

# colloquy

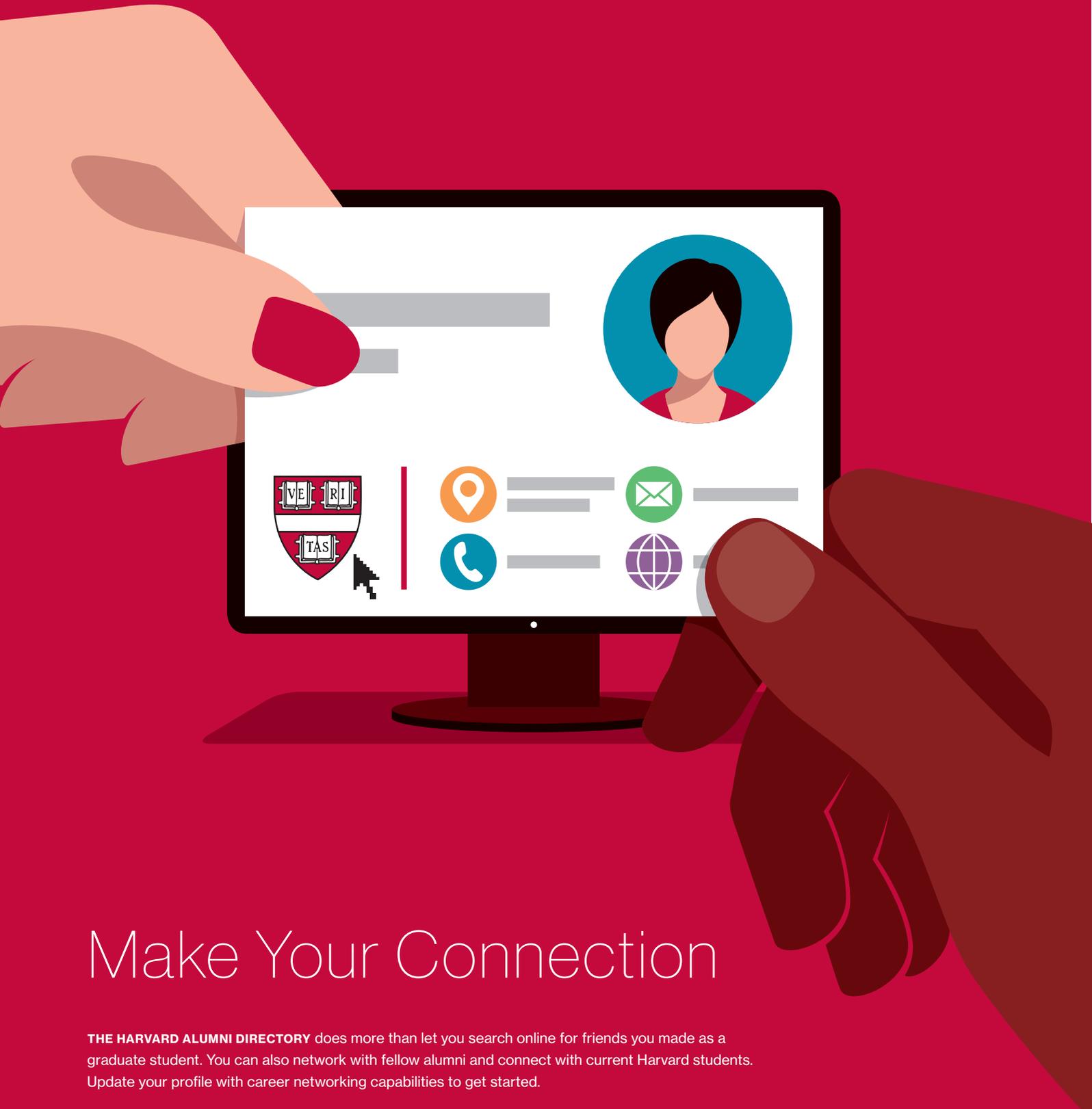
HARVARD UNIVERSITY | THE GRADUATE SCHOOL OF ARTS & SCIENCES



## Changing Minds

When it comes to changing minds,  
perception fights facts

*to note*



# Make Your Connection

**THE HARVARD ALUMNI DIRECTORY** does more than let you search online for friends you made as a graduate student. You can also network with fellow alumni and connect with current Harvard students. Update your profile with career networking capabilities to get started.

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# colloquy

WINTER 2020

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**AS GSAS ALUMNI**, you are, I know, keenly aware of the importance of effective advising and its centrality to the successful completion of a graduate student's education. A positive experience can lead to meaningful lifelong professional and personal connections. But not feeling supported by an advisor or empowered in conducting research can contribute to a host of negative effects for the student, including loss of momentum, lack of progress toward the degree, stress, and mental health issues. While GSAS surveys have shown that a majority of students are satisfied with their advising, a troubling—and consistent—number are not.

During my first year as dean, I began looking into our advising partnerships and quickly realized that if I wanted to truly understand the full advising landscape, I would need to investigate more deeply and engage with individuals beyond those in the traditional advisee-advisor roles. With that in mind, GSAS has launched The Advising Project, focused on improving the advising experience of all students. Over the next two years, The Advising Project will evaluate what constitutes effective advising and celebrate the many remarkable examples that we know exist, compile a collection of best practices, and disseminate information about how students, faculty, and other partners can work together to enhance the advising experience with an eye to effecting lasting institutional change.

In the first year, I want to ask questions of everyone whose experience touches advising: What do we know about the current state of graduate student advising at Harvard? What does effective advising look like? What gets in the way? How can we make effective advising the norm? Using information gathered from these conversations, the project will determine how to disseminate the lessons learned and ensure that effective advising is a priority in all GSAS programs.

Alumni input will be important as we begin our work, so much so that the Engage question in this issue (see page 3) is focused on advising. GSAS will also email you with project information that will include opportunities to share your thoughts. I hope that you will engage with us as we move forward with this important project.

—EMMA DENCH  
DEAN

## colloquy

WINTER 2020

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*Colloquy* is published two 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 [gsas.harvard.edu/alumni](http://gsas.harvard.edu/alumni).

### LETTERS TO THE EDITOR

We welcome your feedback and ideas. Write to: *Colloquy*, Harvard University Graduate School of Arts and Sciences, 1350 Massachusetts Avenue, Suite 350, Cambridge, MA 02138-3846; or email [gsaa@fas.harvard.edu](mailto:gsaa@fas.harvard.edu).

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**ENGAGE**

How did advising help you achieve your career goals?

Let us know! Email [gsaa@fas.harvard.edu](mailto:gsaa@fas.harvard.edu)

**LETTERS**

I read with great interest the article “Lighting the Spark” in the summer 2019 issue.

As someone who has tried to understand something about quantum science in the current literature (yes, gave up in frustration), what I hope the Harvard enterprise delivers are articles for the non-scientist to help one get a grasp on things.

—A. E. SANTANIELLO, PHD '60

In your recent *Colloquy* article “Unboxing CRISPR,” you state: “Jennifer Doudna, PhD '89, and her colleague Emmanuelle Charpentier of the Max Planck Institute for Infection Biology in Berlin, realized...” As written, you make it sound as if both Doudna and Charpentier are located at the MPI in Berlin because: (a) you refer to them as “colleagues” rather than as collaborators, which would have depicted their relationship much more accurately; (b) you failed to include the fact that Jennifer Doudna

is located at my institution, the University of California, Berkeley; and (c) Charpentier was located at Umeå University in Sweden (not at the MPI in Berlin) when Doudna and she realized that Cas9 endonuclease could be used as a universal genome editing tool. So, what would it have hurt to state much more accurately: “Jennifer Doudna, PhD '89, at the University of California, Berkeley, and her collaborator Emmanuelle Charpentier, now at the Max Planck Institute for Infection Biology in Berlin, realized...”

Just wanted you to know that in this post-truth era of fake news, the Harvard community should hold itself to a higher standard of accuracy and factuality.

—JEREMY THORNER, PHD '72

*Colloquy* regrets the confusion caused by this error. The web version of this story has been corrected.

● ● ● **Share your story with us!** Email [gsaa@fas.harvard.edu](mailto:gsaa@fas.harvard.edu). Or write *Colloquy*, Graduate School of Arts and Sciences, Harvard University, 1350 Massachusetts Avenue, Suite 350, Cambridge, MA 02138-3846.

**SPEAKING UP**

Two GSAS alumni found themselves at the center of the impeachment debate when they testified before the House Intelligence Committee as part of the Impeachment Inquiry proceedings.

Lt. Col. Alexander Vindman, AM '12, regional studies–Russia, Eastern Europe, and Central Asia, testified about what he heard on President Trump's July phone call with Ukraine's newly elected president and why what transpired concerned him. Vindman is the director for European affairs on the US National Security Council.

Fiona Hill, AM '91, regional studies–USSR, and PhD '98, raised concerns that focusing on the conspiracy theory that Ukraine interfered in the 2016 US elections ignores the real danger that Russia presents to US democracy. Hill, a former National Security Council member, is an expert on Putin and Russia and the co-author of *Mr. Putin: Operative in the Kremlin*.



