of Congo.

These achievements highlight the collective strength of the GSAS student body and its ability to communicate research effectively. Winning a prized fellowship plays a key role in professional development, since graduate students learn skills that they will use throughout their careers. By supporting their work, GSAS is helping to produce a new generation of scholars and problem solvers who will make contributions in whatever career paths they may take.

Read more about the students who won these prestigious awards on our website, [www.gsas.harvard.edu/news](http://www.gsas.harvard.edu/news).



# Q + A

## Ray Jayawardhana

**An astronomer explores extrasolar planets, while telling stories about the very large and the very small**

Ray Jayawardhana uses many of the world's largest telescopes to explore planetary origins and diversity, as well as the formation of brown dwarfs and stars. His recent research has focused on the detection and characterization of extrasolar planets using high-precision observations in an effort to advance understanding of two types of "extreme worlds"—close-in planets seen in transit and far-out planets that can be directly imaged. He is also an award-winning science writer, a creator of innovative science outreach programs, a popular speaker, and a frequent commentator for the media. Two of his recent books, *Strange New Worlds: The Search for Alien Planets and Life Beyond Our Solar System* (2011, Princeton University Press) and *Neutrino Hunters: The Thrilling Chase for a Ghostly Particle to Unlock the Secrets of the Universe* (2013, Scientific American/Farrar, Straus and Giroux), have described scientific quests in the cosmic and the subatomic realms—exoplanets and neutrinos.

Born and raised in Sri Lanka, Jayawardhana holds a BS from Yale University and a PhD from Harvard University. He is now the Dean of Science and a professor of physics and astronomy at York University in Canada.



### Q + A ID

NAME:

**Ray  
Jayawardhana,  
PhD '00**

FIELD OF STUDY:

**Astronomy**

TODAY:

**Dean of  
Science, York  
University,  
Toronto**

#### **Why do you think it is important to investigate the universe?**

You might think of the universe as being "out there," remote and untouchable, disconnected from the realities and concerns of our lives here on Earth. But that's simply not the case. We are connected to the universe at large in myriad and intimate ways. For one, the calcium in our bones, the iron in our blood, and the oxygen we breathe all come from ancient stars that lived and died before our own Sun was born. For another, meteorites from space have almost certainly affected the course of life on our planet—by triggering mass extinctions and perhaps even delivering organic molecules to the young Earth in the first place—and potential asteroid impacts continue to pose a small but serious risk to our very existence.

Moreover, there are umpteen particles from space bombarding the Earth day and night. Giant solar flares not only produce spectacular aurorae but also disrupt satellites and power

grids, so "space weather" affects our technological society. Most importantly, I think, investigating the universe is integral to understanding our planet in context, to developing a broader perspective on life—in essence, to making sense of who we are—and to nurturing our sense of wonder.

#### **As a child, you were drawn to space because it represented adventure. Do you still find adventure in studying the stars?**

Absolutely. It is exciting to be part of this great human adventure that we call science. The opportunity to explore the unknown, spurred on by curiosity and working with motivated students and colleagues, is an immense privilege. Besides, as a scientist and a writer, I've had the chance to visit places that I could only dream of as a child: from astronomical observatories on the arid mountaintops of Chile to the steamy depths of a South African mine accompanying geochemists to collect groundwater, from the ice



fields of Antarctica where we camped out for five frigid weeks gathering meteorites to the steppes of western Mongolia to watch a total solar eclipse. A few years ago, I even got to experience the thrill of weightlessness on a parabola-hopping aircraft high above the Atlantic.

**In addition to your research, you spend a good amount of time communicating with the public through your popular science books. Why is outreach so important to you?**

I guess I inherited my late father's love of language. As an undergraduate, I wrote for the college newspaper and a science magazine on campus. My lucky break was to get a summer internship at *The Economist*. After that, I was able to write for various publications during college and graduate school. It's not always easy for an active researcher to find time to write for a broad audience, but I find it incredibly rewarding. Some of our research papers tend to focus on specific—some might say narrow—albeit interesting questions. Writing for the public gives me a chance to step back a bit, consider the big picture, and pull a number of threads into a compelling story.

More generally, I believe that engaging with the public is an important aspect of being a scientist—plus it is good fun. Science is a splendid human endeavor, one that enriches us tremendously, not only materially but also culturally. So it is incumbent upon us scientists to share our findings and insights, and even glimpses of the often messy and sometimes frustrating process of research. I try to do that through my writing and speaking, and also by organizing public events and outreach initiatives. One project I'm especially proud of is CoolCosmos. During the International Year of Astronomy in 2009, we deployed 3,000 ads, with five catchy designs to pique people's curiosity about the universe, inside Toronto's subway cars, buses, and streetcars. It was an attempt to reach a broad cross-section

of the population for whom the science of astronomy just does not enter daily life, and remind them about our cosmic connections.

**You've spent much of your career studying brown dwarfs and extra-solar planets at the macro level. What drew you to write a book about neutrinos?**

Neutrinos are extremely interesting elementary particles with rather quirky characteristics. They are all around us: some originate in the nuclear furnace at the Sun's core, others are created in the upper atmosphere, and yet others are produced beneath our feet when radioactive elements in the Earth's interior decay. Neutrinos are the most abundant type of matter particle in the universe, yet we have only recently begun to appreciate their starring role in a great many sagas unfolding across physics, cosmology, and astronomy. Needless to say the science of neutrinos is riveting, but so are the stories of the scientists chasing these elusive particles. It was the combination of the fascinating history, the colorful personalities, and the cutting-edge science that drew me to write *Neutrino Hunters*.

**What are the most exciting discoveries happening in astronomy right now?**

If I had to pick, I would say there are two particularly exciting areas of astronomy: exoplanets and cosmology.

When I started graduate school 20 years ago, we knew of only one planetary system around a normal star—namely, our own solar system. Now we know of thousands of planets circling other stars, and the pace of discovery is breathtaking. That's a dramatic change. But the real story here isn't just about the numbers—it is the diversity of worlds and of planetary systems that has surprised us and challenged our preconceptions many times over. (My previous book, *Strange New Worlds*, recounts the saga of exoplanet discovery.)

Cosmology, the study of the origin and evolution of the universe, is ripe with both tantalizing findings but also mind-boggling mysteries. For example, scientists have measured the tiny ripples in the afterglow of the Big Bang (the cosmic microwave background) with exquisite precision. Meanwhile, they are puzzling over the nature of so-called “dark matter” and “dark energy,” which appear to dominate the mass-energy budget of the universe.

**"Now we know of thousands of planets circling other stars, and the pace of discovery is breathtaking."**

**How do you think the new generation of telescopes, like the James Webb Space Telescope (JWST), will change what we think we know about the universe?**

Every leap in our observing capabilities has resulted in new revelations, many of them quite unexpected. I'm sure that would also be the case with the JWST and the next generation of ground-based telescopes. In my own research area, we are looking forward to using the JWST to characterize some of the nearest exoplanets, to do “remote sensing” of their atmospheres across tens or even hundreds of light-years.

**You were a fellow at the Radcliffe Institute for Advanced Study during the 2011–2012 academic year. What was it like to return to Harvard?**

It was fun to be back in Cambridge, reminiscing about old times and making new memories—jogging by the Charles remains a favorite. It was a special delight to be at Radcliffe, interacting with fellows from so many disparate disciplines yet sharing a common sense of curiosity and intellectual engagement. ☺

# Shelf Life



Alfred Hitchcock never acknowledged Ralph Waldo Emerson's influence (as he did Edgar Allan Poe's), but ***Must We Kill the Thing We Love? Emersonian Perfectionism and the Films of Alfred Hitchcock*** (Columbia University Press, 2014) emphatically does. **WILLIAM ROTHMAN** (AB '65, PhD '74, philosophy) explores Hitchcock's oeuvre using Emersonian concepts, particularly self-transformation (seeking the "unattained but attainable self"). In *North by Northwest* (1959), Roger Thornhill's personal growth undergirds his own survival and his romance with Eve Kendall. Rothman sees *The Birds* (1963) as a dialog with French New Wave directors like Truffaut. And *North by Northwest*, which skewered Cold War pieties (making the Professor as manipulative as Vandamm), and *Psycho* (1960), which twitted the MPAA censors, both highlight Hitchcock's subversive side.



