

# Colloquy

HARVARD UNIVERSITY | The Graduate School of Arts and Sciences



What's  
the  
**BUZZ?**

Bees, behavior & pollination  
*p.12*



**12** **What's the Buzz?  
Bees, Behavior, and Pollination**

ONE GRADUATE STUDENT'S INVESTIGATION INTO  
BUMBLEBEE BEHAVIOR

**20** **The 2016 Centennial Medalists**

HONORING FRANCIS FUKUYAMA, DAVID MUMFORD,  
JOHN O'MALLEY, AND CECILIA ROUSE

**22** **Intellectual Assembly**

ALUMNI DAY 2016

**24** **One Day in May**

COMMENCEMENT 2016

# Colloquy

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

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Cover Image: Patrick Hruby

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# Colloquy

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*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).

**Moving?** Please e-mail your new address to [aro@harvard.edu](mailto:aro@harvard.edu) or send your *Colloquy* mailing label and your new address to Alumni Records, 124 Mount Auburn Street, 4th Floor, Cambridge, MA 02138-3654.

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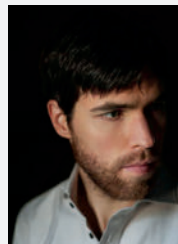
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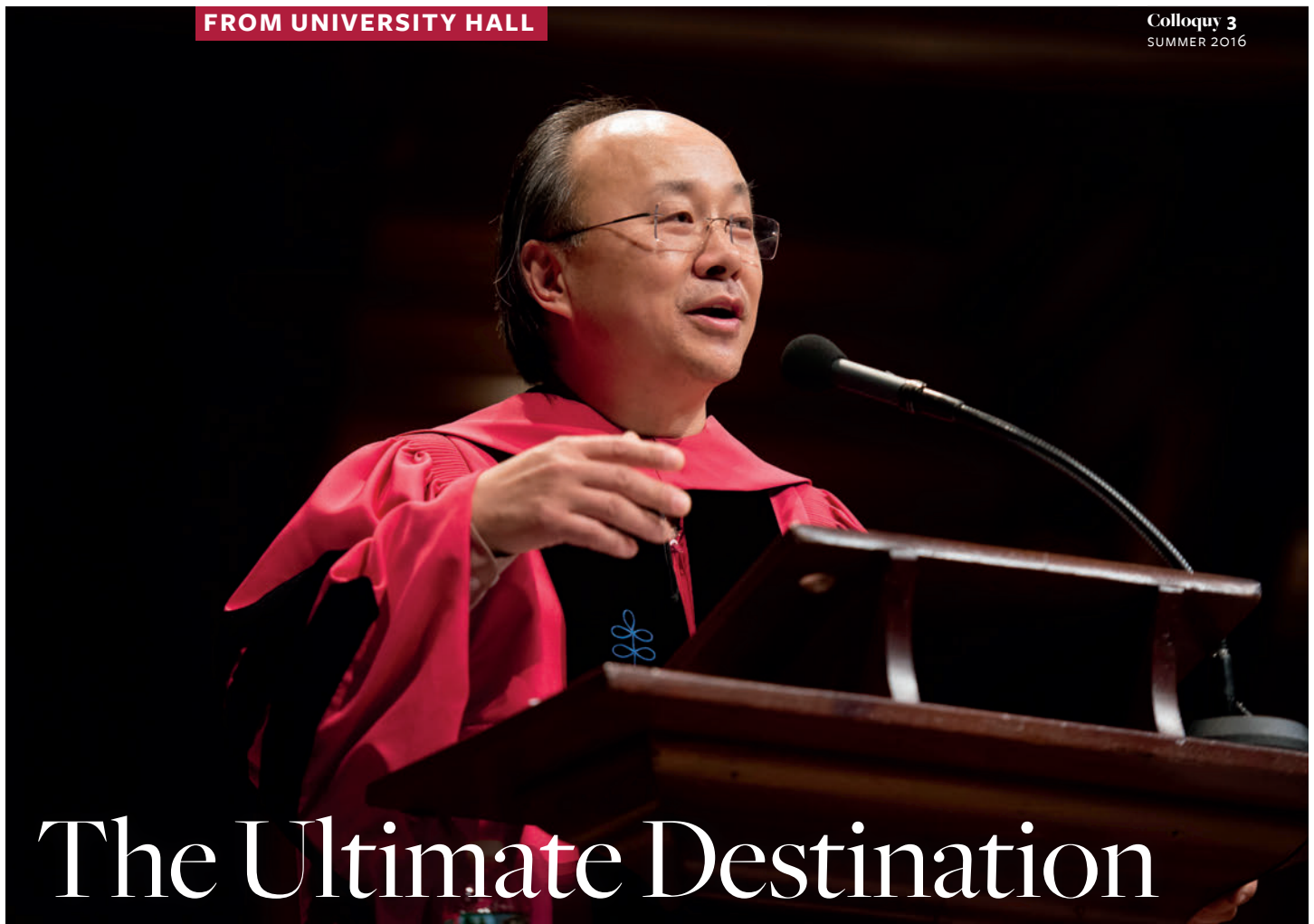


**Andrea L. Volpe**, who interviewed Colleen Cavanaugh for Q&A, is a Cambridge writer who covers ideas, culture, the arts, and technology. Her work has appeared in *The New York Times*, *The Awl*, and *Cognoscenti*, among others.



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# The Ultimate Destination

As a GSAS alumnus, I remember the day when I walked across the stage in Sanders Theatre to accept my diploma. It was an exciting day, the day I took my first steps toward an academic career that led me back to Harvard and to the GSAS deanship (though neither was expected at the time).

I know that becoming an academic is only one of many possible career paths for GSAS alumni. Some choose positions in government or nonprofits. Others join the corporate world or start their own companies. Regardless of your ultimate destination, it is the critical thinking and effective communications skills that you acquired as a GSAS student that can help you succeed at what you do now.

Harvard's strength comes from the strength of its alumni, and you represent a tremendous resource for the GSAS students currently navigating their graduate studies. We work hard to ensure that our students can benefit from connecting with alumni and tap into this rich source of information. For example, in recent years, GSAS has greatly increased its support of departmental initiatives that bring students together with our alumni—an effort made possible by alumni.

Indeed, GSAS's long tradition of developing programs to ensure our students are set up for success after graduation came about thanks to the support and generosity of our alumni population. During January@GSAS, alumni volunteer their time to lead a business applications workshop, where students learn about exciting and successful careers beyond academia. Our English Language Program (ELP),

**Regardless of your ultimate destination, it is the critical thinking and effective communication skills that you developed as a GSAS student that can help you succeed at what you do.**

which introduces international students to life at Harvard while they activate their English speaking skills, is made possible thanks to the generosity of two dedicated members of the Graduate School Alumni Association Council. I, for one, benefited directly from English language support when I entered GSAS exactly 30 years ago, and, therefore, I am personally motivated to ensure that current and future students will continue to benefit from ELP and other programs.

More programs are being planned. The Alumni Council has formed a working group to discuss bridge programs designed to connect students with alumni, recent alumni with long-term ones, and alumni with faculty. The overarching goal is to build a stronger global GSAS community that can benefit all, especially those who are still deciding on their ultimate destination. Any support and contribution you can provide for this endeavor will be highly appreciated by all of us at GSAS, and by our current and future students.

If you are one of the graduates who received your diploma this May, congratulations and welcome to the Graduate School Alumni Association! You can relive the day in our Commencement article on page 24.

# HARVARD HORIZONS

Harvard Horizons features the outstanding work accomplished by GSAS graduate students and provides them with an opportunity for additional mentoring and training in presenting their work to a broad audience. A key criterion for being chosen as a Harvard Horizons Scholar is the quality of a student's research, not their presentation skills—indeed, the program demonstrates that effective communications skills may be learned and that improving them is a critical component of professional development.

During the April 2016 Harvard Horizons Symposium, eight Scholars delivered talks about their research, which ranged from politics to music to seismology.

To learn more about Harvard Horizons and to view videos of past symposia, visit [gsas.harvard.edu/harvardhorizons](http://gsas.harvard.edu/harvardhorizons).



## 1 Ashley Anderson

*Government*

“Regimes perpetuate themselves in other, more subtle ways. They quiet people by including them, so while these regimes might look democratic on the outside, in reality that isn’t always the case.”

## 2 Carolina Salguero

*Molecular and Cellular Biology*

Salguero’s work combines biochemistry with structural biology to understand the three-dimensional part of the SARS virus that acts like a switch to control the production of viral particles, which could be the key to nipping a virus like SARS, and eventually HIV, in the bud.

## 3 Henry Bowles

*Comparative Literature*

“I’m concerned with what unites us as human beings despite ostensible differences in time and space.”

## 4 Phoebe DeVries

*Earth and Planetary Sciences*

DeVries’ work looks specifically at the earthquakes that occurred along the North Anatolian Fault (NAF) in Turkey between the years of 1939 and 1999. “It’s a remarkably linear sequence of earthquakes.”

## 5 Ariel White

*Government*

“There’s a prevailing sense that the people who are incarcerated are inherently different from those who don’t, and this is what accounts for their different voting behavior.”

