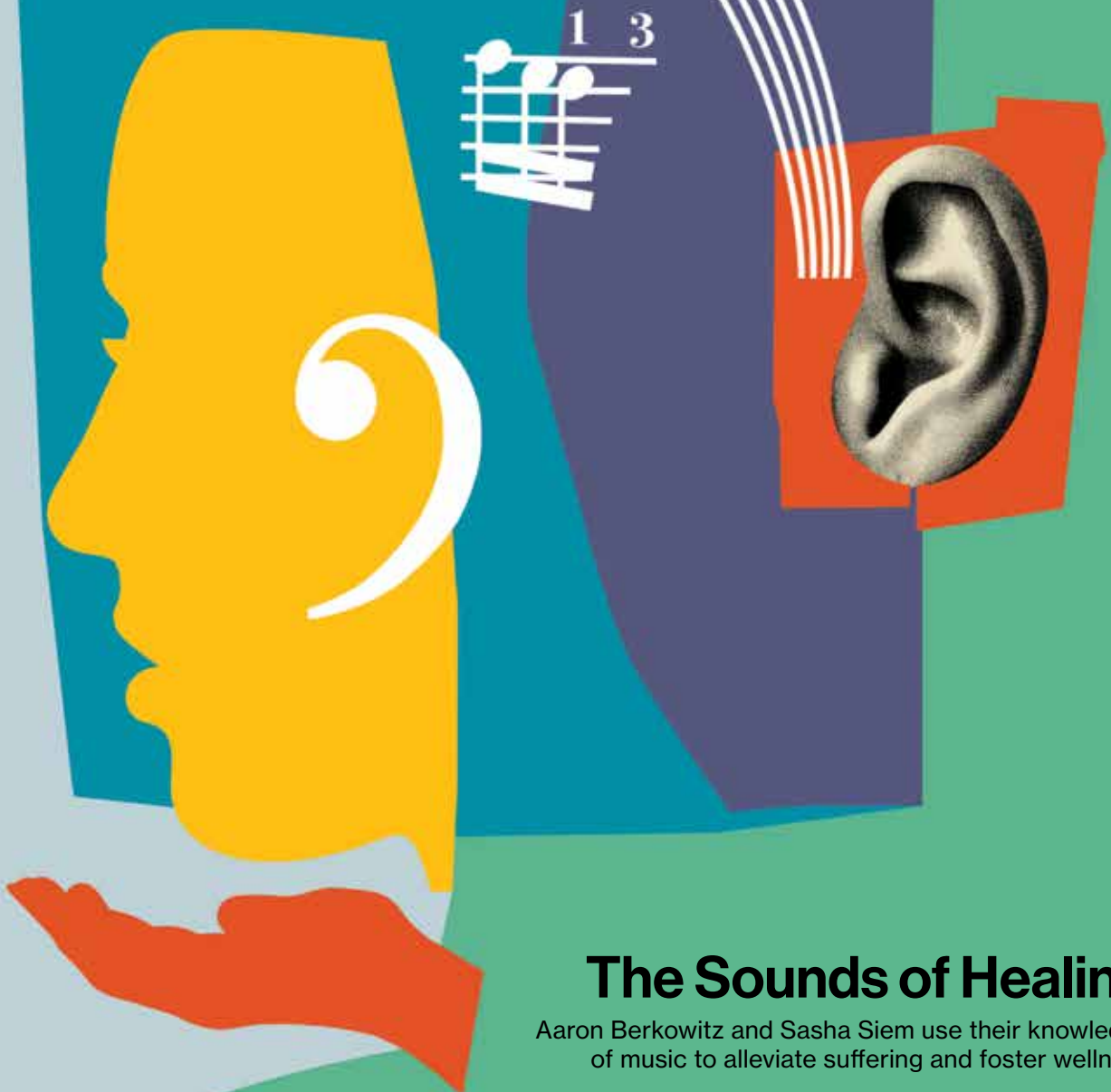


# *colloquy*

HARVARD KENNETH C. GRIFFIN GRADUATE SCHOOL OF ARTS & SCIENCES



## **The Sounds of Healing**

Aaron Berkowitz and Sasha Siem use their knowledge of music to alleviate suffering and foster wellness

**to note**



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# colloquy

WINTER/SPRING 2024

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●●● **Contact Colloquy:** Send your questions and comments about the magazine to [gsas.comms@fas.harvard.edu](mailto:gsas.comms@fas.harvard.edu). We'd love to hear from you!