Auteur theory hails directors as authors who control their films. In ***Self-Projection: The Director's Image in Art Cinema*** (University of Minnesota Press, 2014), **LINDA HAVERTY RUGG** (PhD '89, comparative literature) offers a studied exploration of how auteur-directors project themselves cinematically. Some appear onscreen as variants of themselves (e.g., Woody Allen); others use actor-avatars. Jean-Pierre Léaud stood in for director François Truffaut in several of Truffaut's films. Some embrace self-satire. In *Day for Night* (1973), Truffaut played a director whipsawed by capricious actors, faulty equipment, and limits of time and money, skewering the whole notion of directorial control. Similarly, Werner Herzog spoofed his outsized, almost Nietzschean persona in *Incident at Loch*

Ness (2004), a fictitious documentary about *his* fictitious documentary on the Loch Ness monster.

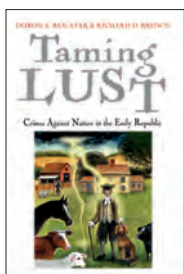
***Taming Lust: Crimes Against Nature in the Early Republic*** (University of Pennsylvania Press, 2014) examines two criminal trials of the 1790s that condemned octogenarians John Farrell and Gideon Washburn to hang for bestiality—a rare charge that had not yielded a death sentence in New England for over a century. The accused were relative outsiders, but Doron Ben-Atar and **RICHARD BROWN** (PhD '66, history) place them within a much larger historical context. The trials took place in the less-developed western hinterland (of Massachusetts and Connecticut), an area that mistrusted the rising commercial economy. The two communities also had deep political and religious fractures. Their Federalist-Congregationalist establishment railed against a threatening cabal of "Jacobins," Jeffersonians, Deists, and dissenters. Finally, many feared a loss of republican virtues.

At best, critics say, academic disciplines are cobwebby garrets out of place in today's mean-and-lean university. At worst, they serve as "silos" that actively impede the exchange of ideas. **JERRY JACOBS** (PhD '83, sociology) strongly disagrees. In ***Defense of Disciplines: Interdisciplinarity and Specialization in the Research University*** (University of Chicago, 2013), Jacobs notes that existing disciplines have not quashed communication across the lines. Thus, historians have taken inspiration from many fields and theoretical approaches, from anthropology and economics to post-structuralism. Jacobs also examines existing interdisciplinary programs and finds them wanting. His chapter

on American studies notes that despite a shared focus on culture, American studies and anthropology long remained strangers. And, since few American studies programs have departmental status, they don't control hiring or tenure decisions.

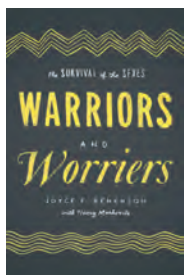
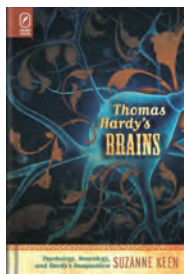
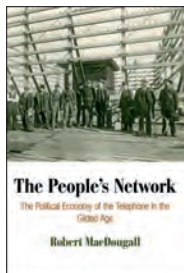
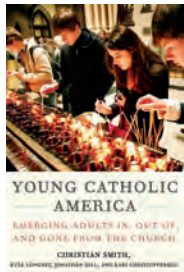
***A Woman of Science: An Extraordinary Journey of Love, Discovery, and the Sex Life of Mushrooms*** (Hatherleigh Press, 2013), by **CARDY RAPER** (PhD '77, cellular and developmental biology), is a lively account of changing times, amorous fungi, and—above all—successfully overcoming gender-based barriers. Hearing young Cardy's scientific interests, her mother had replied, "That's nice, dear...you can be a nurse." But Cardy persevered. College led to graduate school and mycology—and love and marriage to mentor Red Raper. Then came raising two children. At last, after Red's untimely 1974 death, Raper completed her PhD (at age 52). She also recounts becoming pregnant again (at 43) and having an abortion (pre-*Roe v. Wade*), with all its attendant cloak-and-dagger subterfuge and stark isolation.

***Young Catholic America: Emerging Adults In, Out of, and Gone from the Church*** (Oxford University Press, 2014) describes the religious faith of young Catholics today. **CHRISTIAN SMITH** (PhD '90, sociology) and collaborators base their findings on a 3,290-person sample of "millennials" (born 1985–1990). After an overview of Catholic Americans' experiences in the 20th century, the authors analyze their cohort, many of whom are "cafeteria Catholics" who privilege individual conscience over strict observance of Church doctrine (for example, regarding birth control or sexuality) and who





Alumni authors: Would you like your book (general interest, published within the past year) considered for inclusion? Send it to *Colloquy*, Harvard Graduate School of Arts and Sciences, Suite 350, 1350 Massachusetts Avenue, Cambridge, MA 02138. Questions? E-mail [gsaa@fas.harvard.edu](mailto:gsaa@fas.harvard.edu).



rarely attend Mass. To explain these developments, the authors make note of larger social changes and the declining number of priests but particularly emphasize the failure of parents to “model, teach, and pass on the faith.”

American Telephone and Telegraph (AT&T) carefully tended its legacy in 20th-century telecommunications. Its publications and vast archives promoted a simple story of scientific progress and benevolent “natural” monopoly. **ROBERT MACDOUGALL** (PhD ’04, history) transforms this narrative in *The People’s Network: The Political Economy of the Telephone in the Gilded Age* (University of Pennsylvania Press, 2014). Studying Progressive Era America and Canada, MacDougall highlights conflict and contingency. AT&T was beset by inventors challenging its patents, would-be local- and state-level regulators, and internal divisions over corporate vision and tactics. Above all, MacDougall emphasizes a Lilliputian crowd of local phone companies that threatened its dominance. By the 1920s, AT&T had won—emerging as the world’s largest corporation—but its victory reflected less benevolence or “nature” than playing hardball.

*Reclaiming American Virtue: The Human Rights Revolution of the 1970s* (Harvard University Press, 2014) spotlights the political and social forces that shifted American foreign policy from Kissinger-style *realpolitik* to an increasing emphasis on human rights. **BARBARA KEYS** (PhD ’01, history) views the United Nations and its Universal Declaration of Human Rights as less important in this transformation than the impact of the Vietnam War and awareness of various repressive regimes (conservatives generally focusing on the Soviet bloc; liberals, on dictatorial allies, including Greece, Brazil, and Chile). Amnesty International played a major role, as did faith-based initiatives of Quakers, Catholics, and others. Finally, the political repercussions of Watergate opened the way for Jimmy Carter’s presidency

with its self-conscious embrace of the language of human rights.

*Thomas Hardy’s Brains: Psychology, Neurology, and Hardy’s Imagination* (Ohio State University Press, 2014) is a valuable addition to scholarship on the English novelist. **SUZANNE KEEN** (PhD ’90, English and American language and literature) probes Hardy’s fascination with the mind. She traces his ideas, in particular, to diligent scientific reading (in his 80s, Hardy took on Einstein’s Theory of General Relativity) and influences via the Athenaeum and Savile Club. Schematizing Hardy’s narrative strategies, Keen highlights his shifting point of view, from an individual character’s thought processes to the polyphonic commentary of the larger community. Addressing Hardy’s entire oeuvre—both novels and poetry (including a poetic commemoration of the sinking of the *Titanic*)—Keen sees Hardy less as a pessimist than as a voice of measured empathy.