## 6 Charisse Barron

*African and African American Studies*

“There came a moment when artists suddenly had permission to interact with and draw from popular culture in ways that had formerly been strongly discouraged.”

## 7 Chen Liu

*East Asian Languages and Civilizations*

“The jottling culture of 12th-century China shows that literature has no boundaries.”

## 8 Thomas Wisniewski

*Comparative Literature*

“Attention to rhythm, is attention to beauty.”



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WRITER  
Ann Hall

PHOTOGRAPHER  
Ben Gebo

Colloquy 5  
SUMMER 2016

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A portrait of Joseph Newhouse, an older man with glasses, wearing a dark pinstriped suit jacket, a blue and white striped shirt, and a red tie with a dark pattern. He is looking directly at the camera with a slight smile.

## Health Policy turns 25

When Joseph Newhouse, PhD '69, returned to Harvard in 1988 after a 20-year research career in health policy at the RAND Corporation, he was determined to establish an interdisciplinary PhD program in the subject. Within three years, he had devised one and had it approved by the FAS faculty that reached across the boundaries of four different schools—GSAS, the Harvard T. H. Chan School of Public Health, Harvard Medical School, and Harvard Kennedy School—focused on equipping students with the analytical skills needed to conduct research and analysis on the diverse and challenging questions that stimulate the health policy debate. Over its 25-year history, the Harvard PhD Program in Health Policy has graduated nearly 200 students and grown to include Harvard Business School and Harvard Law School.

As Newhouse steps down as chair later this year, the program hosted a celebration on June 26 to mark his contributions and its 25th anniversary. A graduate aid fund, supported by alumni donations, is being established in his honor. “Seeing this program take hold and its graduates flourish in their careers has been one of the most gratifying accomplishments of my professional career,” he says. ☐



Don van Deventer, PhD '77, and Mia de Kuijper, PhD '83, at the Centennial Medalist luncheon.




## NEW CHAIR OF ALUMNI COUNCIL ANNOUNCED

### Mia de Kuijper, PhD '83, takes helm of GSAS advisory group

On July 1, Mia de Kuijper took on the role of chair of the Graduate School Alumni Association Council. De Kuijper, who earned her PhD in economics in 1983, is the founder and CEO of Cambridge Partners, a global corporate strategy advisory firm. “Mia is well accomplished professionally and a very active volunteer,” says GSAS Dean Xiao-Li Meng. “She brings a global perspective to the Alumni Council having worked extensively in Latin America, Asia, Europe, and the US.”

In addition to serving as program faculty of the London School of Economics and as a fellow of Churchill College at Cambridge University, de Kuijper has held senior positions with Royal Dutch Shell, AT&T, and PepsiCo, where she played a leading role in the establishment of Pepsi-Cola in China, India, and Brazil. Over the years, she has dedicated much of her time to helping GSAS students, hosting courses through the Office of Career Services and organizing alumni-led January@GSAS workshops. She recently spent two years as an expert-in-residence at Harvard’s i-Lab, where she provided valuable advice to Harvard student entrepreneurs.

De Kuijper succeeds Don van Deventer, PhD '77, business economics. “Don’s guidance and insight have been invaluablely helpful to me as dean,” says Meng. “I look forward to his continued involvement with Council and support of the Graduate School of Arts and Sciences.”

The Graduate School Alumni Association Council is the governing body for the Association and is made up of 42 GSAS alumni/ae who share a strong commitment to Harvard and to graduate education. 

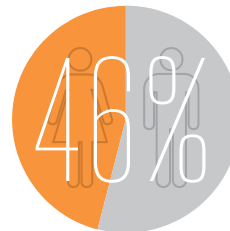
TONY RINALDO

## GSAS BY THE NUMBERS

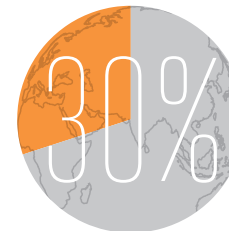
A diverse group of students will join GSAS in the fall, chosen from 12,353 applications.



of applicants accepted



are women



are from outside the US

## WORLD CLASS



GSAS students come from all over the world, and the 2016 graduating class is no exception. Our 357 international PhD students at Commencement represented 35 international countries. Here are their top 14 countries of origin for this year’s PhD graduates.

1. The People’s Republic of China 24
2. The Republic of Korea 12
3. Germany 7
4. Canada 6
5. Singapore 6
6. India 5
7. Romania 4
8. Turkey 4
9. United Kingdom 4
10. France 3
11. Italy 3
12. Japan 3
13. Taiwan, Province of China 3
14. Thailand 3

# Colleen Cavanaugh

**A path-breaking biologist whose imaginative research has transformed how we understand the microbial foundations of symbioses and whose discoveries have contributed new insights into evolution at the organism to genome level.**

Colleen M. Cavanaugh's ground-breaking work explaining the biochemistry of symbiosis between giant tube worms living amidst hydrothermal vents deep on the ocean floor and the one-celled bacteria that live inside them transformed how scientists understood the symbiotic role that bacteria play in chemosynthesis. Her research illuminates the microbial dimensions of symbioses and also has important evolutionary implications. Cavanaugh's work demonstrates that, like chloroplasts in plant cells, which evolved from free-living bacteria, chemosynthetic bacteria produce food for their animal hosts by using sulfur compounds instead of sunlight as an energy source. Her current research focuses on symbiont transmission strategies—how symbiotic partnerships are maintained generation to generation, and the effects on genome evolution, which provide new clues for understanding how hosts and symbionts co-evolve.

Cavanaugh received her BGS in biology from the University of Michigan before earning a PhD in organismic and evolutionary biology from Harvard in 1985. Cavanaugh is Edward C. Jeffrey Professor of Biology in the Department of Organismic and Evolutionary Biology and co-director of the Microbial Sciences Initiative at Harvard. She is a fellow of the American Association for the Advancement of Science and the American Academy of Microbiology and an adjunct Senior Scientist at the Bay Paul Center of the Marine Biological Laboratory in Woods Hole, Massachusetts.

## What drew you to science?

I knew from a young age I was interested in science. For many people who go into biology research one of the main entryways is fieldwork—and that's how it was for me. As an undergraduate at the University of Michigan, I took a course on marine ecology, followed by a six-week, U of M-sponsored course in Woods Hole, Massachusetts, that also tapped into scientists at the Marine Biological Laboratory (MBL) and the Woods Hole Oceanographic Institution (WHOI). We had two weeks of lecture, followed by four weeks to design and execute a research project, write it up, and present it. At Michigan I had written a paper on *Limulus*—horseshoe crabs. I had learned that they mate on the full moon—what biologists call lunar periodicity, so I decided to test this out. It didn't go exactly like the existing scientific

literature said it would. I searched beach after beach on the full moon, never finding them, until I finally met a fisherman/invertebrate zoologist, who told me “when the lilacs bloom, the *Limulus* spawn.” It turned out to have as much to do with temperature as with tides. Eventually, I did find them; I did counts throughout many a cold May night. Coming up with the project—figuring out how to collect the data, getting the data, then analyzing it—that was incredible. That's when I saw firsthand that there were things that were not known in science. And that's when I fell in love with research and with Woods Hole.

## What brought you to Harvard?

A pure love of bacteria. I wanted to learn more about what bacteria were doing in the “real” world—outside the lab, that is. At the MBL I worked with

## Q+A ID

NAME:

Colleen Cavanaugh  
PhD '85

FIELD OF STUDY:

Biology

TODAY:

Edward C. Jeffrey  
Professor of Biology and  
Co-Director of the Microbial Sciences Initiative

John Hobbie, an aquatic ecologist, who was devising novel ways of studying bacteria in natural samples and this opened up new ways of studying them. At Michigan, I had focused on ecology and that became important to my studies of bacteria as well. Everything is a habitat for bacteria, whether it's water, soil, sediment, or other organisms, including humans. At Harvard, I had advisors in both fields. James J. McCarthy, who is now my colleague, and who co-chaired the Nobel Peace Prize-winning Intergovernmental Panel on Climate Change, is a biological oceanographer, and Ken Sebens, now at the University of Washington, is a community ecologist.

**Intellectually, there's a bit of serendipity in how you acquired the various different research experiences that turned out to play a formative**



**role in your thinking about chemosynthesis and symbiosis.**

At the time, my decision to study any particular topic or question never felt like a conscious decision. Many of my first research experiences came from working on various projects in Woods Hole prior to graduate school. My initial introduction to microbial processes was working as a research assistant at the MBL's Ecosystem Center, helping with experiments on an oil spill in the Cape Cod Canal. Then I worked with Hobbie, who made important advances in how we can see, and therefore, count bacteria using fluorescence microscopy. It turns out we underestimated—by orders of magnitude—how many bacteria were in water, in sediment, and in soil. And this sense of scale opened up a new window onto the entire field of microbial ecology. I was also interested in nutrient cycling, the constant, fundamental cycling of elements in biological systems, in my case, ocean and coastal systems.