Fiona Hill testifying before the House Intelligence Committee.



GSAS Student Center offers programming for all students.

**GSAS STUDENTS FIND THEIR CENTER**

Since officially launching in summer 2019, the GSAS Student Center continues to serve as a welcoming space for students, providing a forum for Center fellows, student groups, diversity and inclusion fellows, and the Graduate Student Council to build community in GSAS. Jacqueline Yun, former director of student services, was appointed executive director in August 2019, and she is advancing the outreach undertaken last academic year to re-envision programming, engagement, and space usage for the Center.

**SURVEY RESULTS UNDER EVALUATION**

In October 2019, Harvard President Lawrence Bacow shared the results of the Harvard AAU Student Survey on Sexual Assault and Misconduct, conducted by the University in partnership with the Association of American Universities (AAU). The results that President Bacow included in his announcement show that sexual harassment and assault at Harvard, and on campuses across the country, remain distressing problems. In a message to students, Dean Emma Dench reaffirmed GSAS's commitment to creating an inclusive community free of harassment and discrimination, stating: "Every member of our community—students, faculty, and staff—deserves to thrive, and as a consequence, sexual harassment and sexual assault have no place here."

This is the second such survey Harvard has undertaken. Based on results from 2015, GSAS added a second Title IX coordinator to its student affairs team, developed a mandatory online training for students, and created new workshops and targeted trainings for students, faculty, and staff. As GSAS reviews the most recent results, it is evaluating what has changed since the survey was first offered and identifying areas that require further attention, with an eye to improving resources for students.



Save the date for the next Alumni Day: April 4, 2020.

## A SENSE OF THINGS

How do we know what objects are within reach? How have squishy robots changed our understanding of the technology? How does our brain combine taste and smell to make a cup of coffee smell so good? Listen to Veritalk's latest series on sensing to find out!

If there's a question you're curious about, chances are there's a Harvard PhD student who has the answers. On the award-winning GSAS podcast Veritalk, you can hear the latest big ideas across the humanities, sciences, and social sciences in just 15 minutes. Subscribe to Veritalk and get stories about everything from mermaids to microbes delivered directly to your mobile device.

●●● Visit [gsas.harvard.edu/veritalk](https://gsas.harvard.edu/veritalk)



***“I got enthralled with the physics of the everyday, the stuff that surrounds us and that we see all the time, but that we never really think about.”***

—NICHOLAS CUCCIA, PHD STUDENT IN APPLIED PHYSICS, SPEAKING ABOUT WHAT DREW HIM TO STUDY SOFT MATTER PHYSICS

## ONLINE EXCLUSIVE

# THE HEAT IS ON

Simply put, said Patrick Behrer, the world is getting hotter, “and that heat imposes large costs on people.” In particular, those who work outdoors or in factories lacking air-conditioning or ventilation are most at risk for the ill effects of on-the-job heat exposure such as sunstroke, impaired cognitive function, and possibly even death.

Behrer, an environmental and developmental economist and PhD candidate in economics, emphasizes the looming scale of the crisis with a little math. Given the nature of climate change, he said, the shifts in the number of very hot days will be greater than those in the mean temperature.

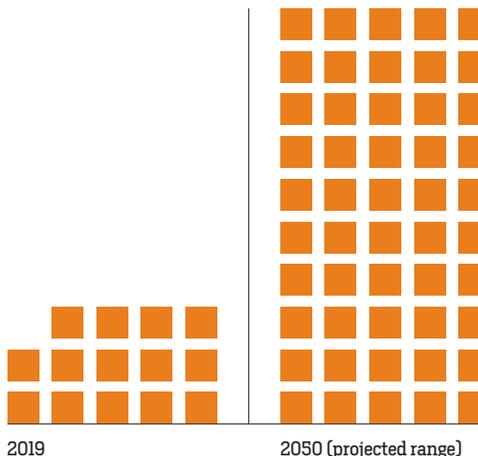
For example, a uniform global temperature increase of 2 degrees Fahrenheit would shift Boston's mean temperature from roughly 52 to 54 degrees Fahrenheit. On its face, not a catastrophic jump.

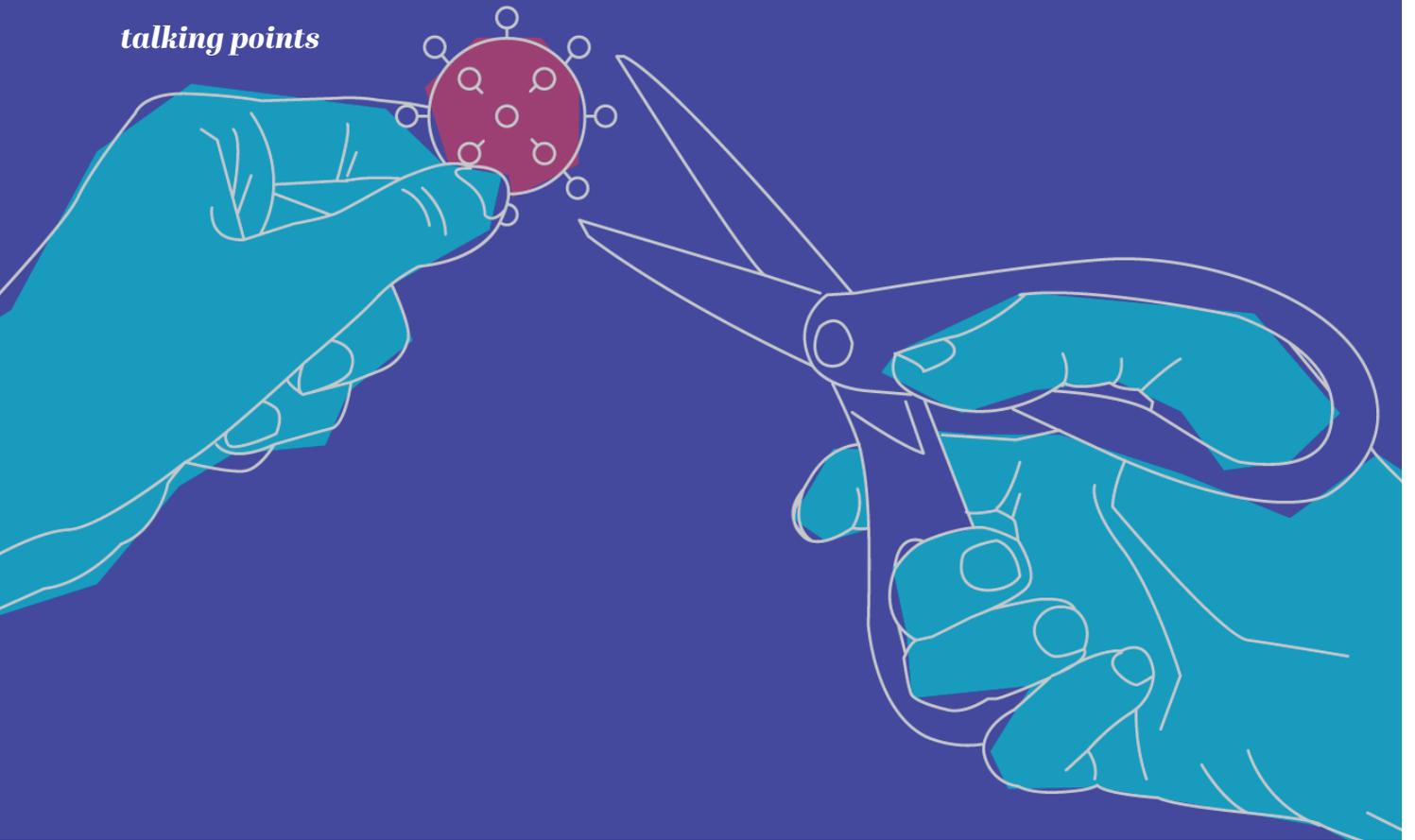
“But what that does mean in a place like Boston, where we currently have periodic hot days, is that you are moving the tails of the distribution and dramatically increasing the number of extremely hot days,” said Behrer. “From the mid '80s to the early 2000s Boston averaged somewhere between five and eight days above 90 degrees. Taking some of the median projections up to 2050, Boston is projected to see somewhere between 30 and 50 days above 90 degrees a year, even though the mean temperature change is only going to be a few degrees.”

And those extra-warm days would take a dramatic toll on the nation's workforce.

●●● Read more of the story at [news.harvard.edu/gazette/story/2019/11/researcher-analyzes-effects-of-climate-change-on-productivity](https://news.harvard.edu/gazette/story/2019/11/researcher-analyzes-effects-of-climate-change-on-productivity).