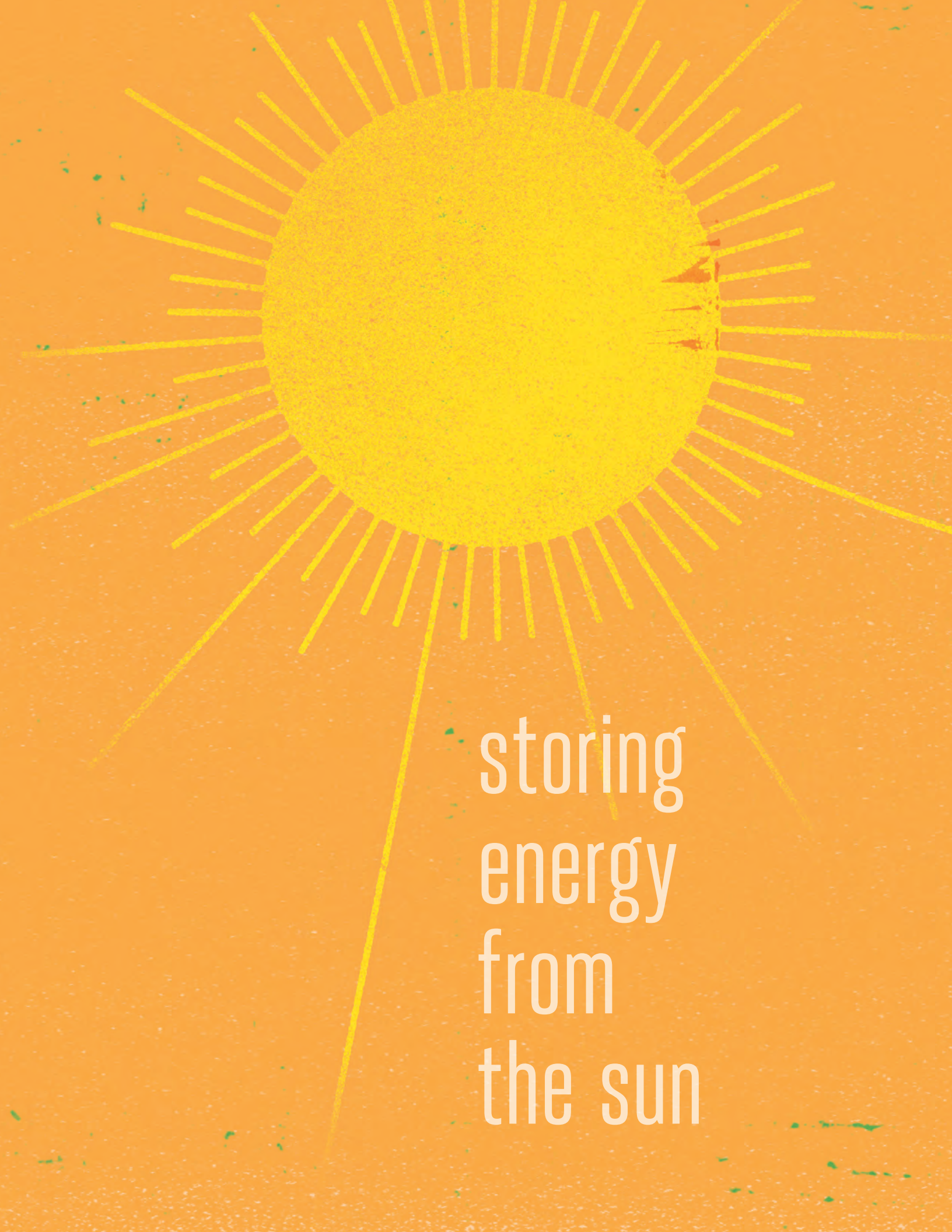
*Warriors and Worriers: The Survival of the Sexes* (Oxford University Press, 2014) argues that gender differences are etched into our genetic blueprint. **JOYCE F. BENENSON** (PhD ’88, psychology) and Henry Markovits contend that from early on males are competitive risk-takers and would-be warriors, focused on “the enemy.” After puberty, they seek to pass on their genes by having sex with many females. But girls and women are risk-averse, focused on protecting themselves and their children. Female-female competition (e.g., over men) is less overt than that of men. They also seek stability through alliances—with their children’s father if possible but also with other females. Benenson’s cross-cultural analysis stresses central tendencies; Goth girls, male ballet dancers, same-sex couples, or men choosing humor over aggression remain outliers. 🍷



**NICHOLAS CARR** (AM ’84, English and American literature and language) fears our overreliance on digital technology, and *The Glass Cage: Automation and Us* (Norton, 2014) is his compelling brief. Economically, robots eliminate jobs without stimulating job growth to offset the losses. Moreover, automation undermines human skills. The Inuit once navigated the featureless Arctic using the stars and patterns of drifting snow. Now, with GPS devices, their skills are disappearing. Similarly, the Federal Aviation Authority warns that over-reliance on autopilots undermines pilot skills: in two 2009 crashes, pilots seemingly forgot how to respond to a stall—277 deaths, no survivors.

Some defend automation because it minimizes the role of error-prone humans. But in 2012, Wall Street’s Knight Capital Group inaugurated an automated trading program. In 45 minutes, it left Knight with half a billion dollars in losses, verging on bankruptcy. (The bug in the software reminds us: programmers, too, are error-prone humans.) Google’s driverless car epitomizes this attempted erasure of the human. Journalists report that the car has “[n]o steering wheel [and] no brake and gas pedals.” But what about software glitches, power failures, or driving surprises the software designers never anticipated? Carr contrasts this *technology-centered* approach with a *human-centered* one. He advocates technology that recognizes our shortcomings (no one stays alert just “watching the dials”) and our strengths (responding quickly and creatively to the unexpected).





storing  
energy  
from  
the sun



# How Harvard Researchers Will Change the World

By Ann Hall

Illustration by The Heads of State



# Imagine the Earth from space, at night.

Orange glows illuminate our world's most populous cities: Tokyo, Moscow, New York. Light equals technology. Technology equals prosperity. But what of the areas of darkness that span thousands of miles in sub-Saharan Africa?

"There is a huge correlation between wealth and energy production," says Alán Aspuru-Guzik, a professor in Harvard's Department of Chemistry and Chemical Biology. "If you have energy you have wealth. The energy we have access to in America is equivalent to having 30 servants helping us in our daily lives." Nearly a billion people live in sub-Saharan Africa without access to the energy that enables other societies to thrive. It's a severe disparity that prevents countries in the developing world from reaching higher standards of living.

But it's a disparity that Aspuru-Guzik, a theoretical chemist with interests in quantum computing, is determined to address. Growing up in a middle-class family in Mexico, he had friends who were very rich and very poor and saw firsthand the effects of an unequal society. Mexico has tremendous solar and wind power potential, and Aspuru-Guzik understands that solving disparity in his own country—and throughout the world—will depend upon tapping these alternate energy sources. "Energy production has to be renewable, there is no way around it," he says. "When I came to Harvard, I decided to dedicate half my time to energy, because it is the socially responsible thing to do. I have this amazing command of resources, and I'm surrounded by the smartest people on the planet, so let's do something useful for it."

One of the problems with renewable energy is storage. Wind turbines and solar panels can generate electricity, however, the energy produced naturally ebbs and flows, meaning that

in times of peak energy usage, renewables cannot be relied upon to deliver the electricity needed. While efficient methods of clean energy storage remain elusive, Aspuru-Guzik is working with Michael Aziz, the Gene and Tracy Sykes Professor of Materials and Energy Technologies at Harvard's School of Engineering and Applied Sciences, and Roy Gordon, the Thomas Dudley Cabot Professor of Chemistry and Professor of Materials Science, on a project to update an old technology: flow batteries.

Invented in the late 1800s and revived several times during the 20th century, flow batteries work by streaming an electrolyte solution that contains dissolved metals through a membrane into another electrolyte solution. As the molecules pass through the membrane, the liquids exchange ions and create an electric current. Though effective, the process is costly and utilizes corrosive liquids that can cause environmental damage if spilled.