Then, in my first year of graduate school I took a course called “Nature and Regulation of Marine Ecosystems,” taught by my advisors and Ruth Turner, a pioneering deep-sea marine biologist. We learned to read scientific papers critically; the deep-sea hydrothermal vents had been recently discovered, and there were a series of talks on them. Turner started off with the ecology of animal communities, and Holger Jannasch, from WHOI, talked about chemosynthetic bacteria as the base of the food chain. Finally, Meredith Jones, curator of worms at the Smithsonian, described the giant, red-plumed tubeworm. The question was how were they eating, since they are mouthless and gutless. He mentioned the presence of sulfur crystals in their tissue. This was a clue for me—when I was at Woods Hole they were working on the sulfur cycle, and sulfur is an energy source for chemosynthesis. So I raised my hand and said, “It’s perfectly clear—they must have chemosynthetic sulfur-oxidizing bacteria as symbionts inside their tissues.”

Then I convinced him to send me some tissue samples. And I started to try to prove that there were bacteria in them.

**This hypothesis, that bacteria living inside giant tubeworms were the symbiotic mechanism for chemosynthesis, was at first met with skepticism. You had to work very hard to do the science to prove it. How did that experience shape the way you approached your subsequent research?**

When I started this research I had yet to take a microbiology course, so I had to learn on my feet and figure out what I needed to learn. Three things stayed with me. The first I learned from Jannasch, who was the expert on vent microbiology. He was skeptical and put me through my paces—but gave me just enough encouragement to keep me going. His skepticism taught me to be critical and rigorous in my analysis and to always include controls in my experiments, both positive and negative. The other legacy of that experience reflects my natural temperament: I was determined, thorough, and wanted to learn from the foundation up. I went and talked to everybody I could—I was and am a sponge when it comes to knowledge. In my own research, with my students, and postdocs, I’m a bit of a “control” freak. In microbial ecology, we work with organisms that are abundant in the environment, yet invisible to the naked eye, so it’s especially crucial to be extremely rigorous in experimental design. Moreover, it’s essential to have a thorough understanding of your field, investigate that subject to the utmost, and simultaneously, be in the lab trying things.

**How did your own experience as a graduate student at Harvard shape how you teach your own students?**

I want my students to understand that not everything is known. In all of the courses I’ve taught, and that includes my freshman seminar on the biology of symbiosis, I always have a research

paper component. It’s important that students learn there are many questions left to ask. When students read a scientific paper, I want them to think like they are a part of the lab group that wrote it and then I ask them, “What would you do next, and why is that important?” “What’s next?” is always the question.

**"I want my students to understand that not everything is known."**

**What’s next?**

I’m interested in co-evolution, the relationship of bacteria and animals, and how symbiosis evolves over time: initially, you have two or more completely different organisms, somehow they get into proximity with each other, there may be an initial conflict, but somehow they reach détente, and form stable relationships—that benefit at least one of the partners. Recently, we have been studying transmission strategies: once established, it’s important in evolutionary terms to maintain a stable symbiosis over generations. But how does that work? In symbiosis, bacteria are transmitted vertically, from mother to offspring, or horizontally, when the host acquires the symbionts from the environment or a contemporary. By sequencing entire genomes of symbiont populations, we have identified mixed methods of transmission, which have implications for genome evolution. In translational terms, these findings will help us analyze and track the biogeographical distributions of pathogens, whether they are traveling as free-living microbes or conveyed by a host. This research continues to expand our understanding of the full range of symbioses. More broadly, everything in the field of microbial symbioses, suggests that such relationships, ranging from mutualistic to parasitic associations, are far more prevalent than currently recognized. ♡

# Shelf Life



In the early 20th century, architectural obsolescence seemed almost a natural law—as **DANIEL ABRAMSON** (PhD '93, fine arts) recounts in ***Obsolescence: An Architectural History*** (University of Chicago Press, 2016). In 1911, one authority pronounced that hotels had a lifespan of 15 to 18 years; office buildings, 25 to 33 years. In Chicago, office buildings razed between 1902 and 1932 were 46 to just 15 years old. It was a heady time for architects and builders. But pushback came via the Great Depression, which burst the speculative bubble, and—in the 1960s and '70s—challenges from historic preservationists, an emphasis on sustainable use, and even, Abramson argues, “concrete brutality,” whose monumental structures challenged anyone even to whisper, “Tear-down.”



***Elephant House*** (Pennsylvania State University Press, 2015) features Dick Blau's photographs and an essay by **NIGEL ROTHFELS** (PhD '94, history) documenting elephants and keepers at Portland's Oregon Zoo. This zoo has had remarkable success with elephants, including an unprecedented 15 elephant births between 1962 and 1975. Rothfels locates the zoo within the context of late-19th-century upper-class cultural sponsorship (alongside symphony orchestras, ballets, and museums) and changing principles of zoo design, from simple caged menageries to expansive outdoor environments. Elephant House studies a 1950s-era facility (replaced in December 2015 by a state-of-the-art habitat). Regardless of where they lived, one senses the bonds between keepers and elephants and the attentive care provided to the animals.



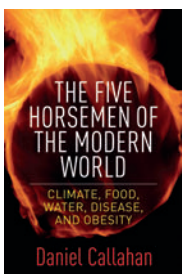
In ***Same Bird: Poems, New and Selected*** (Moon Pie Press, 2016), **DAVID McCANN** (PhD '76, East Asian languages and civilizations) offers a clear poetic vision distinguished by its eloquence, simplicity, and deep resonances. Many of McCann's poems focus on in-between or liminal planes. Beaches—the meeting point for water and land, crustaceans and shorebirds—are one favored subject. And selections like “Blue Ink” and “Post Surgical” plumb the borderlands of life and death. But McCann takes particular inspiration from cultural displacements. Drawing on his experiences in East Asia, he crafts Japanese-style haiku and selections inspired by the Korean sijo form. His writing, precise and immediate, brings to mind Zen calligraphy or Picasso's ink drawings.

Our image of premodern China—from Great Wall to Forbidden City—highlights its homogeneity and inwardness. **NANCY SHATZMAN STEINHARDT** (PhD '81, fine arts) emphasizes instead a multicultural China, dating at least to the Song (960–1279) and Yuan (1271–1368) dynasties. In ***China's Early Mosques*** (Edinburgh University Press, 2015), she outlines the rise of Islam in China through its mosques, cemeteries, and stone inscriptions in Arabic and Persian. Color photographs, diagrams, and floor-plans help illustrate her architectural analysis. She also notes that Muslims played key roles in the imperial court and Muslim astronomers established China's first observatories. Moreover, port cities like Quanzhou had vibrant enclaves not only of Muslims but of “Christians, Hindus, Manichaeans, [and] Buddhists.”

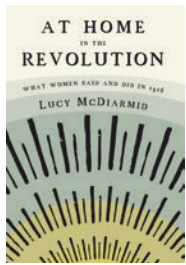


***The Five Horsemen of the Modern World: Climate, Food, Water, Disease, and Obesity*** (Columbia University Press, 2016) attempts a comprehensive analysis of the main threats to global survival. **DANIEL CALLAHAN** (PhD '65, philosophy) also catalogues the impediments to addressing those threats, including political inertia, corporate opposition, faith in technological quick-fixes, and Garrett Hardin's notion of the “tragedy of the commons”—that profit-maximizing individuals won't preserve common resources (like the atmosphere or water supplies). Callahan recommends a multi-pronged approach as the most promising way of addressing these problems, combining broad-based social movements, political action, and some corporate support. However, he worries that nothing but a major disaster (like the Great Depression) will move us to action.

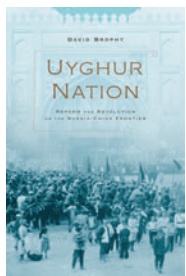
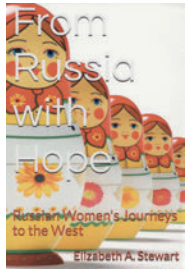
There's a particular pleasure in the well-told anecdote. But in historical scholarship, “well-told” also involves finding the larger meaning of the individual episode. At this, **LUCY McDIARMID** (PhD '72, English and American literature and language) clearly excels. ***At Home in the Revolution: What Women Said and Did in 1916*** (Royal Irish Academy, 2015) recounts the personal experiences of Irish women—mostly Republicans but also some who were apolitical or Unionist—to show the divergent effects of the Easter Rising on gender roles. She opens memorably with a Republican officer rebuffing 20-year-old Catherine Byrne's attempt to join his forces occupying Dublin's General Post Office: Byrne circled the building, smashed a window, and climbed in anyway.



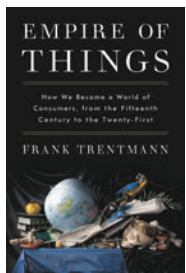
Alumni authors: Would you like your book (general interest, published within the past year) considered for inclusion? Send it to *Colloquy*, Harvard Graduate School of Arts and Sciences, Suite 350, 1350 Massachusetts Avenue, Cambridge, MA 02138. Questions? E-mail [gsaa@fas.harvard.edu](mailto:gsaa@fas.harvard.edu).