### DAYS ABOVE 90 DEGREES IN BOSTON





# Fighting Viruses

CRISPR ENZYME PROGRAMMED TO KILL VIRUSES IN HUMAN CELLS

**A BREAKTHROUGH IN** CRISPR technology holds the potential to diminish or eradicate RNA-based viruses that have infected human cells. The research was conducted at the Broad Institute of MIT and Harvard by Catherine Freije, a PhD student in virology, and Cameron Myhrvold, PhD '16, working with Pardis Sabeti, professor of organismic and evolutionary biology and a leader in the Broad Institute's Infectious Disease and Microbiome Program. Dubbed CARVER—Cas13-Assisted Restriction of Viral Expression and Readout—the technique builds on earlier research reported in the summer 2019 issue of *Colloquy*, which described how Cas13 could be used to target infectious viruses using RNA as their genetic material.

New tech could lead to clinical tool.

To test CARVER's effectiveness, Freije, Myhrvold, and Sabeti added the Cas13 gene and an engineered guide RNA to healthy human cells,

then 24 hours later, they exposed the cells to one of three viruses: lymphocytic choriomeningitis virus (LCMV), influenza A virus (IAV), and vesicular stomatitis virus (VSV). Twenty-four hours after infection, results showed that viral RNA in the cell cultures had been reduced up to 40-fold. Digging a little deeper, they discovered that, after only eight hours, Cas13 also reduced a virus' ability to infect other human cells by more than 300-fold.

"We envision Cas13 as a research tool to explore many aspects of viral biology in human cells," said Freije in an interview with the *Harvard Gazette*. "It could also potentially be a clinical tool, where these systems could be used to diagnose a sample, treat a viral infection, and measure the effectiveness of the treatment—all with the ability to adapt CARVER quickly to deal with new or drug-resistant viruses as they emerge."

# UNHIDDEN FIGURES

CONFERENCE ENCOURAGES WOMEN OF COLOR TO PURSUE DOCTORATES IN PHYSICS

**IF THERE'S ONE** thing LaNell Williams wants women of color interested in studying physics at top institutions to know, it's this: You can do this.

Williams is a PhD student in physics working in the lab of Wagner Family Professor of Chemical Engineering and Professor of Physics Vinodhan Manoharan, and just the third African American woman to pursue a doctorate in physics at Harvard. When she graduates, she will join a cohort of fewer than 100 African American women who have received doctorates in the field since 1973.

"When I tried to apply to Harvard, despite everything I had—a 3.93 GPA and a National Science Foundation fellowship—I was told I was reaching too high. And if you asked any black woman in this field, especially those of us who are at places like Harvard, they'll tell you similar stories," Williams said. "The biggest thing Harvard and places like it miss when it comes to recruiting is that they're not encouraging those of us who are qualified, those of us who are ready, those of us who are able, to come to these places."

To help change the situation, Williams co-founded the Women+ of Color Project as a student at Wesleyan University to support women of color in STEM fields. The group ran a three-day workshop at Harvard recently for 20 African American, Latinx, and Native American women interested in pursuing a career in physics, astronomy, and related fields. Attendees were selected from a pool of candidates who had applied or been nominated, and the goal of the event was to help them access the resources they need to apply to and succeed in graduate school.

"I'm bringing these students here now, because I want to tell them, 'You are good enough,'" she said. "They have the grades; they have the scores; they have the pedigree. What's keeping them from applying—and this is what I'm focused on—is the conversations and the resources."

● ● ● **Read more of the story at** [news.harvard.edu/gazette/story/2019/10/conference-encourages-women-of-color-to-pursue-doctorates-in-physics](https://news.harvard.edu/gazette/story/2019/10/conference-encourages-women-of-color-to-pursue-doctorates-in-physics)



Banerjee and Kremer with fellow laureate Esther Duflo of MIT

## FIGHTING GLOBAL POVERTY

Two GSAS alumni were among the three economists awarded a Nobel Prize in October 2019. Michael Kremer, PhD '92, the Gates Professor of Developing Societies in Harvard's Department of Economics, and Abhijit Banerjee, PhD '88, the Ford Foundation International Professor of Economics at MIT, shared the prize with Esther Duflo, the Abdul Latif Jameel Professor of Poverty Alleviation and Development Economics, also from MIT. In awarding the prize, the Royal Swedish Academy of Sciences noted that, through their research, the three had "considerably improved our ability to fight global poverty."

In an effort to address the troubling and complicated issue of global poverty, the laureates spearheaded a bottom-up approach that incorporated feedback from those most affected. In practice, this involved designing field experiments where researchers asked those living in poverty how, for example, educational outcomes or child health could be improved. The answers informed interventions, such as social programs, that directly benefited those affected. Over two decades, this approach has helped millions and grown to dominate and expand the field of development economics.

"It can often seem like the problems of global poverty are intractable, but over the course of my lifetime and career, the fraction of the world's people living in poverty has dropped dramatically," said Kremer in a *Harvard Gazette* interview. "Over the years, we have learned a lot about what works and what doesn't work, and why."



# PARTICLE PERSONALITIES

**JANET CONRAD, PHD '93,** CONSIDERED STUDYING THE STARS AS A CHILD, BUT EVENTUALLY DECIDED TO INVESTIGATE SOMETHING CONTINUOUSLY PRODUCED BY THEM: NEUTRINOS. THROUGH HER RESEARCH, CONRAD HAS OVERTURNED THE STANDARD MODEL'S ASSUMPTIONS ABOUT THESE TINY PARTICLES, IN THE PROCESS INSPIRING OTHER WOMEN IN THE FIELD.

**When did you realize you wanted to pursue a career in physics?**

I liked science as a child, and my father did a lot of science and engineer-related projects with me. He often looked at the sky, and I started out thinking that I wanted to study astronomy. When I arrived at Swarthmore College as an undergraduate, I discovered that astronomy meant going to places that are cold and dark and lonely. I wasn't sure that was the right thing for me.

**Clearly that didn't stop you from pursuing a scientific career. What happened next?**

I had the opportunity to work on the Harvard Cyclotron and became involved with the group testing a calorimeter, run by Professor Frank Pipkin. I was lucky to meet him, and he eventually became my PhD advisor. When the detector moved to Fermi Labs, I watched big particle experiments for the first time. It was so dramatic and large and wonderful. I felt like every interaction created a little universe

# “Above all, I’m interested in talking to the world about neutrinos.”

—JANET CONRAD, PHD '93

in this giant detector. I really loved it. As a postdoc, I moved on to an experiment looking at the properties of neutrinos.

## Why are neutrinos so important?

You know neutrinos are all around you, right? There are a million neutrinos in every liter of space. They are the most independent of all of the particles in the Standard Model in the sense that they go their own way and periodically will interact, but sometimes they don't. I really like that aspect of them. I think they have great little personalities as particles.

## What do you mean by personalities?

It turns out that there are three “flavors” of neutrinos—electron, muon, and tau—that have an interesting ability to morph, which comes directly out of quantum mechanics. Quantum mechanics says that the type of neutrino you are working with will change with time, a process called neutrino oscillation. One of the analogies I like to use is to call the flavors chocolate, vanilla, and strawberry. If you produce a certain flavor of neutrino, say, chocolate, and send it downstream to a detector that can only taste strawberry, then you can track that change, that oscillation.

## How has your research advanced the understanding of these particles?

According to the Standard Model, we believed that neutrinos traveled at the speed of light, which means that they can't have any mass or tell time—something that Einstein talked about. But, as I said, neutrinos oscillate if they can alternate flavor, and that's a way to measure time. If neutrinos can see time, if they oscillate, then they're not going

the speed of light and actually have mass. That was the big discovery of neutrino oscillations.

## Is that oscillation consistent, like a clock?

Some experiments looking for this tick-tock behavior see it happening at a frequency that is much faster than what you would expect from the existing three flavors. The particles are doing something weird that is not in the Standard Model. This extra oscillation might indicate that there is an extra neutrino out there, waiting to be discovered.

## When you began your career, it must have been very challenging to be a woman in the field. How has that changed?

The change has been slower than I would like, but it is definitely happening. When I compare myself with young women in the field now, I realize my experiences were very different from theirs. I love to give advice, so I focus on what's happening now, rather than the past. I think that that's the most important kind of advice for me to give people.

## Do you consider mentoring women to be part of your work?

I do talk a lot to women, and that is the accident of my DNA—that I am a woman, so I can be a good role model. Today, I am going to the women in physics breakfast and out with the undergraduate women in physics for dinner, so I feel like it's an outreach day. But that is not my everyday life. Above all, I'm interested in talking to the world about neutrinos. I love them! Regardless of whether you are a man or a woman, regardless of your background, I want to talk to you about them. They are my little friends.