#### AT THE START OF THE ACADEMIC YEAR

in September, no one could have predicted the devastating events and challenges abroad and in our own backyard. From students to alumni to staff—indeed, everyone in our orbit—this has been

a challenging time in myriad ways. Our focus continues to be on students, to ensure that they have the resources they need to navigate this moment. This includes a recommitment to the values that enable the effective discourse so necessary to our shared academic work and to the work of intellectual leadership our students will undertake in the future.

The year ahead holds great promise. We look forward to our annual Harvard Horizons Symposium taking place on April 9 at Sanders Theatre. Selected by the Harvard Horizons Faculty Fellows, the research projects of this year's eight scholars include the effects of maternal incarceration on early childhood well-being, environmental contamination, and workplace fatigue. I hope you will join me in celebrating these accomplished students either in person or via live stream later this spring.

More than ever, effective advising, including resources leveraged by these scholars, is essential to our students' success at Harvard and beyond. Our ongoing work to elevate that critical aspect of the student academic experience with the findings of the Report of the GSAS Admissions and Graduate Education (GAGE) Working Group continues through the year. Efforts will include a competitive increase in our financial aid package beginning in the next academic year. I invite you to campus to connect and witness firsthand the exceptional work happening here every day; there are many opportunities to join me in Cambridge.

—EMMA DENCH  
DEAN

## colloquy

WINTER/  
SPRING 2024

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#### LETTERS TO THE EDITOR

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

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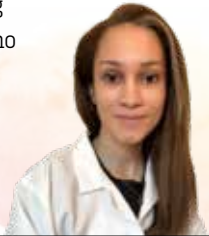


Some of the Harvard Kenneth C. Griffin Graduate School of Arts and Sciences' remarkable alumni and students speak about their work, its impact, and their experiences at the School.

### A STANDARD OF CARE

One day during my time at Harvard Griffin GSAS, I was coming home from the lab and saw there was a film screening at the Science Center. It was a new documentary on people living with HIV/AIDS in New York in the 1980s. When I watched the film, I was moved by how the staff at the hospitals in New York took care of these patients when they needed it most. It reminded me why I wanted to go into medicine. It's about getting the research from the lab to those who need it. At the end of the day, it's about people.

KIMBERLY LOVIE MURDAUGH, SM '13,  
Engineering Sciences



### THE PEBBLE AND THE AVALANCHE

I am fascinated by the question of why we, as humans, have trouble understanding the need to change. It's a question that is fundamental to my work on climate. Most people under 30 look at climate change and go, "Oh my God, planetary emergency, why aren't we doing anything? Why aren't we mobilizing the entire economy and shifting everything we have?" And yes, that is what we need to be doing, and it's crazy that it's not happening now. We need an avalanche of change if we're going to shift things—and that means all of us doing as much as we can, together. You never know which pebble is going to drive the avalanche.

REBECCA HENDERSON, PHD '88  
Business Economics



### BRIDGING TRADITIONS

My family immigrated from China, leaving behind their social support and against so many odds. With tremendous support from [them] I graduated from the College in 2019 and returned to Harvard Griffin GSAS in 2021 to pursue an MD-PhD in the history of science. I am profoundly grateful to have the opportunity to practice both history and medicine. Furthermore, I am deeply excited to work toward integrating biomedicine and traditional medicine, serving as a bridge between Eastern and Western traditions. This was my grandmother's greatest wish.

EANA XUYI MENG, MD-PHD STUDENT  
History of Science



### BEYOND THE END OF HISTORY

When I was writing *The End of History*, I did not realize the modern state—one that is impersonal, in which public officials are oriented toward public interest and not toward their private benefit—was the most difficult to construct given the human proclivity to support friends and family. Few countries have successfully created a modern state. It's very hard to achieve.

FRANCIS FUKUYAMA, PHD '81  
Government



••• Read the full profiles and find many more at [gsas.harvard.edu/news/topic/voices](https://gsas.harvard.edu/news/topic/voices).

## GAGE-ing a Student-centered Approach to Graduate Education

In 2022, the Harvard Kenneth C. Griffin Graduate School of Arts and Sciences launched the GSAS Admissions and Graduate Education (GAGE) working group, a committee of faculty and administrators convened to outline what PhD education should look like in the 21st century. Last September, after months of intensive data gathering, analysis, and consultation, the group released its final report.

Part of the overall strategic planning process of Harvard's Faculty of Arts and Sciences (FAS), the GAGE report is a comprehensive and data-driven document that considers advising, teaching, employment outcomes, institutional finances, and equity, diversity, inclusion, and belonging. "We'd begun to formulate a public philosophy of a student-centered approach to graduate education," says Harvard Griffin GSAS Dean Emma Dench, chair of the working group. "The FAS strategic planning process and the GAGE project gave us a formal platform that pushed and elevated our efforts so that we could do a more comprehensive job."