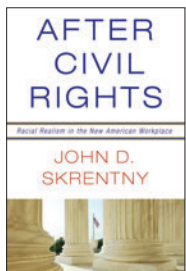
In *From Russia with Hope: Russian Women's Journeys to the West* (CreateSpace Independent Publishing Platform, 2015), **ELIZABETH STEWART** (AM '66, regional studies–USSR) interviews 21 Russian women who immigrated to the United Kingdom. Some left Russia during the Soviet era; others, more recently. They range in age from 30 to 73 and include Jews, Russian Orthodox, and the irreligious. Stewart divides each interview into two main sections—life in Russia and life in London—and provides thematic headings that focus on culture, gender, and daily life. Many of these women have visited Russia since emigrating, but all seem content with their lives in London, though after her interview one subject had returned, “reluctantly,” to Uzbekistan.



Today, newspaper articles associate the word “Uyghur” with Islamic terrorism. But *Uyghur Nation: Reform and Revolution on the Russia-China Frontier* (Harvard University Press, 2016) goes behind the headlines to trace the emergence of Uyghur nationalism. In doing so, **DAVID BROPHY** (PhD '11, Inner Asian and Altaic studies) draws on culture, language, and history as much as political developments. Uyghurs emerged within a multi-ethnic region that's long been a ball for massive strikers—Tsarist (and Soviet) Russia and Qing Dynasty (and Communist) China, even the Ottoman Empire. The Uyghurs converted to Islam during the 16th century, but only in the 1930s did they gain recognition as a distinct nationality—recognition, but not political independence.



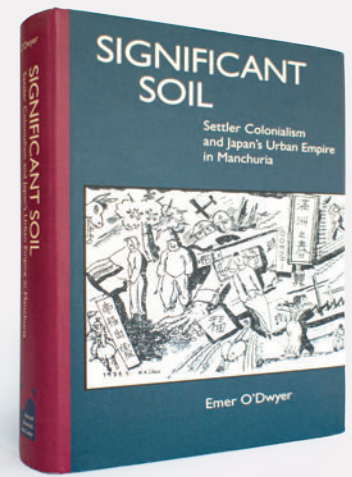
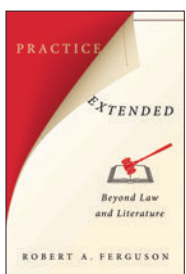
*Empire of Things: How We Became a World of Consumers, from the Fifteenth Century to the Twenty-First* (Harper, 2016) recounts a worldwide, world-changing phenomenon. **FRANK TRENTMANN** (PhD '99, history) explores the increase in possessions since the Renaissance (for example, making effective use of estate inventories), while emphasizing shifts in how people valued their possessions—as capital and collateral, later as objects of fashion and novelty, and today as a means for



self-expression and convenience. The expansion of markets that accompanied the Age of Discovery, 19th- and 20th-century advances in mass production and mass marketing, and the consumer's role in political discourse of all flavors clearly reveal the centrality of consumerism in the modern world.

*After Civil Rights: Racial Realism in the New American Workplace* (Princeton University Press, 2015) analyzes the role of race in employment. **JOHN SKRENTNY** (PhD '94, sociology) distinguishes three main discourses on the problem. Conservatives advocate merit-based, race-blind workplaces; progressives, proactive engagement to remedy accumulated wrongs. “Racial realism,” the legally unsanctioned third approach, reflects ongoing employer practices that recognize a positive economic value in race—seen in corporate celebrations of workplace diversity; “racial signaling” (for example, when a pharmacy in a black neighborhood hires a black manager); or employer preferences for Latino immigrants in low-skill jobs because they “work harder” (which, if true, may reflect language difficulties or immigration status more than an ethnic trait).

The essays in *Practice Extended: Beyond Law and Literature* (Columbia University Press, 2016) ask how literature can shape our understanding of the law. **ROBERT FERGUSON** (PhD '74, history of American civilization) offers some head-to-head comparisons (“The Opinion as Literary Genre”) as well as more oblique strategies that employ literature to illuminate specific legal issues (for example, using Shakespeare's *Merchant of Venice*, *Measure for Measure*, and *The Tempest* to weigh mercy within jurisprudence). He also revisits the court case that ruled James Joyce's *Ulysses* was not pornographic and provides spirited discussions of illegal immigrants and the law and the 1989–90 invasion of Panama, which established troubling precedents for America's wars in Afghanistan and Iraq. 🏠

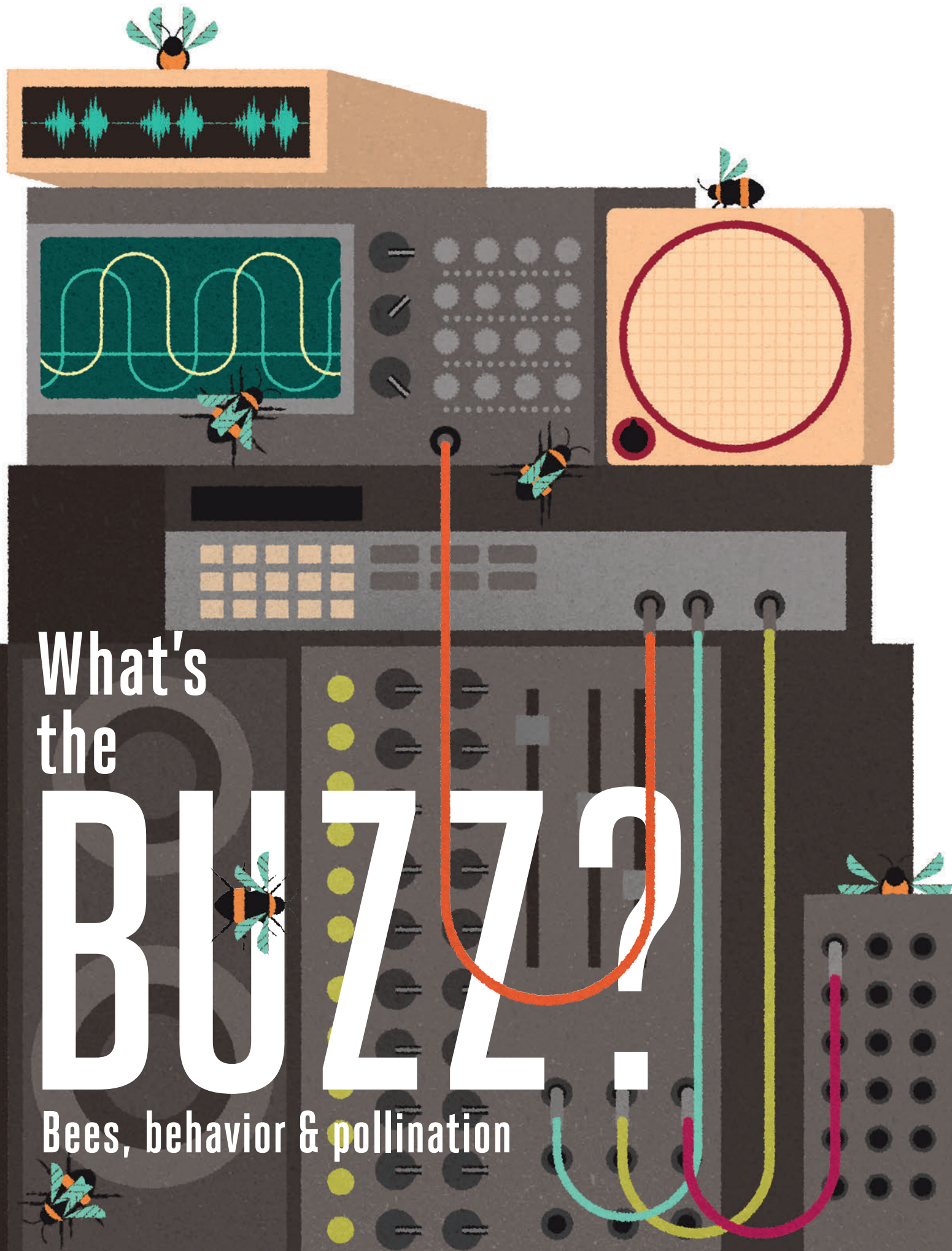


*Significant Soil: Settler Colonialism and Japan's Urban Empire in Manchuria* (Harvard East Asian Monographs, 2015) examines the Kwantung Leasehold, a Rhode Island-sized territory that Japan gained through the 1905 Russo-Japanese War. **EMER O'DWYER** (PhD '07, history and East Asian languages) ranges across various topics, including imperialism, the introduction of Japanese culture, the colony's evolving political structure, Japanese militarism, and relations between the Japanese and native Chinese. Japanese settlers were only about one-third of the population. The Chinese majority (apart from a small, coopted elite) lived in near poverty and was treated harshly. Yet pay levels were high enough that the colony never lacked for Chinese laborers. The Kwantung Leasehold was also something of a company town. *Significant Soil* emphasizes the key role of the South Manchuria Railway (or Mantetsu), which—besides providing transportation—had responsibilities for local education, health care, and social welfare. Japanese settlers sometimes squabbled with Mantetsu, and in 1915, Dairen (the colony's major city) gained political autonomy and an elective municipal government. But corporate paternalism was less a threat to the colony's political life and independence than was 1930s-era Japanese militarism. The book closes with the colony's effective takeover by the military dictatorship in Manchukuo (the Japanese puppet state in newly conquered Manchuria) as military officers replaced civilian leadership over Mantetsu, Dairen, and the colony as a whole.