## CURRICULUM VITAE

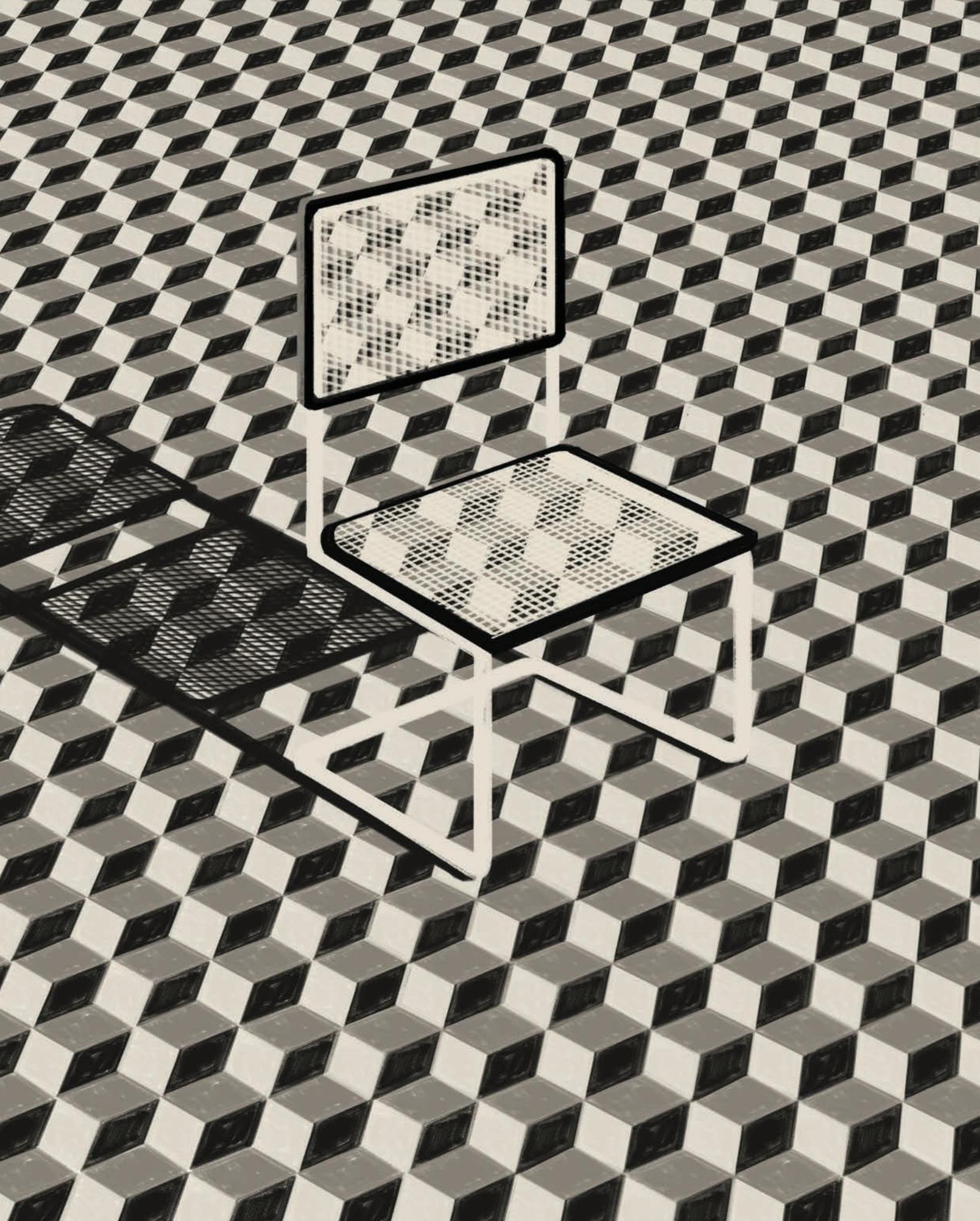
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Professor of Physics,  
2008–Present

Columbia University  
Walter O. Lecroy  
Professor of Physics,  
2006–2008

Swarthmore College  
SB in Physics, 1985

Oxford University  
SM in Physics, 1987

Harvard University  
PhD in Physics, 1993



BY DEBORAH HALBER  
ILLUSTRATION BY EMILIANO PONZI

# C H A N G I N G M I N D S



When it comes to changing minds, perception fights facts.



**HOWARD GARDNER, PHD '71**, wrote the book on how to change minds, but he acknowledges that minds are not always easy—or even possible—to change.

PhD candidate Zoe Jenkin, who studies philosophy of mind, thinks she knows why.

John H. and Elisabeth A. Hobbs Research Professor of Cognition and Education at the Harvard Graduate School of Education, Gardner is best known for his revolutionary theory that humans are intelligent in ways you can't measure through standard IQ tests. Almost all of his 30 books consider the mind: In them, he has analyzed the minds of leaders, creative individuals, and victims of brain damage, among others.

Amid growing national divides over hot-button issues, one of his lesser-known titles, *Changing Minds: The Art and Science of Changing Our Own and Other People's Minds*, seems prescient. What would it take to change the minds of those who support a particular political view? And how to sway those who believe—in the face of mounting evidence to the contrary—that climate change is a hoax?

Gardner—he calls himself “a born pessimist who lives life as an optimist”—is struck by the complex shift in American media since *Changing Minds* was published in 2006. “To change minds, you have to have a different arsenal than you did back in the seemingly simple days where there was one nightly newscast and one newspaper that everybody read,” he says. “And we didn't have social media.”

Gardner observes that, depending on which news outlets or alternative information sources they follow, people are not on the same page about what constitutes reality. He says, “I can't think of a bigger problem.”

## THE DYNAMICS OF PERCEPTION

Jenkin, who studies the relationship between beliefs and perceptual experience, agrees that reality can be pretty subjective. Descartes famously proposed that reality comes down to what we experience directly: a chair, for instance, that we can feel and see. The work of the mind—reason and rationalization—he argued, was separate from that of the body.

Descartes, Jenkin believes, was wrong.

Jenkin counts herself among a handful of philosophers who take the view that the dynamics of perception are actually similar to what goes on in the process of reasoning. For a philosopher, her approach is uncharacteristically scientific, delving into psychology and neuroscience to explore how beliefs, desires, fears, and emotions influence perception.

We tend to think of reasoning as conscious and deliberate, as in depictions of a jury systematically weighing evidence before declaring a defendant guilty or not guilty. Yet, Jenkin says, “We reason in a way that leads to belief formation or belief change in a completely unconscious way.” Elements of our unconscious minds drive our behavior and beliefs all the time, she says. We just aren't aware of it.



Take the marimba experiment. If people watch a xylophone-like instrument called a marimba being struck with a long, sweeping motion, they report hearing its tone for a longer time than if the instrument is struck abruptly. Yet the duration of the sound is identical.

“There’s this huge gap between the raw data that’s hitting our sensory organs—vibration on the eardrum or light on the retina, for instance—and what we experience,” Jenkin says. Our brains process, interpret, and store sensory input in networks we don’t fully understand and can’t access consciously, but that nevertheless inform our daily experiences and, by extension, our reasoning and beliefs.

Jenkin draws from literature for an example. The Jane Austen heroine of *Emma*, Emma Woodhouse, denies that she has feelings for Mr. Knightley. These unacknowledged emotions dictate her

behavior on more than one occasion. But for most of the book, Emma doesn’t see it and won’t admit it.

Growing up in Greenwich Village, Jenkin was fascinated by MC Escher’s visual illusions. “I’ve always been interested in how our minds work, and why we have the beliefs and perceptions that we do,” she says. After majoring in English and philosophy at Williams, it struck Jenkin that while she loved reading and analyzing literature, she wanted to apply critical thinking to the world at large, not just the worlds within novels.

In the graduate program in philosophy at Harvard’s Graduate School of Arts and Sciences, she immediately set out to narrow the divide between perception and reason.

“Most people, like Descartes, want to say that perception rules,” Jenkin says. “What we can see and touch conveys a kind of pure access to the world, whereas

**“We reason in a way that leads to belief formation or belief change in a completely unconscious way.”**  
—ZOE JENKIN

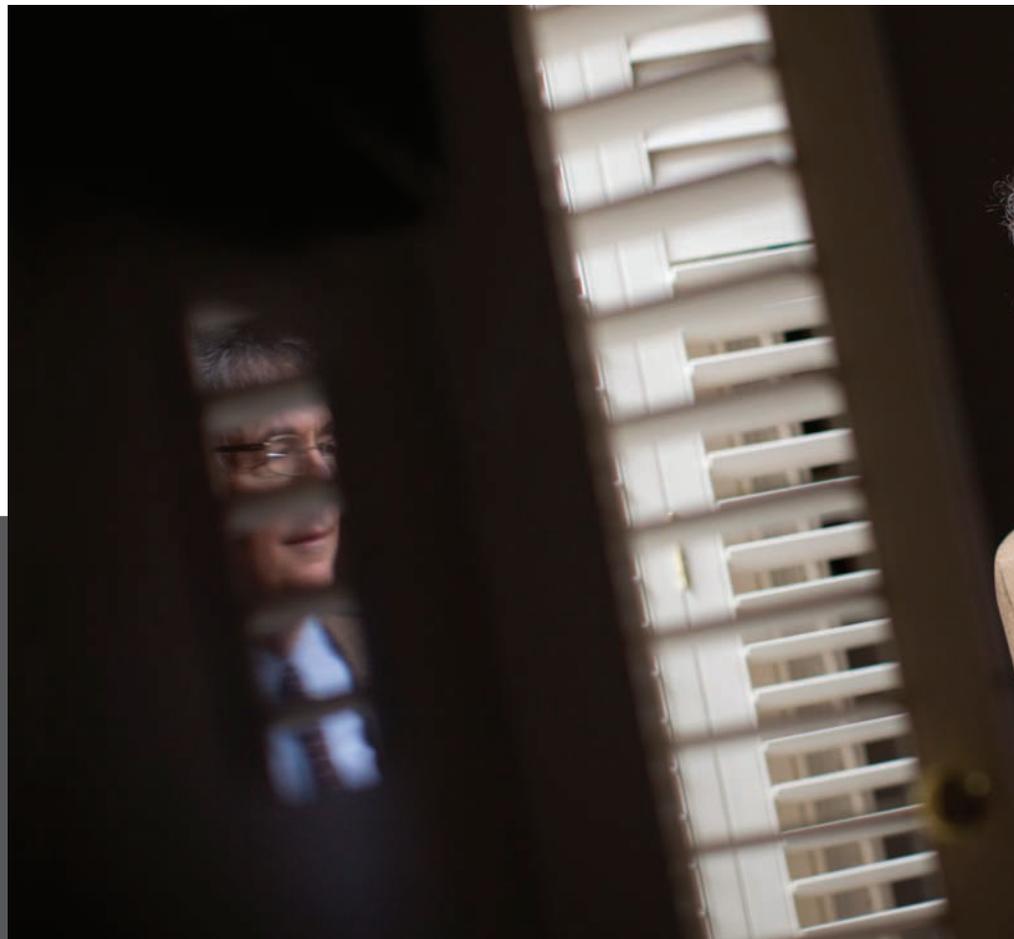
I want to argue that having a perceptual experience is like reasoning your way to a belief. It just all happens unconsciously.”