Work on the report was inspired by the recognition that graduate education faces unprecedented challenges and opportunities, such as the changing academic job markets, increasing competition with peer institutions,

rising costs and pressures of pursuing a PhD, and growing expectations and demands for teaching excellence. Its top-line recommendations include developing clear advising requirements, updating curricula in response to the changing job market, and conducting a holistic review of applicants based on their potential for excellence and their varied voices and perspectives.

Dench says she hopes the GAGE report will inspire departments to simply pick a recommendation and try something new. "There is a huge raft of practical advice and actual measures that departments could enact tomorrow if they wanted to," she says. "I hope the report will make departments feel good about the measures

they're already taking and help them to build on those best practices."



●●● Read more about the GAGE report at [gsas.harvard.edu/news/gage-ing-student-centered-approach-graduate-education](https://gsas.harvard.edu/news/gage-ing-student-centered-approach-graduate-education).

### FROM THE COLLOQUY PODCAST



***"Genetics cannot explain the rapid rise in obesity that we've seen over the past several decades. It just doesn't change that quickly."***

— PROFESSOR SARA NAOMI BLEICH, PHD '07, on the *Colloquy* podcast: [gsas.harvard.edu/news/colloquy-podcast-why-were-obese-and-what-we-can-do-about-it](https://gsas.harvard.edu/news/colloquy-podcast-why-were-obese-and-what-we-can-do-about-it)



# A Milestone in Quantum Computing

A team of Harvard Quantum Initiative researchers led by Professor **Mikhal Lukin** and including PhD student **Dolev Bluvstein** has created the first programmable, logical quantum processor—a quantum computing breakthrough.

In a December 2023 paper published in the journal *Nature*—of which Bluvstein was the first author—Lukin’s group reported that they had realized a processor capable of encoding up to 48 logical qubits and executing hundreds of logical gate operations, a major improvement over previous efforts that could demonstrate only one or two qubits and one gate operation.

The system is the first demonstration of large-scale algorithm execution on an error-corrected quantum computer, heralding the advent of early fault-tolerant, or reliably uninterrupted, quantum computation.

The work was performed in collaboration with Markus Greiner, Harvard’s George Vasmer Leverett Professor of Physics; colleagues from MIT; and QuEra Computing, a Boston company founded on technology from Harvard labs.

●●● **Learn more about the discovery at**  
[news.harvard.edu/gazette/story/2023/12/researchers-create-first-logical-quantum-processor](https://news.harvard.edu/gazette/story/2023/12/researchers-create-first-logical-quantum-processor).

## PARKES IS NEW DEAN OF SEAS



Computer scientist **David C. Parkes** last October became the fourth dean of the Harvard John A. Paulson School of Engineering and Applied Sciences (SEAS). A faculty member at Harvard for over twenty years, Parkes focuses on the intersection of artificial intelligence (AI), machine learning, and economics.

As a founding codirector of the Harvard Data Science Initiative, Parkes has also helped launch innovative new programs that have strengthened connections across the University. In his new role as SEAS dean, Parkes aims to expand the School’s leadership in key areas like AI and sustainability while building a collaborative, inclusive community on campus.

“I want SEAS to be a welcoming place where everyone feels comfortable and at home—able to be their best, to learn, and to contribute knowledge,” Parkes said last fall. Dean Parkes said he planned to continue to teach CS 136, his algorithmic economics course that typically attracts upward of 200 students.

●●● **Read more about the leadership change at SEAS at** [news.harvard.edu/gazette/story/2023/08/david-parkes-named-dean-of-paulson-school-of-engineering-and-applied-sciences](https://news.harvard.edu/gazette/story/2023/08/david-parkes-named-dean-of-paulson-school-of-engineering-and-applied-sciences).

## DEANS TO STEP DOWN

**Douglas W. Elmendorf**, PhD ’89, dean of Harvard’s John F. Kennedy School of Government and **Bridget Terry Long**, PhD ’00, dean of Harvard’s Graduate School of Education (HGSE) both announced in recent months that they will step down from their leadership posts at the end of the 2023–2024 academic year. In his eight years as dean, Elmendorf worked with colleagues to transform the Kennedy School’s campus and strengthen its efforts to improve public policy and leadership through teaching, research, and practice. Long led HGSE through the pandemic, as schools, teachers, and administrators sought new methods of teaching and learning. Both will remain on the faculties of their respective Schools.