What's  
the

# BUZZ?

Bees, behavior & pollination





words by Steve Nadis  
illustration by Patrick Hruby  
photos by Michael Piazza

# One graduate student's investigation of bumblebee behavior



A bumblebee uses its buzz to loosen pollen.

**I**f you were one of the 250,000 people who visited Harvard's Arnold Arboretum in 2013, you might have witnessed a curious spectacle that summer when a dizzying array of flowers was in bloom. And you might have seen a tallish young man wearing headphones, with an insect net propped beneath his elbow, holding a microphone up to flowers and waiting patiently. The individual in question, a GSAS PhD student in organismic and evolutionary biology named Calin Switzer, was not trying to substantiate rumors that flowers can actually sing. Instead, he was capturing the sounds of bumblebees in an attempt to determine the frequency at which they flapped their wings and otherwise shook their bodies. The exercise garnered "a lot of weird looks," Switzer recalls—not from the bees, which did their best to ignore him, but from human passersby, who couldn't figure out what this apparent eccentric was up to.

For Switzer, these early measurements laid the foundation for his subsequent PhD work, which he expects to wrap up in spring 2017. His research is centered on "buzz pollination"—an unusual method by which bumblebees and other select bee species liberate pollen from a flower's male anther in order to amass food for their respective colonies. Bumblebees accomplish this by grabbing the anthers with

their bodies and mandibles (or jaws) and then creating a "buzz"—vibrating themselves at the right frequency until the pollen comes free. While the bees gather pollen in this way, some of those precious grains may inadvertently be delivered to the female stigma of another flower, allowing the plant to reproduce by making seeds.

Switzer, for one, finds the bee's tactic fascinating, both from a biomechanical point of view and from the standpoint of adaptation and evolution. It doesn't take long to sense an obsessive quality to his labors. During an interview with this magazine in June, Switzer spoke nonstop about bees for several hours straight with no ostensible waning in enthusiasm. He wore a T-shirt that said "The Bee Course," referring to a nine-day workshop he attended in Arizona. He's even taken up leather craft as a hobby, currently making a belt that has six different bees and flowers carved into the sides.

## An Increasing Preoccupation

But Switzer wasn't always so entranced with members of the *Apidae* family. As a kid growing up in Bozeman, Montana, he didn't give much thought to bees, which can be found throughout his home state and, indeed, on every continent



# The size and strength of bumblebees, combined with their peculiar anatomical features, enable them to buzz pollinate, which is something that more common honeybees cannot do.

Callin Switzer at the Arnold Arboretum.



save for Antarctica. Nor did he plan on studying bees when he came to Harvard in 2012 (after graduating from Gonzaga University in 2010 and spending two years teaching middle school science in Gallup, New Mexico—“the hardest thing I ever did,” he claims). He assumed that he’d be investigating dragonflies, which was what his first graduate advisor, Stacey Combes, concentrated on.

Then he got sidetracked. One of Combes’ graduate students, James Crall, was using radio-frequency identification (RFID) tags to monitor the behavior of bees. Switzer spent time with Crall during his research outings and found himself becoming increasingly preoccupied with bees. He was particularly struck by their role in pollination, which contributes to the production of about a third of the foods that humans eat.

Of the roughly 20,000 bee species, Switzer was most captivated by bumblebees (of the genus *Bombus*), which look different from more common honeybees, being chubbier and fuzzier, and also move differently through the air. According to an oft-told tale, he says, “engineers had worked out the math and proved that bumblebees ought not to be able to fly based on what we know about aerodynamics.” Those calculations evidently went astray somewhere, as bumblebees are strong, if ungainly, aviators, propelled by contractions of their mesosoma (located in the midsection and often referred to as the thorax) that cause their wings to flap about 190 times a second—flapping more than 50 times, Switzer estimates, in the time it normally takes a human to blink just once.

“Bumblebees are extremely muscular animals,” he says. “In fact, their entire midsection is almost full of muscle.” The size and strength of bumblebees, combined with their peculiar anatomical features, enable them to buzz pollinate, which is something that more common honeybees cannot do.

## Buzzing Along

After a bumblebee has tucked its wings into the resting position, contractions of its flight muscles cause the bee’s thorax to deform in a rapid though periodic burst, giving rise to vibrations or buzzes that typically last about a second. For certain plants, like tomatoes, potatoes, blueberries, cranberries, and eggplants, this may be the only way, or the most efficient way, of releasing pollen.

Switzer was drawn to buzz pollination, partly because the subject has not received as much attention as it deserves in view of its importance to our food supply and partly because, as phenomena go, it’s pretty darn cool. His 2013 recordings at the Arboretum constituted an initial foray into this research area, but that was enough to get him hooked. After recording 350 bumblebees that summer, he calculated an average buzz pollination frequency of about 270 Hz, “equivalent to a C-sharp above middle C on the piano.” On

Switzer was drawn to buzz pollination, partly because the subject has not received as much attention as it deserves and partly because, as phenomena go, it's pretty darn cool.

"Bumblebees are extremely muscular animals."

humid days, early in the summer, bumblebees tend to buzz at even higher frequencies, he discovered. And an individual bee could increase its buzzing frequency by at least 90 Hz. He followed up on this fieldwork by reading as many journal articles and books as he could find on the subject. He also continued with his recordings, both audio and video, trying to measure, for instance, the frequency of vibrations for a single, non-foraging bumblebee detained briefly inside a jar.

## Head Banging Bees

As the experiments proceeded, Switzer correctly surmised that he'd soon be accumulating reams of data—hundreds and hundreds of gigabytes—that would require meticulous handling. So he completed a master's program in statistics during the 2014–2015 academic year. That didn't leave much time for research, but he took full advantage of his winter break, spending a month in Australia.

Sridhar Ravi, a former Combes postdoc currently based at RMIT University in Melbourne, had contacted Switzer, encouraging him to study Australia's native, blue-banded bees to figure out how they pollinated tomatoes. With support from a Putnam Expedition Grant, Switzer spent part of December and January watching these bees in action at the Botanic Gardens in Adelaide, about 400 miles northwest of Melbourne.

It was painstaking work. On one occasion, Switzer had to wait almost five hours to obtain a video of a bee lasting only a second. But it was worth the wait because what he





Switzer's advisor, Robin Hopkins, studies plant-pollinator coevolution.

**"We're starting to think more about pollinator learning and how that learning can make pollinators more efficient at what they do."**

and his colleagues found was truly astounding. It had been assumed that blue-banded bees, like bumblebees, unleashed pollen from a plant by latching onto the anthers with their mandibles and shaking. High-speed videos told a different story: the Australian bees dislodged the pollen by banging the flowers with their heads, 350 times a second. The rapid-fire head butts created an audible buzz—a higher pitched one than bumblebees generally produce.

## New Avenues

After Combes, a coauthor of the "Shakers and head bangers" paper, left Harvard for the University of California, Davis in 2015, Switzer decided to continue his research with evolutionary biologist Robin Hopkins, an assistant professor of organismic and evolutionary biology, whose lab is based in the Weld Hill Research Building on the edge of the Arboretum. It's been an agreeable set up, allowing him to make use of Weld Hill's state-of-the-art microscopy equipment, greenhouses, and environmentally-controlled growth chambers. He also has access to the Arboretum's world-renowned collection of more than 15,000 curated plants, while working just a few steps away from the great outdoors—a stunning, 280-acre expanse of hills, trees, flowers, birds, and, of course, bees.

Switzer has proven to be a good complement to Hopkins' team. "There is a general theme in our lab of studying plant-pollinator coevolution," Hopkins says. "Although this subject dates back to Darwin, there are many things we assume but less we know." Switzer's work, she adds, "has opened up new research avenues in the lab. We're starting to think more about pollinator learning and how that learning can make pollinators more efficient at what they do."

Hopkins calls Switzer "an incredibly creative and hard working student," and 2015 turned out to be a productive year for him. He made further recordings at the Arboretum, demonstrating that bumblebees "sonicate," or buzz, at different frequencies while visiting different plants—Chinese beautyberries, roses, and St. John's wort—perhaps as a means of maximizing their pollen take. His lab experiments, in which he placed bees in cages with different plants, yielded similar results.

In that same year, Switzer tested different methods of marking bees, either by attaching numbered tags between their wing bases or by painting patches of their bodies. He found that bees marked with paint were much more likely to collect pollen than those that were tagged. "The only drawback," he notes, "is that paint can chip off. And if you're marking more than 100 bees, you quickly run out of colors."

## Keeping Focused

In research performed in 2015 and published a year later, Switzer and Combes assessed the effects of the common



Switzer has determined that bumblebees buzz at a frequency of about 270 Hz.

**"A lot of projects around here start this way, serendipitously, because you are literally immersed in plants. There's a stimulus that comes from being so close to the organisms you study."**

neonicotinoid pesticide, imidacloprid, on bumblebees.