Rather than using expensive metals, the modern flow battery consists of a tank filled with organic molecules—a modified version of a naturally-occurring quinone. These molecules are pumped toward an electrode, where they receive two electrons and two protons. When all the molecules in the tank have been through the process, the battery is fully charged. The energy stored can subsequently be accessed by running the battery in reverse, enabling the molecules to discharge the two electrons. "I worked on the theoretical calculations related to adapting quinone molecules and Mike, Roy, and their teams conducted the experiments that proved it could work," says Aspuru-Guzik. "My vision is to make organic molecules for important

applications, such as storing energy or for use in electronics." In addition, he stresses the collaboration between theoreticians and experimentalists. "These types of projects can only be achieved by having theory and experiment working hand in hand."

In theory, flow batteries could be used to capture solar energy by day and tapped at night by a household or even several homes connected through

a mini grid. Aspuru-Guzik predicts that the first use of flow batteries will be a scaled-version that regulates the electricity grid, ensuring that the renewable energy produced can be stored for later use.

## THE POWER OF THE SUN

Storage is one of the things Daniel Nocera, the Patterson Rockwood Professor of Energy, thinks about the most. "You can't go very far with renewables unless you can store the energy," he says. "Developing effective and inexpensive storage technologies would be a game changer for renewable energy."

In addressing the storage problem, Nocera delves deeply into one of the most successful energy generation and storage processes on the planet: photosynthesis. During this chemical reaction, plants convert sunlight into a fuel that feeds them, essentially storing solar energy as sugar. Nocera has spent a great deal of his career researching photosynthesis in an effort to replicate this conversion process. "I wanted to understand that reaction in plants, how plants

Alán Aspuru-Guzik uses the tools of theoretical chemistry to help develop storage solutions for renewable energy generation.





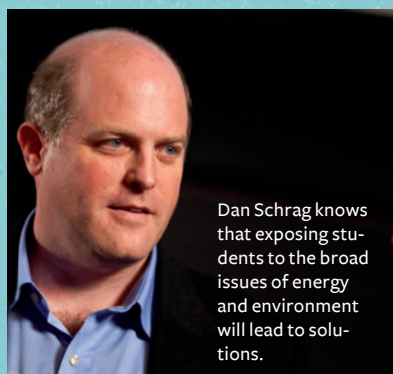
# EXPANDING PERSPECTIVES

**The Graduate Consortium on Energy and Environment exposes students to fundamental challenges.**

Despite impassioned debate, certain facts are irrefutable. Ice caps and glaciers are melting. Sea levels are rising. CO<sub>2</sub> measurements have reached 400 parts per million, an amount last registered more than 30 million years ago when crocodiles lived in Greenland. The conversation is pivoting from whether global warming exists to what we can do to slow—or even stop—this dramatic planet-wide transformation.

## BROAD EXPOSURE

In an effort to understand the interplay between energy production and this environmental change, a group of Harvard graduate students in physics, applied physics, and earth sciences formed the Harvard Energy Journal Club during the mid-2000s. “They were interested in energy and wanted to understand energy technology,” remembers Dan Schrag, the Sturgis Hooper Professor of Geology and Professor of Environmental Science and Engineering, who advised the



club. “At the time there weren’t many courses dealing with those specific issues,” Schrag and his colleague Michael Aziz, the Gene and Tracy Sykes Professor of Materials and Energy Technologies, attended meetings and helped guide some of the discussions, but after a few years, the club became unsustainable. Student interest in the topic remained high, however, particularly among those from other disciplines.

“I began thinking about creating a program that would not provide deep

training but basic exposure to the issues for those who worked on topics tangentially related to energy and environment,” says Schrag. He brought his idea to then-GSAS Dean Allan Brandt, who immediately expressed support. “I had considered developing a master’s program or interdisciplinary certificate, but Allan thought the idea was much more exciting than that,” says Schrag. “He saw it as an opportunity to be part of a special community.” And thus the Graduate Consortium on Energy and Environment was born.

The consortium consists of three components. Students take classes in energy technology, designed specifically for the consortium’s broad audience of doctoral-level students by Aziz; the environmental consequences of energy choices, designed similarly by Schrag; and energy policy, organized by William Hogan, the Raymond Plank Professor of Global Energy Policy at Harvard Kennedy School. They attend a lunch seminar each Friday, where faculty members from around the University discuss their work. “These components provide them a systematic way of thinking about the important issues in the energy/environment arena, and an exposure to the wide variety of current research activities within the University,” explains Aziz, who serves as the consortium’s faculty coordinator. Finally, they form relationships among themselves, essentially building a network of like-minded people from varied disciplines. “I believe this pays dividends long after they leave Harvard,” explains Schrag. “They know the expert to call in other fields when their work would benefit from a different perspective.”

## BUILDING COMMUNITY

Since its inception in 2009, the Graduate Consortium on Energy and Environment has helped approximately 120 graduate students from over 20 departments at 8 different Harvard schools gain a broad understanding of key issues while building a strong interdisciplinary community. The connections they make are powerful. “Being part of the consortium was a really good experience,” says Adrian Jinich, a PhD candidate in systems biology. “I developed relationships with a creative, really smart, very diverse group of people. It expanded my perspective.”

As a doctoral student working in

Alán Aspuru-Guzik’s lab, Jinich wants to use the tools of systems biology to help meet the sustainability challenges surrounding food and energy. He currently works on a project seeking to estimate theoretically the thermodynamics of metabolic reactions, which may help metabolic engineers as they, for example, determine how to speed up plant growth to meet future food or fuel needs.

Jinich is glad he applied to become a member of the consortium, not just because it dovetailed with his research interests, but because he became more



literate about energy and the environment. However, it is the diverse community of researchers and fellow students that he has found most important. “Through the program and through conversations with Dan Schrag, I met this awesome group of people that I didn’t know existed, including some working on food and agriculture issues,” Jinich says. “I feel less lonely now because I know more people like me.”

## THE ROAD AHEAD

The fundamental challenges surrounding energy and environment, including climate change, will have a great effect on populations throughout the world; Schrag believes that exposing students to the broad issues of energy and environment will lead to solutions. “I think it is important that a chemist working on new photovoltaic devices actually understands electricity policy and pricing. Or that an economist who is thinking about clean energy comprehends the carbon cycle and how a nuclear power plant works,” he says. “Exactly how that’s going to lead to a breakthrough, I can’t tell you. But I have enormous faith that by equipping our students with knowledge in this area, it’s going to pay dividends in the long run.”

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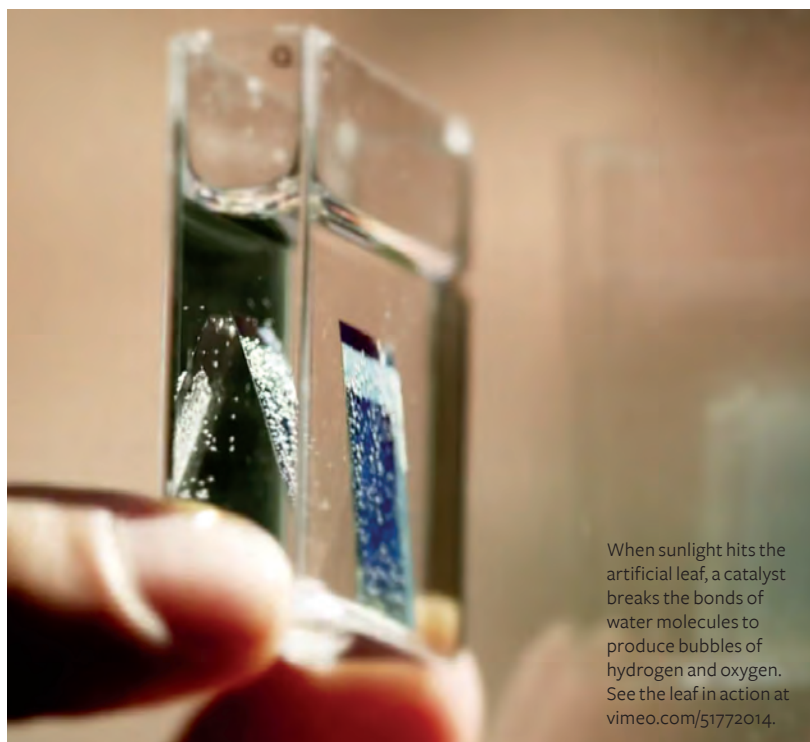
## storing energy from the sun

work,” he explains. “Overlaid on that interest was the global energy problem, which gave me an imperative to do this kind of science.” His work has resulted in the development of an artificial leaf that mimics the process.