### SHIFTING BELIEFS

Gardner is no stranger to challenging the canon. He once published a book of essays written by his critics—then refuted each one. His initially controversial redefinitions of intelligence and creativity became one of the seminal ideas of the 20th century.

In *Changing Minds*, Gardner reviews his expanded notion of intelligence: Intelligence could entail a proficiency for spoken and written language; understanding the causal relationships and numerical information essential for logic and mathematics; forming and manipulating spatial representations in one’s mind; solving problems using one’s whole body or fine motor skills; being attuned to one’s innermost self; and working effectively with and influencing others.

**“To change minds, you have to have a different arsenal than you did back in the seemingly simple days where there was one nightly newscast and one newspaper that everybody read.”** —HOWARD GARDNER



He identifies “six Rs” that can shift people’s thinking: resources, reason, research, resonance, representational re-description, and real-world events. Incorporating input from experts, stories, graphics, and ideas framed to resonate with particular audiences are all ways, Gardner posits, to change minds.

Take the example of President Donald Trump. In Gardner’s view, Trump’s “Strongman” persona resonates deeply with some. “As he rightly says, he could shoot people on Fifth Avenue and no one would care. His core [of supporters] is immovable.”

If resonance drives people to vote for Trump, perhaps that same tactic can change voters’ minds, Jenkin counters. “Combat it with a different kind of resonance, such as another candidate who is just as emotionally compelling,” she says.

How do people decide what to believe about climate change? Jenkin says indi-

viduals typically encounter scientific evidence supporting climate change that doesn’t reflect something they can experience first-hand. “Maybe there’s one degree of global warming, but you don’t really feel that difference, even though you read news articles describing the impact it has around the world. People are predisposed to believe what matches their perceptual experiences—that the climate is not changing—even in the face of facts to the contrary,” she says.

Gardner thinks that presented with enough convincing evidence, climate change deniers might change their minds. It won’t happen overnight, though.

“One of the things I do believe about changing minds is that Damascene moments are very rare. Changes happen gradually. You’re not even aware of it,” he says. “At a certain point you find yourself saying something or doing something you haven’t done before and you say, ‘Gee, you know, this is not the way I was a few years ago.’”

So, what will Gardner never change his mind about?

His sacred cows are universities, professions, and the truth with a capital T. “You can never convince me that we should get rid of American universities—although most Republicans think we should because they are not good for the nation. You’re never going to convince me that professions are bad, because even though there are a lot of bad professionals, being able to give disinterested feedback on complicated information is a tremendous human advance.

“And if you give up on truth,” he says, “forget it.”

## EXPERIENCING RIGHT AND WRONG

Gardner still receives—and personally answers—hundreds of emails about multiple intelligences. He’s heading up national and international studies of higher education, and he lectures around the world—as we spoke, he scribbled tweaks to his slides for a talk he was scheduled to give in Milan—and thinks about how to give back for the “charmed” life he’s led in almost six decades as a student and then a scholar at Harvard. (His latest book, a memoir called *A Synthesizing Mind*, is slated to appear in August 2020.)

Since the 1990s, Gardner has directed The Good Project, aimed at making students more ethical citizens. He blogs frequently about education and ethics, he says, not necessarily to change minds, but to fling his ideas into the cosmos in the hope they’ll lead to some good.

Next fall, Jenkin will join the philosophy department at Washington University in St. Louis as an assistant professor. She, too, thinks about how we experience right and wrong. She believes that too often we’re on autopilot—not just in ways that allow us to navigate the physical world, but also through deeply rooted emotions that hijack the rational part of our brains. “Especially with important things like voting, it’s good to try to question ourselves,” she says. “Especially if we get a hint that something is going awry.”

“I feel that it’s very bad for people whose personal lives are comfortable to think everything is okay with the rest of the world,” Gardner says. “I do whatever little thing I can to nudge things in a positive direction.” He pauses, smiles—a rare hiatus from the rapid-fire barrage of ideas that constitutes a conversation with Howard Gardner.

“You know,” he says, “sometimes I do feel like I’ve moved the needle a bit.” 🍷





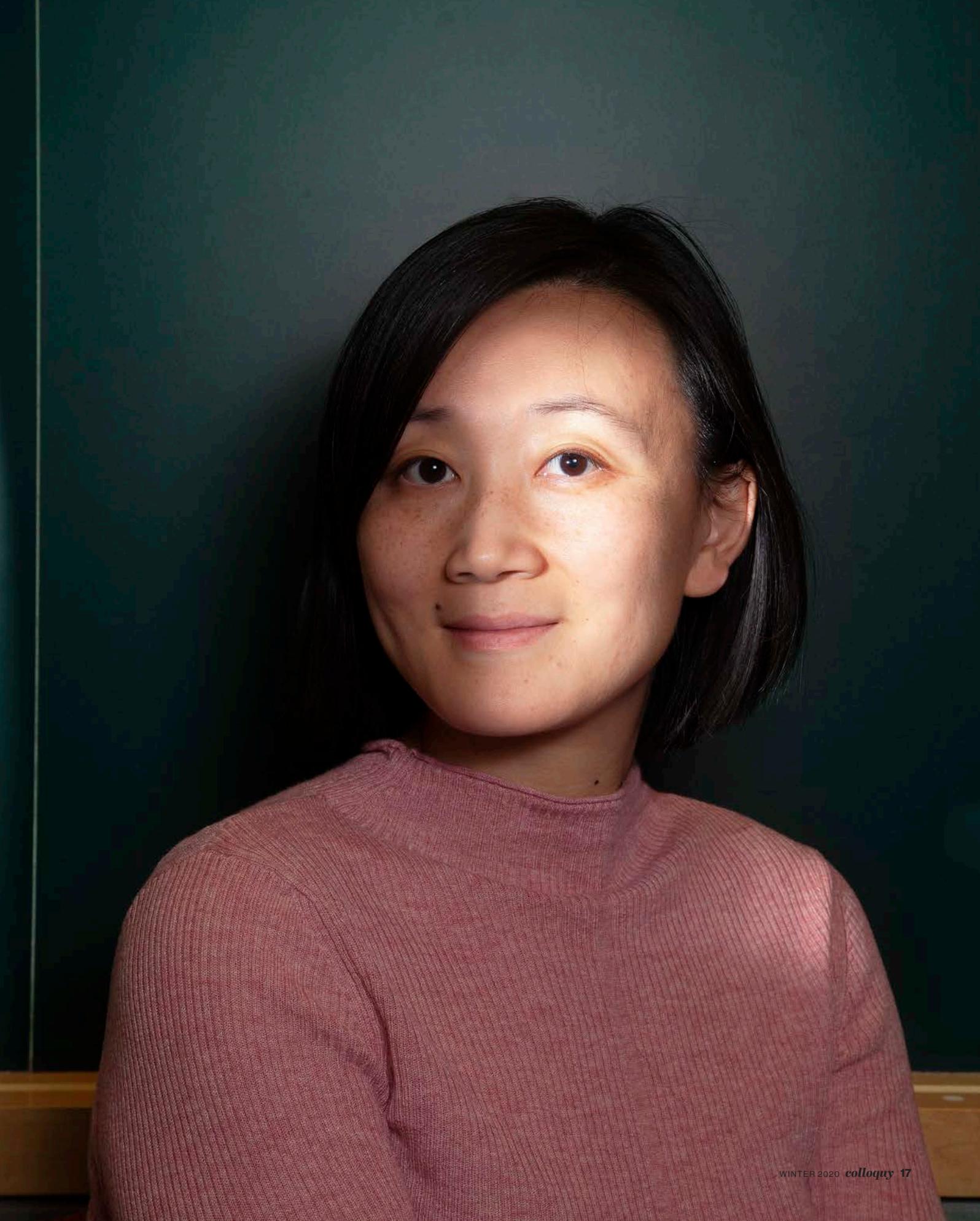
# LIFE ON MARS

LARISSA ZHOU IS WORKING TO BRING THE  
CRUNCH OF AN APPLE TO OUTER SPACE.