Consuming 0.05 nanograms of the toxin had no discernible effect on behavior. Bumblebees that ingested 0.5 nanograms of imidacloprid, however, were less likely to pollinate than unexposed bees, and animals that consumed 5 nanograms, so far as the researchers could tell, never pollinated again.

In April 2016, the Maryland legislature approved a bill that would prohibit consumer uses of neonicotinoids (pending the governor's signature), and Switzer believes a broader ban could help protect declining bee populations nationwide. But he's reluctant to get involved in a political controversy while trying to wrap up his dissertation. He's keeping his focus, instead, squarely on science, though sometimes that can lead in unexpected directions.

In spring 2016, for example, Switzer was on the grounds with Arboretum director William (Ned) Friedman, who told him about mountain laurels (*Kalmia latifolia*), which were just coming into bloom at the base of Hemlock Hill. These flowers have a novel way of dispersing pollen: Their anthers are cocked back like a spring, and when a bee lands on the petals, the spring is released and pollen is catapulted into the air. Given that *Kalmia latifolia* only blooms for a few weeks, Switzer dropped what he was doing to study the phenomenon with Hopkins and others—both in the wild and in the lab—trying to determine whether this is an effective mechanism for getting pollen onto a pollinator. "No one knows how the interactions between plants and animals work in the case of mountain laurels, and it will be really exciting to find out," says Friedman, the Arnold Professor of Organismic and Evolutionary Biology.

"A lot of projects around here start this way, serendipitously, because you are literally immersed in plants," Friedman adds. "There's a stimulus that comes from being so close to the organisms you study." The proximity to nature helps motivate and energize the 70 or so research scientists and students that work at the Arboretum's Weld Hill Research Building, Friedman asserts, contributing to an incredibly vibrant and interactive community.

Switzer realizes he is well situated to pursue his interest in bees. The animals have been good to him, a source of countless hours of enchantment. And he's only been stung once for his efforts, despite the almost constant exposure, and that incident was not even the bee's fault. Switzer was running his fingers through his hair when he came across the hapless creature, which presumably struck out in fear rather than in malice. Although Switzer finds the work engrossing, and sometimes even thrilling, there can be frustrating moments, he admits, "as it's hard to get bees to do what you want them to do when you want them to do it." The same, of course, can be said about humans. But Switzer goes further when it comes to his furry *Bombus* friends: "The more I learn about bees, the more interesting they become." And it's hard to say that about every person you meet. 🍯

Ernest Henry Wilson (1876–1930) traveled further than all of the Arnold Arboretum's plant explorers of the early 20th century, collecting thousands of plant specimens and taking incredible photographs documenting trees and forests, landscapes, and ethnography. Below, *Pinus koraiensis* and *Pinus densiflora* in Korea.



# LIVING LABORATORY

The Living Collections of the Arnold Arboretum of Harvard University not only support the Arboretum's mission by serving key research, education, and conservation roles, but in their entirety represent one of the very best examples of a historic Frederick Law Olmsted-designed landscape. With some 15,000 accessioned plants, representing almost 4,000 unique taxa that include 2,100 species, the Living Collections of the Arnold Arboretum remain a major destination for those who study and enjoy woody plants. Of the accessions brought to the Arboretum from elsewhere, 44 percent are of wild origin, hailing from over 60 different temperate countries. Another 39 percent are of cultivated origin, including pedigreed hybrids, nursery-origin introduc-

tions, and accessions from other gardens. This historic interplay between taxonomic, floristic, and cultivated diversities has resulted in one of the most comprehensive and heavily documented collections of temperate woody plants in the world.

The living collections are central to the Arnold Arboretum—all research, education, and conservation initiatives are driven by them. To ensure its prominence, the Arboretum has undertaken a set of initiatives to simultaneously preserve its singular legacy and secure its future, shaping and defining the Living Collections of the Arnold Arboretum for the coming century so that investigators, such as Callin Switzer and Robin Hopkins, will have an ideal living laboratory for their research

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# HONORING EXCELLENCE

## Four outstanding alumni receive highest award

On May 25, 2016, the Graduate School of Arts and Sciences awarded the Centennial Medal to four alumni who have made extraordinary contributions to society. The medal, GSAS's highest honor, was first awarded in 1989 on the occasion of the 100th anniversary of the School's founding. Since that time, 108 accomplished alumni have received the medal, which is awarded at a celebratory luncheon the day before Commencement.

[gsas.harvard.edu/news/stories/gsas-presents-2016-centennial-medals](http://gsas.harvard.edu/news/stories/gsas-presents-2016-centennial-medals)



## FRANCIS FUKUYAMA

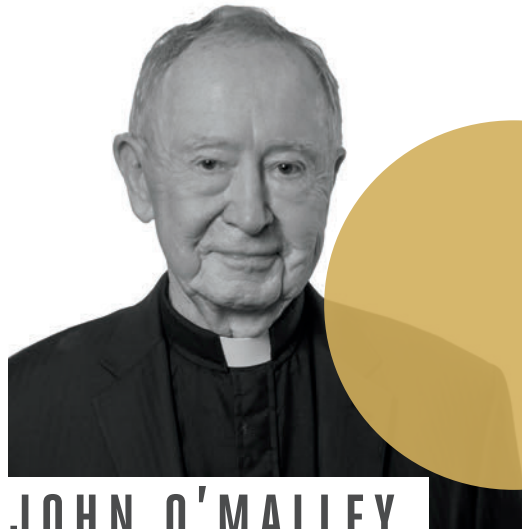
Few political scientists loom quite as large as Francis Fukuyama, PhD '81, and few can boast such a rich educational background. As an undergraduate, he studied classics with Allan Bloom at Cornell. As a graduate student, he spent time with Barthes and Derrida in Paris. At Harvard, he completed the final year of his PhD in government on a fellowship that he received through Samuel Huntington, a leading figure in comparative politics and international relations. Fukuyama began his career at the RAND Corporation in California and as a deputy director of policy planning in the US Department of State. He is currently based at Stanford, where he is the Olivier Nomellini Senior Fellow at the Freeman Spogli Institute for International Studies and director of the Center on Democracy, Development, and the Rule of Law.

"Intellectually I think he's the student that Sam would be the proudest of," says Graham Allison, director of the Belfer Center for Science and International Affairs and Douglas Dillon Professor of Government at Harvard Kennedy School. "Like his teacher, Fukuyama asks fundamental questions about where political order comes from, and how it evolves, and the pros and cons of various forms. He does so with a commitment to scholarship and a courageous independence that never ducks uncomfortable and challenging conclusions."

## DAVID MUMFORD

Mathematicians work in a world that many of us find inaccessible, but David Mumford '57, PhD '61, has a genius for building bridges. His career has encompassed both pure mathematics and applied mathematics; he has made advances not only in the abstract world of proofs and theorems, but also in the psychology of vision and the scientific modeling of thought. Mumford taught on the Harvard faculty for 35 years, from his PhD in 1961 until his appointment in 1996 as University Professor in the Division of Applied Math at Brown, where he is now emeritus. After leading the field of algebraic geometry for two decades, he made a remarkable transition to applied mathematics. He is particularly interested in pattern theory, visual perception, and the neurophysiology of vision, and he has used statistical approaches to advance the field of computer vision and study some of the most puzzling mysteries of cognition.

One of the undergraduates in Mumford's Harvard classroom was Joe Harris, now Higgins Professor of Mathematics—a chair that Mumford himself held for 20 years. "It would be hard to overstate Mumford's impact on mathematics," says Harris. "The subject of algebraic geometry, which had been studied intensively for almost two centuries and which occupies a central place in mathematics, was completely transformed, largely as a result of his work."



## JOHN O'MALLEY

Professor and priest, historian and Jesuit, John O'Malley, PhD '65, is that rare scholar who has emerged as both an academic and spiritual leader. He taught for several years at the University of Detroit before returning to Cambridge to serve for nearly three decades as a distinguished professor of church history at the former Weston Jesuit School of Theology. He is now University Professor in the Department of Theology at Georgetown. He began his career as a scholar of Italian Renaissance intellectual history and went on to become a leading authority on early modern Catholicism. His religious dedication and passion for the study of history have encouraged countless others to follow in his footsteps.

"John is like a pied piper," says Mark Massa, ThD '87, professor of church history and dean of the Boston College School of Theology and Ministry, who studied history with O'Malley both as an undergraduate and as a graduate student. "A lot of my friends were inspired to go into history because of John's ability to make it interesting, relevant, alive. He connected all the dots for us. William Faulkner once said that the past is not really dead, in fact it's not even past—and I think John has the ability to make us see how that is true."



## CECILIA ROUSE

A leading scholar of the economics of education, Cecilia Rouse '86, PhD '92, completed a dissertation in economics that tackled a previously unexplored topic: the economic effects of attending community college rather than a traditional four-year college. "She opened a completely new research area," says Lawrence Katz, Elisabeth Allison Professor of Economics and one of her primary advisors. "Almost all research on the economics of higher education focused on four-year schools, and she in her dissertation broke new ground in trying to understand the increasingly important role community colleges played, particularly for disadvantaged and minority students."