## EXCELLENT ESSAYS



Writer and curator **Tai Mitsuji** and seismologist **Thomas Andrew**

**Lee** were named winners of the 2023–2024 Bowdoin Graduate Prize last fall. A PhD student in the history of art and architecture, Mitsuji won the prize for essays in the English language for his piece, “Manet’s *Barricade* was a barricade,” while Lee, a student in earth and planetary sciences, took the natural sciences prize for his work, “Back to the Future: Gaining New Perspective on Hurricanes through Data Rescue and Environmental Seismology.” Established in 1791, the Bowdoin Prizes recognize essays of originality and high literary merit written in a way that engages both specialists and nonspecialists. Each winner of a Bowdoin Prize receives a cash award of \$3,500, a medal and a certificate, and his or her name is printed in the Commencement program.



# FROM SLAVERY TO SUBURBIA

IN HER FORTHCOMING BOOK, *NO MORE AUCTION BLOCK FOR ME: AFRICAN AMERICANS AND THE PROBLEM OF PROPERTY*, **SHIRLEY THOMPSON**, PHD '01, EXAMINES THE LEGACIES OF SLAVERY FOR AFRICAN AMERICAN ENCOUNTERS WITH PROPERTY AND OWNERSHIP. AN ASSOCIATE PROFESSOR AND ASSOCIATE CHAIR OF AMERICAN STUDIES AT THE UNIVERSITY OF TEXAS AT AUSTIN, THOMPSON SAYS THE NOTION OF BLACK PEOPLE AS PROPERTY IS DEEPLY EMBEDDED IN THE CULTURAL, POLITICAL, AND LEGAL DNA OF THE UNITED STATES.

## **How did the concepts of race and property become interwoven?**

Racial slavery. The commodification of Africans and their descendants, their transportation across the Atlantic as commodities, and their sale into slavery in the Americas all yoke the concept of blackness as a racial category together with status as an article of property. It becomes institutionalized in the mid-1600s in Virginia with a series of race-based laws that binds laborers of African descent to their masters for life—and binds their children and their children's children as well. Then, in the constitutional period, enslaved people are classified as three-fifths of a human being and consigned to the status of property in the other two-fifths of their body.



# ***“Enslaved people are classified as three-fifths of a human being and consigned to the status of property in the other two-fifths of their body.”*** —SHIRLEY THOMPSON

In practice, this dichotomy is drawn on selectively to reinforce white supremacy throughout US history. For example, in March 1857, United States Supreme Court Chief Justice Roger B. Taney writes for the majority in *Dred Scott v. John Sanford* that Blacks have always been “treated as an ordinary article of merchandise and traffic.” Therefore, they “had no rights which the white man was bound to respect.” It’s that history, the legacy of that status, that I want to begin to unpack in Black institutional culture, theorizing, and literary works in the aftermath of slavery.

## **How have the legacies of slavery influenced African American encounters with property and ownership since abolition?**

One of the institutions I’ve been studying is the African American life insurance company. Black people were considered too risky to insure. You can understand why. They were faced with white supremacist violence—lynching, rape—as well as a lack of access to health care. So you could do a very “objective” analysis of lifespans in this period and come up with a calculation that valued whiteness and white middle-class maleness, in particular, and devalued people who didn’t measure up to that standard.

African American companies grow out of informal mutual aid societies and eventually transform themselves into corporate entities, offering life insurance to the community. This is an example of Black capitalism—African Americans trying to build institutions that will allow them to tap into the economic potential of financial markets. These Black institutions begin to build themselves up until they eventually look like mainstream insurance companies.

In the process, though, they begin to diverge from the mutual care model and reinforce some of the same violence of commoditization of human life, making people fit the numbers in ways that echo the same logic of enslavement. There’s a mixed legacy there.

## **Without historicizing, what are some of the ways in which race and property continue to be interwoven in our society and our culture today?**

It is difficult not to historicize when we look at real estate markets and the way the 2008 mortgage crisis disproportionately devastated people in Black communities whose wealth was bound up in real estate and who were targets of subprime lending. Think about suburbanization in the 1940s and 1950s. That process created immense wealth for white property owners while throwing up barriers for Black access to mortgages and homes. It was part of a longstanding process that keeps Blacks in certain regions and then devalues the property in those spaces.

We can track this process across any US city. Blacks move into a neighborhood, and whites panic and flee, setting in motion a deflation of property values until developers target the area for revitalization. It’s a series of cycles, right?