BY ADAM ZEWE PHOTOGRAPHS BY DANA SMITH

*Frances Brown*

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Imagine being cooped up on a Mars-bound spaceship for seven months with nothing to eat except freeze-dried meals that, once rehydrated, only vaguely resemble “real” food.

The sharp crunch of a fresh apple or the unctuous creaminess of a soft cheese, tasty reminders of planet Earth, drift farther away as the ship moves through the blackness of space.

Improving the dining experience for astronauts has become a mission for GSAS student Larissa Zhou, a materials science and mechanical engineering PhD candidate at the Harvard John A. Paulson School of Engineering and Applied Sciences. Zhou wants to understand what happens to food when enough water is removed that it becomes shelf stable.

“When you put water back into dehydrated food to rehydrate it, you don’t get the original mechanical properties back. If you remove the water from an apple, for instance, it won’t regain its crispiness when you rehydrate it,” said Zhou, who is based in the lab of David Weitz, Mallinckrodt Professor of Physics and of Applied Physics. “I want to understand, why can’t you get that crispy apple back? If we can understand that, maybe we can develop technologies to get around some of the damage that is caused during dehydration, or repair some of this damage, so you can rehydrate and restore the original texture of the food.”

### **IN THE KITCHEN**

For Zhou, working on a problem with implications for space travel is fitting—as a child, she dreamed of becoming an astronaut. Those lofty ambitions led Zhou to study physics as an undergraduate at Harvard. She gravitated toward engineering courses because she liked working with her hands.

But while she was content to solder wires or create MATLAB models, Zhou truly came alive in the kitchen.

“I thought about food all the time,” she said. “Cooking is very similar to science. You are doing an experiment, following a workflow, and then, in the end, you get to eat it. Did it taste good? You get feedback very quickly.”

During Zhou’s senior year, Harvard launched “Science and Cooking: From Haute Cuisine to the Science of Soft Matter.” She jumped at the opportunity to be a teaching fellow for a course that perfectly married her interests. She was dazzled by some of the best chefs in the world and surprised by how hard they worked to understand the mechanisms underlying their cooking. The experience inspired Zhou to consider a career that combined cooking and science.

“Cooking is both intellectual and visceral. We all have this very personal connection to food,” she said. “I’m not here to tell you what I think you should like. We all have our personal preferences, and they are informed by our background, culture, and history, and I think that is really cool. But with science, I can help you understand how to achieve your ideal as a cook.”

Her work as a teaching fellow led her into an internship with the Alicia Foundation, an organization devoted to technological innovation in cuisine, which was founded by Spanish chef Ferran Adrià in 2003.

There, she worked to develop a better understanding of the science behind French fries.

“I ate a lot of French fries,” she recalled. “I examined so many different potatoes and different ways to make French fries. I studied all the different stages, and I got to understand why I think McDonald’s has some of the best French fries, in terms of restaurants that do mass production. They have a workflow that involves double-frying with a freezing step in between.”

When frozen, the water left inside the fried potatoes expands and ruptures

some of the internal structure, she said. When that potato is fried again in the finishing step, the water turns to steam and fights its way out onto the surface, creating crevices that generate more golden, crunchy surface area, while preserving the soft, jammy quality inside the fry.

## ART AND SCIENCE

With her internship drawing to a close, Zhou began reaching out to Nathan Myhrvold, principal author of *Modernist Cuisine*, a critically acclaimed book that serves as a guide to the science of contemporary cooking. Her persistence paid off, and Zhou moved to the State of Washington to work as a food scientist for the follow-up book, a five-volume set on the science behind baking bread.

“Bread seems to be kind of simple. I think we all thought that—there are only four ingredients, it can’t be that complicated,” she said. “But in reality, it is extremely complicated. There is also an art to it. Every culture has its own version of bread, too. The breadth and depth and the history of bread is incredible.”

Zhou, along with a team of chefs, conducted experiments to understand the science behind each step in the bread-making process and test myths that bakers have passed down for generations.

For instance, it is common practice for many bakers to assume that over-proofed dough is ruined. But Zhou’s team conducted dozens of tests and found that, if a baker just re-kneads the dough and turns it out again, it will re-proof in exactly the same way.

They compared the taste and texture of dozens of breads made from both over-proofed and properly prepared dough and found no difference.

“People think the structure is damaged after the over-proofed bread collapses, but what actually collapses is the gluten,” she said. “Because the chemical bonds of gluten can be renewed if you just stick them together, through kneading the dough again, you can rebuild the structure.”

Along with her coworkers, Zhou took advantage of the Pacific Northwest’s natural beauty by skiing, hiking, and rock climbing. With a newfound love of the outdoors, she started buying freeze-dried meals for overnight hiking trips.

“As a food scientist, I thought that these packaged meals don’t taste that great. I could probably do better,” she said. “The technology of dehydrating and rehydrating food hasn’t experienced much technological change in decades.”

Determined to change that, Zhou decided to pursue a PhD. She is at the beginning stage of the project with the ultimate goal of quantifying the mechanical properties of food as they change during different stages of dehydration. While it’s easy to see these properties change during the process, making sense of those changes is more difficult, she said.

## EATING IN SPACE

Zhou is also focusing on farther-reaching challenges. She worked with a team of students from the University of Colorado, Boulder, and Cornell to design a greenhouse for Mars as part of NASA’s BIG Idea Challenge. Her major contribution was the design of a kitchen in the greenhouse so astronauts could turn their Martian harvests into meals.

“It seemed obvious to me to design a kitchen—do you expect the astronauts to just eat salad all the time?” she said. “I drew on the lessons I learned from world-class chefs. That may seem like an

uncommon jump—astronauts are not looking for a fine-dining experience—but who knows better how to bring out the best flavors, manipulate the most inedible ingredients, or utilize exotic ingredients than these chefs who have Michelin-starred restaurants?”

After winning the Most Innovative Award from NASA, Zhou and her teammates are now presenting their Mars greenhouse plan at conferences across the US. They are looking for opportunities to build and test prototypes of certain subsystems of the greenhouse.

While breaking new ground with her outer-space kitchen, Zhou continues to dig deeper into her PhD research. She recently won a prestigious NASA Space Technology Research Fellowship, awarded to only about 50 students a year, to fund her work.

“The most exciting aspect of the fellowship, for me, is that it shows that NASA is recognizing the importance of improved food technology to their long-term goals. They’re putting their money where their mouth is,” she said. “This opens the door for me and others who want to work on the really hard problems of eating in space.”

One major challenge she still faces is determining the right food system to examine. Food is inconsistent: one apple is strikingly different from another, so Zhou can’t use something that complex for her experiments. But she also can’t use a system that is so simple it won’t yield meaningful results. While there’s still a lot of work to be done, she draws inspiration from a future filled with possibilities.

“I am really excited for what the future holds. This is a really opportune time to be doing this research because of all the activity from NASA and private companies around going back to the moon and going to Mars,” she said. “I am excited that I can see a direct application of my research, but I also feel pressure because I want to produce something useful to aid in this global effort.” 🍀

**“IT SEEMED OBVIOUS TO ME TO DESIGN A KITCHEN—  
DO YOU EXPECT THE ASTRONAUTS TO JUST EAT SALAD  
ALL THE TIME?”** —LARISSA ZHOU



# Intangible Benefit

**WHETHER THEY ARE** targeting soybeans or dishwashers, computers or cheese, tariffs—once the minutiae of treaties—are making headlines. Traditionally levied to counter other economic factors, tariffs have become a weapon in our on-going trade wars with China, the European Union, and even Canada. But what may appear to be a simple mathematical

**BY CLEA SIMON**  
ILLUSTRATION BY  
ALEKSANDAR SAVIĆ

approach—raising the price on a foreign product to spur sales of a domestic alternative, for example—is anything but, says Xiang Ding, a GSAS PhD candidate in the business economics program at Harvard Business School. Indeed, the import tariffs now being imposed—or threatened—by the United States and its trading partners will likely have a wide array of unexpected outcomes.

Multi-industry corporations invest in ideas that benefit their global enterprise. But old-school tariffs are poised to impact their bottom line.

Tariffs, an import or export tax imposed between sovereign states, were first imposed by the United States in 1789, in the inaugural legislation of the then new country's first Congress. These taxes—or customs duties, as they are also known—may have helped raise money for a fledgling democracy and protected its new industries. Globally, tariffs were applied primarily to commodities, such as cotton and sugar, by countries with fewer trading partners and simpler trading relationships.