In simple terms, the artificial leaf is a sandwich with catalysts as the bread surrounding a silicon strip. Placing the leaf in a glass of water and exposing it to the sun causes a reaction that breaks water ( $H_2O$ ) into the gases hydrogen and oxygen, a process that is both carbon neutral and nonpolluting. When the hydrogen and oxygen are recombined in a fuel cell, the reaction generates electricity, with water as a byproduct. “All you are really doing is taking sunlight in and giving energy off, but in a useful form, rather than by generating heat,” Nocera explains. “What I do is energy conversion, simply transforming sunlight into another useful form of energy.”

Technology like the artificial leaf could revolutionize how energy is used throughout the globe. In the developed world, societies depend on the energy grid, a centralized pool of electricity that homes and businesses tap into. This grid is the result of trillions of dollars of infrastructure investment over a hundred years, and even though it has become antiquated, there’s no immediate need to move to a more distributed system. But the developing world lacks the technology and the means to create one from scratch. “The artificial leaf moves energy production from a centralized to a distributed model,” says Nocera. “The sun is everywhere and that means that with the right tools, people in the developing world could become early adopters of the technology.”

Because it generates hydrogen fuel, the artificial leaf can also effect change in the developed world. Fuel is the best way to contain energy in a small package. That’s why, for example, we put gasoline in our cars; switching to another, basically renewable, fuel would be fairly seamless in light of the already developed fuel cell car technology. And using renewable resources like sunlight to generate fuel would benefit both the developed and developing worlds, while addressing the disparities between them. “When you start giving poor people energy, whether it’s through fuels or flow battery technology, that economically empowers them,” says Nocera. “Once people in the developed world see the transformation in the developing world, they’ll want to live



When sunlight hits the artificial leaf, a catalyst breaks the bonds of water molecules to produce bubbles of hydrogen and oxygen. See the leaf in action at [vimeo.com/51772014](https://vimeo.com/51772014).

like that. People ultimately want to be in control of their own energy and that will force a change.”

It doesn’t hurt that both the artificial leaf and flow batteries have minimal environmental impact when compared with fossil fuels. Now that  $CO_2$  levels have reached 400 parts per million and the world’s population is expected reach 11 billion by 2050, the planet is in urgent need of solutions like those being developed at Harvard.

**"What I do is energy conversion, simply transforming sunlight into another useful form of energy."**

### CREATIVE SOLUTIONS

Should access to energy—and the ability to utilize it on a level playing field—be an inalienable, human right? If so, how can access to it be gained without adding to the already untenable problem presented by global warming? The answers may lie within academia and at Harvard in particular. In April, President Drew Faust announced the creation of the Climate Change Solutions Fund, a commitment to supporting energy and environmental research

to address two great challenges: changing our society’s energy system and infrastructure while spurring the transition to clean, affordable, and renewable energy sources. President Faust observed that since universities have provided much of the research demonstrating the existence of climate change, many of the solutions will also come through scientific investigation. “Already we support research at the vanguard of energy and climate science,” she said. “Our research across Harvard—in climate science, engineering, law, public health, policy, design, and business—has unparalleled capacity to accelerate the progression from nonrenewable sources of energy.”

Solving the environmental and disparity problems presented by energy and climate change will require creative thinking, like the kind that inspired Leonardo da Vinci. “The modern scientist of the 21st century should be like Leonardo,” says Aspuru-Guzik. “We were Leonardos in the 15th century, and then we stopped and began hyperspecializing. I say that the multidisciplinary opportunities are there like never before. We have to transgress the boundaries of our fields and even of the university, because how else can we help society?”



Daniel Nocera has invented an artificial leaf that mimics photosynthesis by using sunlight to create hydrogen fuel.



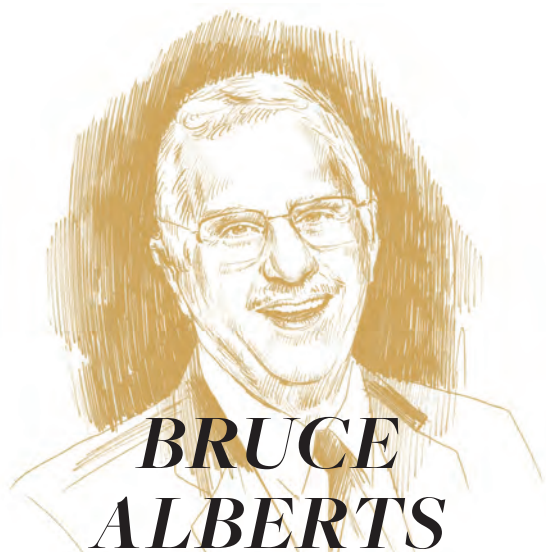
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THE 2014  
CENTENNIAL  
MEDALS

*2014 marks the 25th anniversary of the Centennial Medal, first awarded in 1989 on the occasion of the 100th anniversary of the founding of Harvard's Graduate School of Arts and Sciences. Since that time, 96 accomplished alumni have received GSAS's highest honor at an event held on the day before Commencement celebrating the contributions to society that emerged from their graduate education. This year, four prestigious scholars received the Centennial Medal.*

BY BARI WALSH | PORTRAITS BY ELISABETH MOCH



**BRUCE  
ALBERTS**

AB '60, PHD '66, BIOPHYSICS

As head of the National Academy of Sciences, as a special presidential envoy, and as editor of *Science* magazine, Bruce Alberts's influence as an international advocate for science has reached to the highest levels of global policy. His engagement began in the early 1980s when, as a prominent biochemist at the University of California, San Francisco, he noticed the glaring disparity in resources between the city's schools and the wealthy university in their midst. In response, he launched a massive effort to support the schools, transferring equipment, pedagogical resources, and people—some 300 graduate students and postdocs a year—under an umbrella organization called the UCSF Science and Health Education Partnership, now an internationally recognized model.

Alberts had spent a decade at Princeton before arriving at UCSF in 1976, winning acclaim as a teacher, a researcher who illuminated the mechanisms of DNA replication, and one of the original authors of *The Molecular Biology of the Cell*, the preeminent textbook in the field. But from his earliest days, even as his energies could have been consumed by his expanding career, "Bruce was committed to building a scientific community larger than his own laboratory," says Marc Kirschner, John Franklin Enders University Professor at Harvard.

Elected to two six-year terms as president of the National Academy of Sciences, Alberts spurred the creation of national standards for K-12 science education and worked to bring science literacy and leadership to the developing world. He expanded that work as one of the first three Science Envoys tapped by President Obama to promote science in Muslim-majority nations. As editor-in-chief of *Science*, Alberts was able to assess reform efforts and policy advances around the world.

His career, says Marc Kirschner, "can be best characterized as combining the highest standards of science with the strongest commitment to education and a total devotion to public service. There is nothing that Bruce would not do to advance these causes, and there is nobody else in the US today who has done so much, from the most fundamental level of mentoring young scientists and students to the most exalted."



**KEITH  
CHRISTIENSEN**

PHD '77, FINE ARTS

The story of Keith Christiansen's rise to prominence as one of this country's most esteemed museum curators begins, appropriately enough, with an artistic flourish. Waiting in line at the bank, on his last day of a research trip to Florence in 1977, the young art historian ran into John Pope-Hennessy, who had just resigned as director of the British Museum. Pope-Hennessy revealed that he was moving to the Metropolitan Museum of Art and invited Christiansen to join his staff.