Rouse went on to become co-chair of the American Economic Association's Committee on the Status of Minority Groups in the Economics Profession, where she has championed a summer program that increases diversity in academia by preparing undergraduates for doctoral study. She also served as an economic advisor to the Clinton administration and on President Obama's three-member Council of Economic Advisers. In 2012, she was named dean of the Woodrow Wilson School of Public and International Affairs at Princeton University, whose faculty she had joined in 1992. "There are economists who choose problems merely because they're intellectually interesting," says Larry Summers, Charles W. Eliot University Professor. "Ceci chooses problems because they are the real problems of our society. She is a model of the socially committed intellectual."



Christopher Winship, PhD '77, considered *"The Rational, Sub-rational, and Extra-rational: Toward a Comprehensive Theory of Action."*



# Intellectual Assembly

## Graduates return to campus for Alumni Day

More than 300 alumni gathered on the Cambridge campus on April 9, 2016, for Alumni Day, participating in sessions that highlighted the work of Harvard's faculty and GSAS alumni.

Andrew W. Lo, who earned his PhD in economics in 1984, delivered the keynote address, asking the question Can Financial Engineering Cure Cancer? Lo, who is the Charles E. and Susan T. Harris Professor at the MIT Sloan School of Management, began by recounting the seemingly miraculous cancer remission that Jimmy Carter, 39th President of the United States, experienced after undergoing immunotherapy last year. Lo commented that "biomedicine is at an inflection point."

In a series of breakout sessions, alumni heard from Harvard faculty and GSAS alumni, who discussed their research in a variety of fields, in many cases highlighting the interdisciplinary nature of their work.

An annual tradition, Alumni Day offers the chance to reconnect with fellow graduates while learning about the research conducted at Harvard by the faculty who advise GSAS's graduate students.

*Save the date for the next Alumni Day, April 8, 2017.*



**"Don't declare war on cancer...put a price tag on its head instead!"**

Andrew Lo, PhD '84



Gennaro Chierchia commenting on his collaborations with Virginie Greene and Stuart M. Shieber during "Making Sense: On a Pedagogical Experiment."







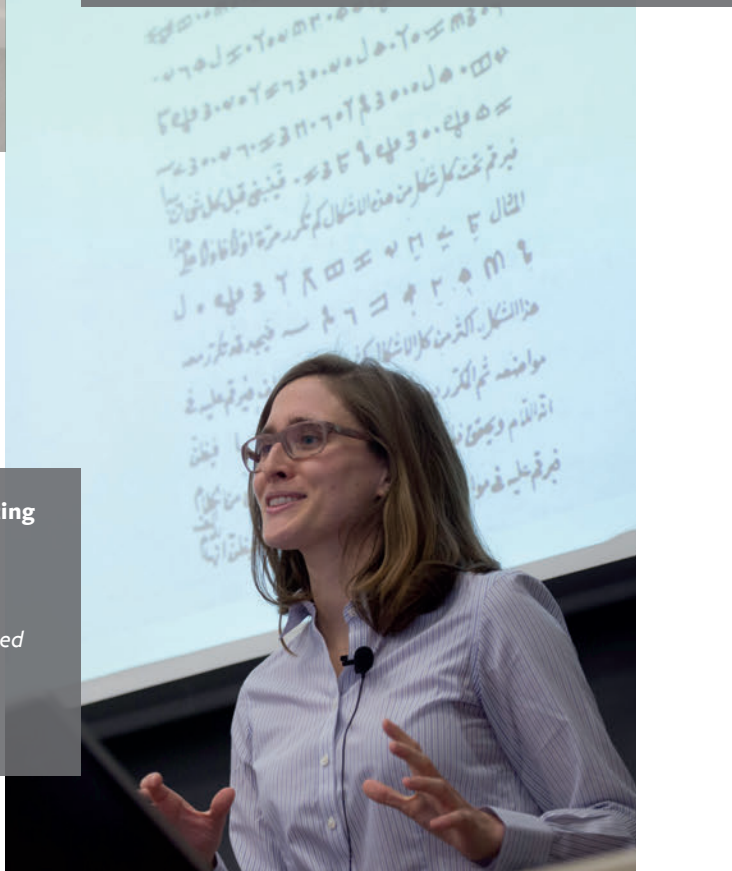
**“16 percent of red dwarf stars have rocky planets in a habitable zone.”**  
John Asher Johnson during *“Searching for Planets and Astrophysical Talent in Uncharted Territory.”*



**“The best perk of my job is that I get to work with GSAS students.”**  
Susan Dymecki during *“Deciphering the Brain Serotonergic System: From Breathing to Behavior”*



Karen L. Thornber, PhD '06, speaks about *“Breaking Discipline, Integrating Literature: Africa-China Relationships Reconsidered.”*



**“What’s wrong with the idea that printing causes civilization?”**  
Kathryn Schwartz, PhD '15, during *“Book History: A New Approach to Texts and Historical Contexts.”* Schwartz co-presented with Ann Blair.

A large crowd of graduates in black and red regalia is gathered for a commencement ceremony. The scene is filled with green foliage in the foreground, partially obscuring the graduates. Large, white, serif text is overlaid on the image, reading "One Day in May".

# One Day in May



A beautiful May day marked Harvard's 365th Commencement. Hundreds of GSAS master's and PhD candidates took their final steps as students across campus during the traditional parade, led by bagpipers and watched by friends and family as they marched into Harvard Yard for the Morning Exercises. Among the many speakers was Jiang He, a PhD candidate in molecular and cellular biology, whose talk "The Spider's Bite" provided insight into his decision to pursue graduate studies. Following the exercises, students streamed into Sanders Theatre for the Diploma Awarding Ceremony.

The day concluded with lunch on the Lawns at Richards Hall, where, now alumni, many celebrated with a champagne toast.



# Noted

## ASTRONOMY

**Sean M. Carroll, PhD '93**, published *The Big Picture: On the Origins of Life, Meaning and the Universe* (Dutton, 2016). The book weaves together fundamental laws of theoretical physics, the evolution of life, and everyday human experiences in an attempt to answer our deepest personal questions. Carroll joined the California Institute of Technology and the Walker Burke Institute of Theoretical Physics as a research professor in 2014, where he researches dark matter, modified gravity, and extra dimensions.

## ENGINEERING AND APPLIED SCIENCES

**Alexander Epstein, PhD '12**, received the Federal Laboratory Consortium's Excellence in Technology Transfer award, in partnership with his United States Department of Transportation team and city collaborators, for their work in advancing truck side guards. When a truck is involved in a side-impact collision, these safety devices help prevent pedestrians, bicyclists, and other road users from being swept under the truck and injured. Epstein has served in the Volpe Center's Office of Policy, Planning and Environment since 2011, where he researches safety and sustainability enhancing technologies, ranging from individual vehicles to airports.

## ENGLISH

**Sara Gorman, PhD '13** has co-authored her first book, *Denying to the Grave: Why We Ignore the Facts That Will Save Us*, to be published by Oxford University Press in September 2016. Written with Jack M. Gorman, the book examines how health care

decisions are made and how medical professionals can best reach audiences who do not believe what science teaches them about health. Sara is currently a project manager at Johnson & Johnson Global Public Health, where she works to increase the quality of evidence in the global health field.

## FILM AND VISUAL STUDIES

This fall, **Kyle Parry, PhD '14**, will begin a tenure track position as an

assistant professor for history of art and visual culture at the University of California, Santa Cruz. Parry recently concluded a postdoctoral fellowship at the University of Rochester, where he was jointly affiliated with the Graduate Program in Visual & Cultural Studies and the digital scholarship initiatives of the library. As a postdoc, he produced an experimental event series and pursued written and practice based research.

## ASTRONOMY

**David Charbonneau, PhD '01**, has been awarded one of the 2016 Blavatnik National Awards for Young Scientists for his discoveries of exoplanets, as well as his development of observational methods that astronomers employ to discover life in space. Charbonneau has been a professor of astronomy at Harvard since 2010 and is an astronomer at the Harvard-Smithsonian Center for Astrophysics in Cambridge. Charbonneau was recently profiled in a *Harvard Gazette* article, excerpted below.

*When he arrived at Harvard to begin graduate school in astronomy, Charbonneau was certain that he would work on theoretical astrophysics and cosmology. However, in 1995, the first exoplanet (a planet outside the solar system) orbiting a sun-like star had just been discovered. This discovery posed so many simple but unanswered questions that Charbonneau was encouraged by his mentor, Robert Noyes, to try his first project in planets. He never looked back.*

*Charbonneau's discoveries have opened the floodgates for search and discovery outside our cosmic neighborhood. In 1999, while still a graduate student, Charbonneau was the first to observe a transiting exoplanet.*

*The big question Charbonneau is working on now is the detection of atmospheric biomarkers, such as oxygen, the molecules that we can detect in the atmosphere of a distant world that might permit us to infer the presence of life.*

Read more at [news.harvard.edu/gazette/story/2016/06/harvard-professor-wins-blavatnik-award](http://news.harvard.edu/gazette/story/2016/06/harvard-professor-wins-blavatnik-award).