Ding, who grew up in Germany, Finland, Singapore, and Hong Kong before attending Princeton as an undergraduate, says that in the modern era, tariff application doesn't take into account the realities of the contemporary global marketplace. "Even 50 years ago, production was incredibly simplistic," says Ding. "Today, global trading patterns are much more intertwined, and production processes are more technologically intensive." The consumer items now being bought and sold—those soybeans or iPhones—are no longer the focal point of most businesses. Instead, it's the ideas—the technology—behind the products that have the most value.

"When we think about the 21st century, so much of the value added comes from the brains of the R&D workers, scientists, and managers," says Ding. As a result, contemporary companies look at a larger picture by increasing spending on activities categorized as "intangibles," such as research and software. Since 2000, the spending on intangibles by US manufacturing firms has outpaced spending on traditional forms of capital expenditures, such as production plants or machines. "In this new era, firm-wide resources that generate knowledge are supremely valuable," he says. "Trade plays an important role in this regard. A firm's export opportunities and the degree of competition generated by imports shape the firm's incentives to

acquire new knowledge and develop new technologies."

Over the same period of time, manufacturing has become more globally interconnected, with industrial production increasingly relying on a supply chain consisting of inputs, or parts, made in one country being assembled into a final product in another. "Production is incredibly linked," says Ding. "Tariffs may reduce competition in the industry they target, but they also raise the cost of parts produced elsewhere."

### BEYOND BORDERS

If this relatively new focus on intangible resources within firms and the increasing global complexity of manufacturing has impacted how effective a tariff can be, Ding's particular area of research—companies that span multiple industries—adds an additional complication. Multi-industry firms make up only 20 percent of US companies, but they are responsible for 75 percent of domestic manufacturing's gross output.

"It's fascinating that most of what we consume comes from a handful of multi-industry firms, like Amazon, Google, and Procter & Gamble," he says. "Take General Electric, for example, which operates in seemingly random industry segments, like aviation turbines and X-ray scanners." Many are familiar with the concept of economies of scale—that it is cheaper to produce more of any one thing—but Ding is looking at economies of scope, how the different divisions of these broad-ranging companies work together.

"The question I'm interested in is whether there's anything that weaves together the activities taking place within the different areas of these firms," he says. "Whether they have resources that allow them to reap cost efficiencies from their scope of operation."

As he sought to answer that question, Ding evaluated US Economic Census

microdata to investigate economies of scope. What he discovered and published in his most recent paper, "Intangible Economies of Scope: Micro Evidence and Macro Implications," is that the answers will have real-world ramifications.

"A key finding in my research is that intangible inputs generate cross-industry cost efficiencies, or economies of scope," he explains. "Regular, physical inputs do not." Steel bars, for example, can only be used in the product they were designed for. If a firm improves its IT infrastructure, all its products benefit. This cross-divisional benefit within a company—coupled with the global nature of the production chain and the outsized influence of multi-industry companies—contributes to a global economy that has become an increasingly intricate engine in the 21st century, reliant on many interdependent parts. Hitting any one of those parts with a blunt, outdated tool like a tariff is likely to have unforeseen consequences.

For example, an import tariff can reduce competition and help domestic companies gain market share, allowing for an investment in research and development. If technology developed for one product in a multi-industry company is found to be useful in another, unrelated area, the company may decide to roll it out more broadly. However, the same tariff could increase the cost of materials imported by the company, which would instead curtail investment in research and development. Instead of benefiting US companies, Ding believes that tariffs could have the opposite effect, a function of the complicated nature of contemporary trade.

"On the one hand, a tariff is making it more profitable to invest in research and development, because competition is lower," he says. "At the same time, it may increase the cost of production." Tariffs, originally designed to benefit wholly domestic enterprises focused on a single industry, now have contradictory effects

on these large multi-industry, multinational firms: Any benefit arising from an intangible investment rolled out across the company could be overshadowed by an increase in manufacturing costs in one area of the company. The choice? Discontinue investment in intangibles or pass the increased cost onto the consumer.

### **PAYING A PRICE**

Despite the fact that tariffs are often suggested as a primary way to regulate trade, alternatives do exist: Government subsidies offer a more targeted benefit to specific domestic industries. “It would be

more precise to subsidize, for example, steelmakers directly,” says Ding. “Some countries, like China, can do that, because they have the political will and provide trade protection for certain industries.”

Often, the rationale for tariffs is less about protecting domestic industries as to be punitive—to punish trading partners that will not agree to favorable terms. “What I fear is that sometimes the motivation behind the use of tariffs is not necessarily to promote a particular industry,” says Ding. “It has much more to do with underlying political motivations—both in terms of engaging in a dialogue with a

particular constituency at home and as a bargaining tool when it comes to the conduct of US policy abroad.”

Politically motivated or not, tariffs often lead to companies and ultimately consumers paying a price, despite the investment in intangibles, such as research and development. “US companies might end up being more profitable, and they might develop new ideas,” Ding says. “But it would be incredibly hard to generate research proving that tariffs were positive overall for the US consumer.”

“Ding’s work on such large multi-industry companies has revealed how a positive demand shock in some industries boosts productivity in other parts of the economies,” notes his advisor, Marc Melitz, the David A. Wells Professor of Political Economy. “And conversely, tariffs that hit just a few key sectors can have significant negative consequences that spill over to many other parts of the economy.”

For the global economy, the overall effect is likely to be uncertainty, a dangerous prospect, according to Ding. “With tariffs rapidly proposed and withdrawn, it becomes incredibly hard to gauge what future conditions might be,” he says. “This political and economic uncertainty could have a chilling effect on corporate investment in intangibles.” Smothering, in other words, the activities on which our modern economy is based.

Even as the current trade war threatens, Ding retains hope. “I’m optimistic that policymakers at the end of the day are sensible and rational creatures,” he says. “I’m also optimistic about the ingenuity of businesses to find alternatives.” As he points out, in economics, balance usually asserts itself. Developing countries could be poised to benefit as trade barriers go up between the US and China.

“If the US imports less from China due to tariffs,” he says, “that might promote growth in the neighboring Southeast Asian countries that so desperately need it.” 🍷

“Today, global trading patterns are much more intertwined, and production processes are more technologically intensive.” —XIANG DING





## STAR TURN

Former Harvard Horizons Scholar **Elisabeth Newton**, PhD '16, astronomy, headed up a group that discovered DS Tuc Ab, a 45 million-years-old exoplanet orbiting a star outside our solar system. Now an assistant professor of physics and astronomy at Dartmouth, Newton believes that the discovery can provide insight into how Earth and the solar system developed. *The Astrophysical Journal Letters* published news of the find soon after she joined Dartmouth.

## ALUMNI UPDATES



**Rachel Croson**, PhD '94, economics, was named executive vice president and provost of University of Minnesota, effective March 2020. In making the announcement, the University of Minnesota lauded her as an accomplished academic leader who brings “an extraordinary breadth of talent, experience, and strategic acumen.” Croson is currently the dean of the College of Social Science at Michigan State University and a Michigan State University Foundation Professor of Economics.



**Hanna Holborn Gray**, PhD '57, history, delivered the 2019 Kathleen Cannon Lecture at the University of Notre Dame in October. Gray, the Harry Pratt Judson Distinguished Service Professor Emeritus of Early Modern and European History and ninth president of the University of Chicago, gave a lecture titled “Measuring the Height of Higher Education.” The Kathleen Cannon, O. P., Distinguished Lecture Series brings “extraordinary women from both within and beyond the academy to the Notre Dame campus.”



**Mikhail Kats**, PhD '14, applied physics, received the Institute of Electrical and Electronics Engineers Photonics Society Young Investigator Award for his “contributions in the fields of nanophotonics and optical materials.” The honor is awarded to researchers under 35 who have made “outstanding technical contributions to photonics.” Kats is associate professor and Dugald C. Jackson Faculty Scholar in the Department of Electrical and Computer Engineering at University of Wisconsin–Madison.



**Cyril M. Kay**, PhD '56, medical sciences, received an honorary doctorate of science from the University of Alberta for his “transformative impact in local, national, and international communities.” Professor emeritus of biochemistry at the University of Alberta, Kay is a leading protein biochemist who co-founded the Medical Research Council of Canada Group in Protein Structure and Function. He is also a fellow of the Royal Society of Canada.



**Alexander More**, PhD '14, history, was appointed associate professor in the School of Health Sciences at Long Island University's Brooklyn campus, where he also directs the Honors College. More researches the impact of climate change on population health and the economy at LIU and at Harvard's Initiative for the Science of the Human Past and at the Climate Change Institute at the University of Maine.



2019 Centennial Medalist **Joseph Nye**, PhD '64, government, recently published *Do Morals Matter? Presidents and Foreign Policy from FDR to Trump*. One of the world's leading scholars of international relations, Nye considers the role of ethics in US foreign policy during the post-1945 era, rating each president on three ethical dimensions: their intentions, the means they used, and the consequences of their decisions.



**Morgan Sheng**, PhD '90, medical sciences, returns to the MIT faculty as a professor of neuroscience after working for more than 10 years at Genentech, where he was vice president of neuroscience. Sheng researches mental illness and neurodegenerative disease from a genetic and biological perspective. In 2019, he was also appointed to Prevail Therapeutics' board of directors. Prevail researches gene therapies for neurodegenerative diseases.