Thirty-seven years later, the art world has been deeply enriched by that encounter, and Christiansen holds the post named for the man who brought him on board. As John Pope-Hennessy Chairman of European Paintings, he oversees the Met's world-renowned collection of Old Masters—seven centuries of individual masterpieces and cultural monuments. Christiansen has organized these treasures into "watershed exhibitions on topics as diverse as Mantegna, Tiepolo, Caravaggio, Poussin, and 15th-century Siena," revealing a "remarkable curiosity and intellectual scope," says Harvard curator Stephan Wolohojian.

Last year, Christiansen unveiled the first major renovation of the Met's European galleries since 1972. The reinstallation creates breathing room, injects historical and geographical coherence, and offers new opportunities for discovery. Most important, Christiansen was able to expand the number of paintings on view from 450 to more than 700, giving due prominence to the Met's magnificent collection—now enhanced by his own wise acquisitions.

For Christiansen, art is the greatest learning experience. "Keith is simply a great teacher—and I have never taken a class with him!" says his friend, the prominent private collector Jon Landau. "When we have looked at art together, I have always come out of the church, or palazzo, or museum with more knowledge, insight, and visual sensitivity than when I went in."





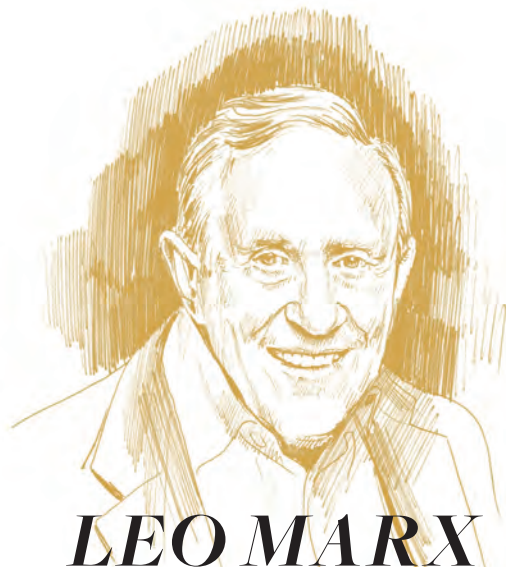
## JUDITH LASKER

PHD '76, SOCIOLOGY

It is rare in academia for an eminent scholar to be as personally cherished—by undergraduates, graduate students, and faculty at all levels—as is Judith Lasker. But then, Lasker has always combined the personal and the intellectual, viewing her academic work as intimately connected to the real world and to the emotional lives of those around her. Through unique studies of experiences of pregnancy loss, infertility, and chronic illness, to her current research on international volunteerism, “Judith Lasker has consistently been using a rich sociological imagination,” says Barbara Katz Rothman, professor of sociology at the Graduate Center of the City University of New York. “She connects troubles to issues, individual concerns to larger social problems—and engages with the search for solutions. Her work truly is a contribution to both our scholarship and our humanity.”

Judith Lasker is N.E.H. Distinguished Professor of Sociology at Lehigh University. Through the 1980s and beyond, she undertook what proved to be a groundbreaking exploration of women’s health and reproductive lives. Her first book on the subject was *When Pregnancy Fails: Families Coping with Miscarriage, Ectopic Pregnancy, Stillbirth and Infant Death*. From that work, she developed a quantitative tool to assess the effects of pregnancy loss, called the Perinatal Grief Scale, now widely used, and she conducted domestic and international studies that made a major contribution to the literature on grief and bereavement. Later in that same decade, she published *In Search of Parenthood: Coping with Infertility and High Tech Conception*, part of a body of work exploring the social and ethical dimensions of new reproductive technology.

Her friend Ellen Sogolow, a former research scientist with the Centers for Disease Control, provides an apt summary of this unique scholar. “From her teaching and research, Judy’s legacy will span generations. From her personal strength, her reach already is vast, in ways that perhaps science does not measure. Dr. Judith Lasker shines a bright light on how very much one person can accomplish with one lifetime.”



## LEO MARX

SB '41, PHD '50, HISTORY OF  
AMERICAN CIVILIZATION

It is perhaps the highest honor for a scholar: A line of inquiry that you developed, tracing connections previously uncharted, becomes a book that changes your field, spawns new ways of thinking, captures the *Zeitgeist*, and yet remains startlingly contemporary over the decades.

Such was the trajectory of ideas first articulated by Leo Marx in his Harvard thesis and then in his seminal work of American studies, *The Machine in the Garden*. Exploring tensions between the pastoral and the industrial in Hawthorne, Emerson, Thoreau, and Melville, the book seemed to predict America’s current unease about the role of technology, the degradation of the environment, and its own sense of possibility. It has been in print continuously in the 50 years since its debut in 1964. “Few scholars can claim to have invented a new field, fewer still to have done so with a work that still breathes freshness after 50 years. Leo Marx has done both,” says Sheila Jasanoff, Pforzheimer Professor at Harvard.

Leo Marx is Senior Lecturer and William R. Kenan Professor of American Cultural History Emeritus in the Program in Science, Technology, and Society at MIT. He arrived there in 1976, after stints at the University of Minnesota and Amherst College, to help found the Program in Science, Technology, and Society.

His breadth of scope helped fuel the deep and continuing impact of his masterwork. “Leo Marx’s *Machine in the Garden* reads as freshly relevant in 2014 as it did in 1964,” says Joyce Chaplin, James Duncan Phillips Professor of Early American History at Harvard. “As realization dawns that concerns about the environment and of the impact of human technology upon it are problems that will not go away, it is extraordinary to realize that Marx put nature and technology into the study of American culture from the start. He was right then, and he’s right now.”





Professor Raj Chetty



Inaugural Harvard Horizons Scholar  
Stephanie Dick



Keynote speaker Louise Richardson



Professor Diana Eck



Professor David Reich



# Intellectual Engagement

Alumni Day 2014 brings the GSAS community together

GSAS graduates returned to campus in April for Alumni Day, an annual tradition that brought more than 300 former students to Cambridge for a day of intellectual engagement. Louise Richardson, PhD '89, principal and vice-chancellor of the University of St. Andrews, delivered the keynote address titled "Terrorism: What Have We Learned?" in which she provided an expert view of how terrorism groups are created, succeed, and are ultimately defeated. Touching on 9/11, the Boston Marathon bombing, and the experiences of other countries, Richardson outlined the importance of reviewing the history of counterterrorism in counteracting groups seeking reaction and renown through violence. Richardson gave participants much to discuss during the Faculty Club luncheon that followed.

Two afternoon symposia highlighted the work of five professors, covering topics concerning genomics and human population history, American equality of opportunity, religious pluralism, and early navigation. A session concerning the media of scholarship featured Stephanie Dick, PhD '14, history of science, who was an inaugural Harvard Horizons Scholar in 2013.

In his remarks, GSAS Dean Xiao-Li Meng saluted alumni for their vision and desire to advance the School's mission. "I am grateful for the tremendous support of our alumni," he said. "Alumni are an incredible force for making change and making change happen quickly."

Professor John Huth







"When you read about  
these gravitational waves  
from the Big Bang, didn't  
your knees buckle?"

— PROFESSOR MELISSA FRANKLIN

John Kovac, associate  
professor of astron-  
omy and physics,  
discussed his experi-  
mental research.





# PHYSICS REUNION



In early April, GSAS celebrated the venerable history of one of the country's great physics programs when graduate alumni of Harvard's Department of Physics returned to Cambridge for a day of engagement and education. The symposium included panel discussions that assessed discoveries past, present, and potential, and examined the ways in which this fundamental science has become increasingly multidisciplinary. Nearly 200 people from 22 states and 4 countries connected with faculty and with PhD candidates based in biology, chemistry, and engineering labs across Harvard.

The day began with a welcome from department chair Melissa Franklin, Mallinckrodt Professor of Physics, and Jack Reardon, executive director of the Harvard Alumni Association, followed by "Graduate Students Then and Now." This session included two alumni forums on nonacademic careers, led by Harvard professors Howard Georgi and Paul Horowitz. The speakers, many of whom hold positions in finance firms or science and technology companies, discussed the varied ways they have put their degrees to use. In the "Graduate Student Snapshot" that followed, six current PhD candidates shared their experiences working in such a close-knit department, including Alex Lupsasca, who explained that the camaraderie between members is as important as the excitement of research.