## GOVERNMENT

**Alfred A. Marcus, PhD '77**, published two books: *Innovations in Sustainability: Fuel and Food* (Cambridge University Press, 2015) looks at how companies can encourage innovation designed to solve global challenges, and *The Future of Technology Management and the Business Environment* (Pearson, 2016), in which Marcus offers advice for utilizing technological change and confronting the threats and opportunities change creates. Marcus currently works as a professor and the Spencer Chair in the Strategy and Technological Leadership University of Minnesota Carlson School of Management, and the Technological Leadership Institute.

**Frank J. Popper, PhD '72**, was named to a four year term as co-editor of the *Journal of Planning and Education Research*. He continues to teach at the Bloustein School of Planning and Public Policy at Rutgers University and is a visiting professor in the Environmental Studies Program at Princeton University. Popper chairs the board of the Texas-based Great Plains Restoration Council, through which the Buffalo Commons project is run. The project, a concept he and his wife Dr. Deborah Popper developed in 1987, is dedicated to community-based ecological restoration.

**Benjamin Berger, PhD '01**, has been named executive director of the Lang Center for Civic & Social Responsibility at Swarthmore College for a five-year term, having served as interim director since July 1, 2015. Over the last year, Berger worked to create meaningful change to guide the next director as well as the Center itself, and he continued a commitment to faculty outreach. Berger will continue as associate professor of political science at Swarthmore, a position he has held since 2002.

## EDUCATION

**Anthony Jack, PhD '16**, has joined the Harvard Graduate School of Education as an assistant professor of education. He was also named the Shutzer Assistant Professor at the Radcliffe Institute for Advanced Study at Harvard University. Jack's research delves into overlooked diversity among lower income undergraduates from conventionally struggling public schools, as well as those from boarding and preparatory schools, leading him to develop the concepts "doubly disadvantaged" and "privileged poor."



Jack was profiled in the October 2015 issue of the *GSAS Bulletin*. Below is an excerpt from the article (read it at [gsas.harvard.edu/news/stories/taking-nothing-granted](http://gsas.harvard.edu/news/stories/taking-nothing-granted)).

*While Harvard and other prestigious universities have instituted admissions policies designed to*

*attract students from lower-income backgrounds, there is less talk about how to provide for these students' success once they enroll. As Anthony Jack, a PhD candidate in the Department of Sociology and a doctoral fellow in the Multi-disciplinary Program in Inequality & Social Policy, points out, for all the good intentions behind these changes, college policies have not kept pace with the increasingly diverse classes of students who enter their gates.*


*Jack uses the example of office hours to illustrate students' divergent preparation for core features of the college experience that many of us take for granted. "On the first day of section, when I introduce office hours, do I say 'My office hours are Tuesdays from 2 to 4 p.m.'? That's Greek to some people who come from schools where their presence was an imposition, not an expectation." As Jack points out, students can have all sorts of questions and anxieties from not knowing whether they are expected to come to the office with questions prepared or, if the meeting is going to take place in a café, whether they will need to buy a drink and how much that drink will cost.*

*At Harvard, Jack says, "We are fortunate enough to be surrounded with different kinds of diversity. But the job of diversity shouldn't be relegated to people who fit in those categories."*

## HISTORY OF SCIENCE

**Arvind Venkat, AM '96**, has been promoted to professor of emergency medicine at the Drexel University College of Medicine. Venkat currently serves as the vice chair for research and faculty academic affairs in the Department of Emergency Medicine at Drexel, in addition to serving as an ethics consultant at Allegheny General Hospital and the systems ethics committee chair of Allegheny Health Network.

## PSYCHOLOGY

The American Sociological Association will award its Cox-Johnson-Frazier Award to **Thomas F. Pettigrew, PhD '56**, in August 2016 in recognition of many contributions to the study and continued improvement of American race relations. He is currently research professor of social psychology at the University of California, Santa Cruz, a position he has held since 1994. 



## Bringing New Ventures to Life

Earlier this year, Harvard announced the creation of the Harvard Life Lab, a 15,000-square-foot facility based in Allston, Massachusetts. The Life Lab, scheduled to open in fall 2016, will provide Harvard faculty, students, postdoctoral scholars, and alumni with the laboratory space and community needed to grow and scale early-stage life sciences and biotech companies.

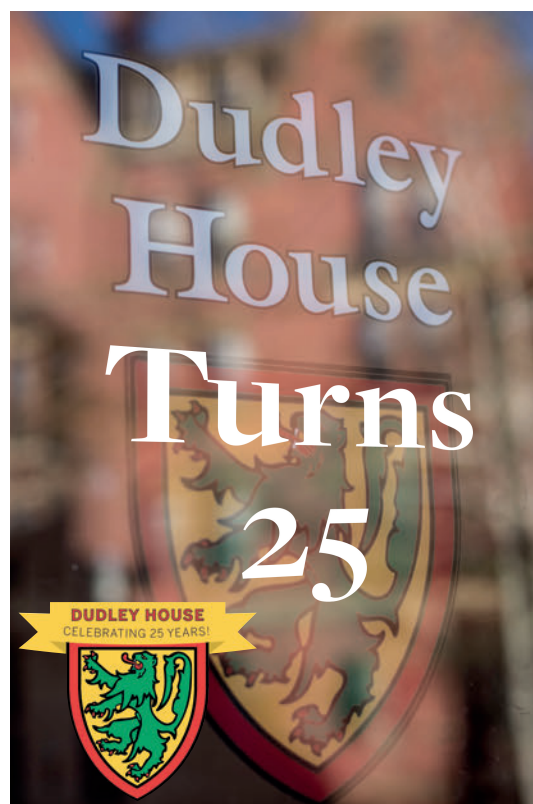
Located on Harvard's Allston campus, adjacent to the Harvard Innovation Lab (i-lab) and Launch Lab, the Life Lab intends to help build a thriving start-up community "by seeding the campus with early stage scientific ventures."

Learn more at [harvardlifelab.com](http://harvardlifelab.com)

# HARVARD FOREVER



On the eve of Alumni Day, recent graduates met with Dean Xiao-Li Meng, members of the Graduate School Alumni Association Council, and GSAS staff for an intimate gathering focused on alumni engagement, titled "Harvard Forever: The Roles and Impact of Alumni."

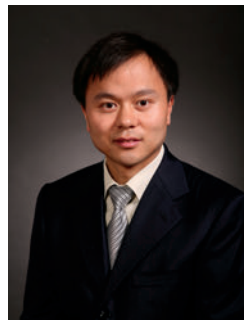


When Dudley House was dedicated as GSAS's graduate student center 25 years ago, the idea of building community among graduate students was still considered experimental. The effort (spearheaded by the Graduate School Alumni Association Council, deans and administrators, and students) grew from the realization that graduate students needed to leave the lab or library and come together in a place where they could decompress while enjoying the interests and hobbies that enrich not only their own lives, but those of the larger Harvard community.

Dudley House has been a grand success, a model for peers, and a refuge for students, especially those at the beginning of their programs who are seeking to find their place at Harvard. GSAS is hosting a series of events during the 2016–2017 academic year to mark this milestone, which will include a gala evening and a Dudley Fellows reunion.

What does Dudley mean to you? Help us celebrate by sharing your Dudley story at [gaa@fas.harvard.edu](mailto:gaa@fas.harvard.edu).

# “Harvard opened a whole new world to me.”



Jianming Yu, PhD '98, describes his time at the Graduate School of Arts and Sciences (GSAS) as four years of 12-hour days, studying and working late in the labs. And every minute inspired him. “I was elated by the buzz,” says Yu. “Harvard opened a whole new world to me—when I was working alongside the most prominent biologists, it dawned on me that together we could make a difference.”

After earning a PhD in biological sciences in public health, Yu became an investor and entrepreneur in the life sciences. He credits GSAS for helping to strengthen his analytical skills, systematic thinking, and communications capabilities. “GSAS provided me with the best academic training and prepared me very well for my career development,” he says.

Yu went on to work for McKinsey as a consultant and cofounded New Horizon Capital, a private equity firm that acquires companies specializing in a variety of sectors, from mining in Russia to medical devices in Boston.

In gratitude for his GSAS experience, Yu has established the Jianming Yu Dean’s Fund for Professional Development. He hopes the fund will increase access to professional conferences, workshops, and training for students as they build proficiency in their fields and prepare to launch careers when they graduate.

“The GSAS professional development program has been thoughtfully designed to address the needs of graduate students,” says Yu. “I would like to ensure that more GSAS students, younger versions of me, enjoy their time at Harvard and have free access to as many resources the school and our alumni network can provide.”

Yu believes professional development for students elevates Harvard’s influence in academia and assures that GSAS stays competitive in attracting the best graduate students.

“I would like to pass on a legacy to younger generations so that Harvard can grow from strength to strength,” says Yu, who now lives in Beijing, China, with his wife and two children. “I am very proud to do my bit for the bigger cause at Harvard: to advance human knowledge.”

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[alumni.harvard.edu/ways-to-give/gsas-giving](http://alumni.harvard.edu/ways-to-give/gsas-giving)



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80/80	6.5
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