**Matthew Stephenson**, PhD '03, government, was appointed Eli Goldston Professor of Law at Harvard Law School. An expert in anticorruption law, Stephenson delivered a lecture marking his appointment titled “Corruption and Anticorruption,” in which he commented that the idea of corruption as a fundamental problem is not universally accepted. HLS Dean John Manning said Stephenson “adds so much to the intellectual life of this school.”

AUTHOR PROFILE

## UNDERSTANDING THE PRESENT

*Sophia Rosenfeld is Walter H. Annenberg Professor of History at the University of Pennsylvania, where she teaches European intellectual and cultural history. In her latest book, Democracy and Truth, Rosenfeld explains how lessons from the past can inform conversations about politics today.*

**How did you come to write *Democracy and Truth*?**

Like many other people, I became addicted to the news after the last presidential election. At first, I thought I was procrastinating, but the more I thought about it, the more it seemed that what I'd worked on for several decades as a scholar was converging with what was happening in the world. Writing the book was a response to current events, but I do believe history, in both its familiarity and its strangeness, allows us to understand the present, to come to terms with the world we live in now.



Sophia Rosenfeld

**Is truth important to democracy, or how did the idea of truth become inextricably linked to the concept of democracy?**

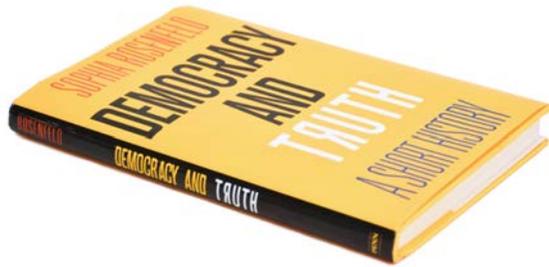
That's a critical question. At least in principle, truth is a key component of democracy. Democracy has to be built on a foundation of truth produced through a collective mechanism, and democracy has to help generate truth. The complexity, as I try to explain in the book, comes from the fact that while the founders of early forms of democracy stressed the importance of truth, no one was given sole authority to define what that truth was. No one institution, no one person, no one method, which meant, of course, that truth was always going to be a little up for grabs, worked out in a conflictual way. The end result is that the pursuit of truth is always both really important and a source of conflict, with a potential for destabilizing democracy.

**Often, we expect facts and truths to be the same thing. But can facts also be up for interpretation?**

Anyone can show you that what counts as a basic fact, for example, an unemployment rate, depends upon all sorts of preconceptions—what work is, who should be working, what should be paid and valued in monetary form—which can make facts appear anything but objective. On the other hand, if we can't agree on some basic facts as starting points, it's hard to have any meaningful public debate. We need to agree whether the unemployment rate is going up or down as a baseline for then disagreeing about labor policy, for example.

**What do you want readers to take away from the book?**

The danger of a book like this is that it essentially preaches to the choir. Am I changing people's minds? I hope so, but I don't think I can be so presumptuous. I might, though, be able to offer slightly better arguments for people who want to explain what is or isn't distinctive about the present and what can be done about the state of political untruth today. Overall, I hope that I can provide some food for thought beyond all the terrifying headlines.



## EXCERPT

Excerpt from *Democracy and Truth: A Short History*

This book is intended as a short history in two senses. First, the whole amounts to only about two hundred pages. Second, the timeframe has been radically circumscribed; it covers not the entire story of democracy going back to the ancient world but rather its modern manifestation since the eighteenth century. The central premise is that a historically particular and even peculiar relationship between democracy and truth took root roughly two hundred fifty years ago on both sides of the Atlantic, and this relationship has shaped political life into the twenty-first century—in the United States and with important variations, in capitalist democracies around the globe. To understand the apparent crisis in truth today requires grappling with this history.

What this glance backward reveals, first and foremost, is that truth under the conditions of modern democracy has always been fragile. Truth—meaning doubly the opposite of lies (in moral terms) and the opposite of mistaken beliefs and erroneous information (in terms of epistemology)—has been touted as a key democratic value from the get-go. Republics and, later, modern democracies have long prided themselves on both building on and generating truths in ways that constitute a striking departure from absolutist rule, whether in the mold of King Louis XIV or in the style of the modern dictator. That's why the seemingly brazen flourishing of misinformation and falsehoods in public life now can strike us as so shocking. And yet, democratic truth has never had any precise contours or content. Even if honesty, transparency, and factuality have, since the Enlightenment, been held in high regard as political values, truth has generally been understood not as dogma, but as the product of multiple constituencies in an inegalitarian world pursuing it according to varied methods and as continually open to fresh challenges and revision. No one can call all the shots. That means truth has also always been precarious, not to mention wrapped up in social strife along class, racial, religious, and educational lines. It has also been regularly subject to attempted hijackings—from above and from below, from the left and from the right—as different cohorts have worked hard to try to gain a monopoly on it. This book situates what is happening around us right now in this historical framework—a short one, indeed, but not so abbreviated and present-minded that we can't gain some necessary perspective.

## RECENTLY PUBLISHED

Below are recently published books written or edited by GSAS alumni.

**Richard Bell**, PhD '06, History, *Stolen*, Simon & Schuster, 2019

**Erika Dreifus**, PhD '99, History, *Birthright: Poems*, Kelsay Books, 2019

**Nigel Gould-Davies**, PhD '03, Government, *Tectonic Politics: Global Political Risk in an Age of Transformation*, Brookings Institution Press/Chatham House, 2019

**Dorinne Kondo**, PhD '82, Anthropology, *Worldmaking: Race, Performance, and the Work of Creativity*, Duke University Press, 2018

**Jane H. Hong**, PhD '13, History, *Opening the Gates to Asia: A Transpacific History of How America Repealed Asian Exclusion*, University of North Carolina Press, 2019

**Joseph S. Nye, Jr.**, PhD '64, Government, *Do Morals Matter? Presidents and Foreign Policy from FDR to Trump*, Oxford University Press, 2020

**Jonathan Rosenberg**, PhD '97, History, *Dangerous Melodies: Classical Music in America from the Great War through the Cold War*, W. W. Norton, 2019

**Max Saunders**, AM '80, *Imagined Futures: Writing, Science, and Modernity in the To-Day and To-Morrow Book Series, 1923–31*, Oxford University Press, 2019

**Jay M. Pasachoff**, PhD '69, Astronomy (with Roberta J. M. Olson), *Cosmos: The Art and Science of the Universe*, The University of Chicago Press, 2019

●●● **Would you like your book considered for inclusion?** Send it to Colloquy, Graduate School of Arts and Sciences, Harvard University, 1350 Massachusetts Avenue, Suite 350, Cambridge, MA 02138. Questions? Email [gaa@fas.harvard.edu](mailto:gaa@fas.harvard.edu).



# Continuing Education

RECONNECT WITH YOUR INTELLECTUAL ROOTS  
AT GSAS ALUMNI WEEKEND 2020!

## PHYSICS REUNION: FRIDAY, APRIL 3, 2020

Join fellow alumni for a Department of Physics reunion. Meet current students and faculty and learn about the latest breakthroughs in the field.

## ALUMNI DAY: SATURDAY, APRIL 4, 2020

Attend engaging academic presentations and learn how Harvard faculty and GSAS students are collaborating on innovative projects that advance research across the disciplines. Alumni Day is a great opportunity to engage with fellow alumni in your field and others while you participate in scholarly presentations.

This year, data scientist and mathbabe.org blogger Cathy O'Neil, PhD '99, will deliver the keynote address. During her remarks, O'Neil will share her unique perspective on the ways we allow algorithms to influence our lives, what makes an algorithm accountable, and what academic institutions and individuals can do to mitigate algorithmic bias and harm.

## HARVARD HORIZONS: MONDAY, APRIL 6, 2020, 4:30 P.M.

Each year, eight outstanding PhD candidates from a variety of fields deliver brief, compelling talks about their research from the Sanders Theatre stage. Don't miss this opportunity to hear the next great idea in your field!

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and register:

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AlumniDay](https://gsas.harvard.edu/AlumniDay)

## AND DON'T MISS THESE SPRING EVENTS

Palm Beach, Florida:  
February 10, 2020

Miami, Florida:  
February 11, 2020

Baltimore, Maryland:  
March 3, 2020

Philadelphia, Pennsylvania:  
April 14, 2020

••• For more information,  
visit [gsas.harvard.edu/alumni](https://gsas.harvard.edu/alumni)



**Cristina Popa PhD '16** came to Harvard intrigued by particle physics. Today, she works as a quantitative researcher at Two Sigma. The training she received from faculty mentors and the freedom to sample different subjects at GSAS led to a career she loves. "The problem-solving aspect of my job is very similar to physics research," she says. "I read papers, come up with mathematical models, and run computer simulations to test them." A native of Romania, Popa gives annually to the Graduate School Fund. "I had such a great opportunity to follow my dreams and pursue my interests. I want to do my part to make it possible for other students to explore careers they're passionate about and realize their potential."

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