"The reason I'm really happy here is that we're living in a time of great discovery," he said. "But it's more fun to do that when you're living with a great community."

After a luncheon hosted by Professor Franklin and GSAS Dean Xiao-Li Meng, attendees settled into the Science Center for two talks highlighting ongoing theoretical and experimental efforts, which illustrated how boundaries between disciplines have diminished to allow for greater collaboration. Theoretical physicists shared research on dark matter, high-temperature superconductivity, string theory, and physical biology, while on the experimental side, panelists considered quantum computing, cosmic inflation, and what comes after the Higgs Boson discovery. During a break, participants engaged with PhD candidates at a poster session, where students described their findings regarding black hole entropy, the search for exoplanets, cosmic microwave background radiation, and more.

Before adjourning for a dean's reception back at the Jefferson Lab, Professor Franklin enthusiastically summarized the day. "Physics is amazing!" she said. "It's beautiful! It's bountiful! When you read about these gravitational waves from the Big Bang, didn't your knees buckle? So here's to physics. I love it! You love it!"

Clockwise from  
top left: Bertrand  
Halperin, Vinodhan  
Manoharan, Markus  
Greiner, Melissa  
Franklin, Lisa Randall

363





WRITER  
Ann Hall

PHOTOGRAPHERS  
Neal Hamberg and  
Bethany Versoy

Waking to a perfect summer morning, the 2014 doctoral and master's candidates joined GSAS Dean Xiao-Li Meng and Administrative Dean Margot Gill for breakfast on the Gropius Lawns in preparation for one of Cambridge's most festive parades—the traditional march down Oxford Street to Harvard Yard for Commencement, led by bagpipers in Highland dress. Once settled in Tercentenary Theatre, students were surprised to learn that Aretha Franklin, Queen of Soul and recipient of an Honorary Doctor of Arts degree, would sing the National Anthem as the Morning Exercises began.

During the Diploma Awarding Ceremony at Sanders Theatre, graduates received their diplomas on a stage packed with faculty members, watched by family who filled the balcony, all eager to share their crowning achievement: a degree from the Graduate School of Arts and Sciences presented by Dean Meng and Faculty of Arts and Sciences Dean Michael Smith. Having “devoted themselves to the rigorous pursuit of advanced study, attained high distinction, and made original contributions to knowledge in their several fields of scholarship,” as Dean Meng noted during the Morning Exercises, these women and men of learning exited the stage, welcomed into the ancient and universal company of scholars.





# Noted



## Anthropology

**PAUL GELLES, PhD '90**, has published *Chumash Renaissance: Indian Casinos, Education, and Cultural Politics in Rural California* (CreateSpace, 2013). In the book, Gelles offers an in-depth look at the Santa Ynez Chumash tribe, chronicling the political and cultural effects of colonization on the growing California community. Challenging common stereotypes made about the tribe, Gelles explains how the Chumash have been able to overcome suppression and marginalization to seize control over their patrimony and heritage. Gelles is a former professor of anthropology at the University of California and currently teaches at Midland School in Los Olivos, California.

## Astronomy

**JIM HERRNSTEIN, AB '86, PhD '97**, and **ROBIN MCGARY HERRNSTEIN, PhD '03**, have initiated new programs in research and health care delivery to save lives and break cycles of poverty and disease in rural Madagascar. Along with

Dr. Matthew Bonds (Department of Global Health and Social Medicine, Harvard Medical School) and Dr. Michael Rich (Division of Global Health Equity, Brigham and Women's Hospital) they founded PIVOT, a Boston-based non-governmental organization dedicated to universal access to quality health care for the poor. PIVOT is being incubated by global health giant, Partners in Health. In addition, the Herrnstains recently donated \$3 million to establish a Global Health Institute at Stony Brook University. Both PIVOT and the new institute will work in close collaboration with Stony Brook University's Centre ValBio research station based in Ranomafana National Park, Madagascar.

## Comparative Literature

**STEVEN F. WALKER, PhD '73**, has published the book *Midlife Transformation in Literature and Film: Jungian and Eriksonian Perspectives* (Routledge, 2012), a consideration of the growth and renewal that takes place at midlife. The theme of midlife transformation shows up in some expected places (the *Odyssey*, *Antony and Cleopatra*, Fellini's film, *8 1/2*), and in some rather unexpected ones (*Mrs. Dallo-way*, *Beloved*, Jane Campion's film, *The Piano*). Walker began researching the topic

as he approached midlife, but began writing about it much later. He is professor of comparative literature at Rutgers University.

## Economics

Economist **MATTHEW GENTZKOW, AB '96, PhD '04**, has won the 2014 John Bates Clark Medal, an annual prize given to an American economist under the age of 40 judged to have made the most significant contribution to economic thought and knowledge. Gentzkow's groundbreaking work uses economic methods to study and analyze the effects of media and the Internet on society while also considering the origins of sociopolitical biases in newspapers and other publications. Gentzkow is Richard O. Ryan Professor of Economics and Neubauer Family Faculty Fellow at the University of Chicago Booth School of Business.

## English

**JOHN N. WALL, PhD '73**, and **DAVID HILL, MARCH '02**, have completed a digital humanities project that recreates the sights and sounds of Paul's Churchyard outside St. Paul's Cathedral in London in the early 17th century. The project, funded by a grant from the National Endowment for the Humanities, uses digital modeling software to integrate into a single visual and acoustic display a wide range of information about the look and sound of early modern London before it was destroyed by the Great Fire of London in 1666. Visitors to the project's website ([vpcp.chass.ncsu.edu](http://vpcp.chass.ncsu.edu)) can tour a visual model



of Paul's Churchyard while listening to John Donne's sermon for November 5th, 1622, accompanied by ambient sounds of bells, birds, horses, dogs, and members of the congregation gathered at Paul's Cross to hear Donne's sermon.

**MARGARET ATWOOD, AM '62, LTD '04**, was awarded the 2014 Harvard Arts Medal at a ceremony in Sanders Theatre on May 1st. Following the official presentation of the award by Harvard University President Drew Gilpin Faust, actor John Lithgow, AB '67, led a discussion with the renowned author, poet, and environmental activist. Atwood is the author of over 40 books of fiction, poetry, and critical essays. Her most recent work is *MaddAddam* (Nan A. Talese, 2013), the third installment of a trilogy of fiction including the works *The Year of the Flood* (Nan A. Talese, 2009), and *Oryx and Crake* (Nan A. Talese, 2003).

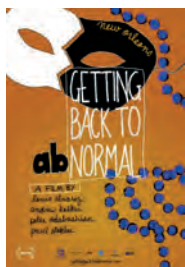
## Government

**ALEXANDRA SAMUEL, PhD '04**, is vice president of social media at research technology provider Vision Critical and author of the *Work Smarter with Social Media* series for Harvard Business Review Press. Her writing, speaking, and research focus on how people and organizations can work smarter and live better by making effective use of





social media. Before joining Vision Critical, Samuel was director of the Social and Interactive Media Centre at Emily Carr University of Art and Design, where she worked on applied research challenges with British Columbia-based companies. As the founder and principal with Social Signal, one of the world's first social media agencies, she has shaped the online strategy for a wide range of projects, including Tyze, Change Everything, and NetSquared.



**PAUL STEKLER, PHD '83**, is co-director and co-producer of *Getting Back to Abnormal*, a documentary film about race and politics in a post-Katrina New Orleans, set to air as part of the 27th season of the *Point of View* (POV) series on PBS. An official selection of the 2013 SXSW Film Festival, *Getting Back to Abnormal* follows Stacy Head, a white woman heading a re-election campaign for a city council seat traditionally held by a black representative. The work is one of many award-winning films produced by Stekler, including *George Wallace: Settin' the Woods on Fire* (2001), *Last Man Standing: Politics Texas Style* (2004), and *Frontline's* "The Choice 2008" (2008). He is currently professor of public affairs and chair of the Radio-Televi-

sion-Film Department at the University of Texas at Austin.

### Medical Sciences

Scientist **GÖKHAN S. HOTAMISLIGIL, PHD '94**, is the recipient of the Danone International Prize for Nutrition for his research in immunology and metabolic diseases. Known for pioneering the field of immunometabolism, Hotamisliligil's work has led to findings relating to the causes of obesity, diabetes, and atherosclerosis. He is specifically interested in the study of regulatory pathways and their interaction with immune and stress responses. Hotamisliligil is James Stevens Simmons Professor of Genetics and Metabolism and chair of the Department of Genetics and Complex Diseases at Harvard.

For his "outstanding contributions to neurogenetics and medicine," **GUY ROULEAU, PHD '89**, has been awarded the Prix d'excellence 2014 by the Collège des médecins du Québec. Focused on neurological and psychiatric diseases such as ALS, epilepsy, spastic paraplegia, autism, and schizophrenia, Rouleau's research seeks to identify the genetic basis for such diseases, pinpointing the genes that may be at fault. Rouleau is director of the Montreal Neurological Institute and Hospital, and holds the Wilder Penfield Chair in Neuroscience as professor of neurology and neurosurgery at McGill University.

### Physics

For his innovative work on the localization of light and the invention and develop-

ment of what are known as new photonic band gap (PBG) materials, **SAJEEV JOHN, PHD '84**, has been awarded one of five 2014 Killam Prizes. Intended to recognize outstanding career achievement by scholars actively engaged in research, the Killam Prize is widely known as one of Canada's most prestigious scholarly awards. John's work on the localization of light has the potential to pave the way for photonic computers with laser light technology in place of standard electric currents, resulting in faster, more affordable computing tools. John first developed his theories in his PhD thesis at Harvard. He is now professor of physics at the University of Toronto.

### Psychology

**DEBORAH FISH RAGIN, PHD '85**, has published the 2nd edition of *Health Psychology: An Interdisciplinary Approach to Health* (Pearson/Prentice Hall, 2014), a text that endorses the use of the social ecological model, offering a uniquely interdisciplinary approach to the study of health. The book focuses on five primary factors of health outcomes: the individual, the community, physical and social environments, health care systems, and health policy. It includes research and findings from the fields of medical anthropology, economics, ethnopharmacology, environmental studies, medicine, and public health, in addition to biology, psychology, and sociology. Ragin is professor of psychology at Monclair State University.

### Romance Languages and Literatures

**NORMAN SHAPIRO, AB '51, PHD '58**, has been named distinguished literary translator at Wesleyan University, where he teaches courses in French theater, poetry, Black Francophone literature, and literary translation. He is widely recognized as a leading translator of French and has published numerous works of poetry, fiction, and drama. His book, *The Complete Fables of Jean de la Fontaine* (University of Illinois Press, 2007), won him the American Translators Association's Lewis Galantière Award. He is a member of the Academy of American Poets and an Officier de l'Ordre des Arts et des Lettres de la République Française.

### Sociology

**BARRY WELLMAN, PHD '70**, is a 2014 Canadian Digital Media Pioneer Award winner. Established in 2011, the prize is given annually to Canadians "who have made significant contributions to the advancement of digital media." A longtime scholar of social networks both digital and otherwise, Wellman has been a key player in research efforts to recognize and comprehend the impacts of information technology and digital communications on human social interaction. Wellman is S.D. Clark Professor at the University of Toronto, where he directs the NetLab, an interdisciplinary scholarly network studying the intersection of social, communication, and computer networks. ☺



## YOUR HARVARD VISITS NEW YORK CITY

Harvard alumni gathered at the Intrepid Sea, Air & Space Museum for “Your Harvard,” a new series of events bringing together Harvard alumni, parents, and friends around the world. Featuring remarks from President Drew Gilpin Faust, the event included an engaging discussion between GSAS graduate and Harvard professor Sendhil Mullainathan, PhD ’98, and other Harvard faculty members, titled “Decisions, Decisions, Decisions.” Their conversation explored what shapes our behavior, how influences and biases affect our decision making, and what this means for leading change, shaping policy, and addressing pressing societal challenges.

Sendhil Mullainathan, PhD ’98 (middle), in conversation with Cass R. Sunstein, AB ’75, JD ’78, and Chrystia Freeland, AB ’90.

# finding the right fit

## Investigating Nonacademic Careers

For students curious about work outside academia, the Office of Career Services and the GSAS Office of Alumni Relations were proud to co-sponsor “Leveraging Your PhD in the Workplace,” an annual program in which GSAS alumni are invited back to campus to share insights on the nonacademic career path. This successful event delved into the process behind a successful job search and highlighted several alternative professions, including entrepreneurial and consulting opportunities.

Organized around two panel discussions, the gathering enabled current GSAS students to hear both from peers ready to begin new jobs soon after Commencement and from PhDs with years of experience in nonacademic settings. Their advice underscored the importance of connecting

early (and often!) with Harvard’s Office of Career Services. The panelists also provided suggestions for how to gain experience that could help secure a position beyond the academic realm, like enrolling in Harvard Business School’s Mini-MBA Program or finding the time to take on an internship. Those in the audience asked important questions about how to manage academic commitments with other work when planning for a future career. At a networking reception that followed, participants had the chance to connect one-on-one with the speakers.

During January@GSAS, the Graduate School Alumni Associate Council cosponsors several career events that introduce graduate students to careers in finance, consulting, non-profit and government agencies, and entrepreneurship.



Noël Bisson, Harvard’s associate dean of undergraduate education, explains how she moved from academia to academic administration.

## THE DAVIS CENTER @ 65

The Davis Center is planning a reunion in celebration of its 65th anniversary on Friday, October 24, and Saturday, October 25, 2014. A reception and dinner at the Harvard Faculty Club on Friday evening will be followed by engaging panels and conversation with professors, alumni, and special guests on Saturday. For more information, visit the center’s website at [daviscenter.fas.harvard.edu](http://daviscenter.fas.harvard.edu).





# Clear and Compelling Communication

## Helping graduate students share their work

For Stephen Blyth, PhD '92, successful graduate work is not measured by how few people understand it. "It is so important to be able to communicate one's ideas in a clear and compelling way," says Blyth, a professor of the practice in statistics and managing director and head of public markets at Harvard Management Company (HMC). "You need to be able to distill key features of your research to a broader audience."

This is why he is happy to be able to support Harvard Horizons through a gift to a dean's innovation fund for the Graduate School of Arts and Sciences (GSAS) and witness, for the second year in a row, eight young scholars present their doctoral research in compelling, five-minute presentations.

Blyth is pleased to see how the experience fostered camaraderie among the participants. Memories of his own graduate community are one of the reasons he gives today. While a student of statistics, he became friends with fellow classmate Xiao-Li Meng, PhD '90, and collaborated with him on a research article. "I like to point out that it is my most cited paper and now, as prolific as Xiao-Li is, one of his least cited papers," he says.

While at Harvard, Blyth served as a resident tutor in Winthrop House, playing on intramural teams and relishing the intellectual energy he found in both his peers and the undergraduates in the House. After graduating, Blyth went on to a career in finance, serving as a managing director for Morgan Stanley and Deutsche Bank. When he returned to Harvard in 2006 to take a senior role at HMC, he was in touch with Meng, who asked him to join the faculty of the Department of Statistics.

Blyth signed on to teach classes in applied quantitative finance, having admired Meng's approach to graduate education in the department. "He really stresses the importance of teaching complex and subtle concepts in accessible ways," Blyth says.

When Meng became dean of the Graduate School of Arts and Sciences, Blyth wanted to find a way to support his vision. "I like being able to give back in a meaningful way," he says.

"I can see Harvard from many different angles—I've been student, staff, and faculty here," says Blyth. "It only reinforces that Harvard is a great institution to support and I have the privilege of seeing the impact in the classroom."



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A bagpiper keeps time  
while calling gradu-  
ates to join the Com-  
mencement parade.  
*Photograph by Neal  
Hamberg*