## **How do those in the Black community employ music, art, and literature to assert their dignity in the face of objectification?**

Think of the recording industry, for instance. Throughout the 20th century, it tries to capture Black speech, the Black singing voice, Black music, Black dance, or other kinds of expressive culture and make them available to the market. None of it puts an end to the fugitive

aspects of Black music in a place like New Orleans, for example—the second-line bands, and the jazz funerals, which are directly linked to the old mutual aid societies. That music continues to function in nonmarket ways in these communities of care and support in ways that fly under the radar of the music industry. That continues to this day. You have a strong tradition of New Orleans funk, R&B, and then hip hop and bounce music that has recently become popular but had functioned in New Orleans long before its national popularity as a kind of lingua franca and spiritual salve for ordinary people. 🍷

## **CURRICULUM VITAE**

### **University of Texas**

Associate Professor of African and African Diaspora Studies  
2010–Present

Associate Professor of American Studies  
2009–Present

Assistant Professor of American Studies  
2001–2009

### **Harvard University**

Instructor, History and Literature  
2000–2001

Teaching Fellow, History and Literature  
1998–2000

### **University of Southern Maine**

Adjunct Instructor, Women’s Studies  
Spring 1998

### **Lewiston–Auburn College**

Adjunct Instructor, Humanities  
Fall 1997

# The Sounds of Healing

**Sasha Siem** and **Aaron Berkowitz** got their PhD in music from Harvard Griffin GSAS. A composer, singer-songwriter, and teacher, Siem uses music to connect people to their inner lives and to help them cultivate a sense of wholeness. A medical doctor and professor at the University of California San Francisco, Berkowitz's knowledge of ethnomusicology and anthropology informs his efforts to bring neurological education to some of the world's poorest countries. Both put their education to work as healers helping to mend a wounded world.





THE SOUNDS OF HEALING

# Breaking the Wave

SASHA SIEM TRANSCENDS THE BOUNDARIES  
BETWEEN MUSIC, SPIRITUALITY, AND HEALING

By Paul Massari



# It

**IS 2019—BEFORE THE** pandemic, before the war—and Sasha Siem stands tall and strong on the rooftop of a building in Jerusalem. It is the nexus of three of the world's great religious traditions—Judaism, Christianity, and Islam—a place of great wisdom and community; a place of great contention and suffering. Bathed in the city's warm sunlight, she sings to a world in conflict with itself:

*We are holey, we are wholey, we are holy,  
There are holes in the day and in the dark.*

“Physically and geographically, Jerusalem embodies a split and also the potential for holiness—in the sense of deep respect for all of humanity,” Siem says. “That’s why we chose to shoot the video for the title track of my album *wHOLeY* there. It felt like a prayer in a way; like putting a beam of energy into the heart of a city that has, of course, represented so much for so long.”

An award-winning composer who has worked with the London Symphony Orchestra, the Royal Opera House, and the London Philharmonic, Siem, PhD '11, now focuses her talents on writing and performing songs that engage the spirit and foster healing at a time of fragmentation and strife. In many ways, she's been on this path her whole life. But the journey took a crucial turn during her time at the Harvard Kenneth C. Griffin Graduate School of Arts and Sciences (GSAS).

## Finding Her Voice

The daughter of a Christian father of Norwegian origin with possible connection to the indigenous Sami people of the north, and a mother descended originally from Eastern European Jews but born in South Africa and raised in Britain, Siem began training as a classical pianist and cellist when she was only 5 years old. When she was 11, Siem's mother gave her a book of Maya Angelou's collected poems. Siem closed the door to her room—a “sacred space” where a sensitive pre-teen challenged by dyslexia could retreat from a world that often felt overwhelming—and started flipping through the book. She paused at one poem in particular—“I Know Why the Caged Bird Sings.” It spoke to her. She spoke back.

“I just started singing the lines of the poem as I played the piano,” she says. “There was something almost mystical about it. I was swept up by the theme of freedom, which has since run through my work and my life.”

The prospect of raising her voice in public terrified Siem, who had adopted shyness as a self-protective mechanism. She focused on composition and study, obtaining her undergraduate musicology degree from the University of Cambridge. “Through the lens of music, I explored the physics, history, and philosophy of sound,” she says. “It was a holistic approach. I was excited to keep going, so I came to Harvard Griffin GSAS to study for my PhD.”

Siem had loved her deep dive into musicology and enjoyed the composing she had done, but the intellectualism of her work increasingly weighed on her. She longed for the innocent, soulful creativity that inspired her to bring poetry and music together as a child. Harvard turned out to be the perfect place to bring her life back into balance. She continued her studies of musicology, traveling to Milan, Italy, to examine illuminated manuscripts of the ancient Ambrosian hymnody of the Roman Catholic Church and publishing a paper on their meaning. But she also ventured to Harvard's Department of English to study with some of the country's leading poets. “Studying poetry with [Boylston Professor of Oratory and Rhetoric] Jorie Graham at Harvard was the first time I started to think of myself as a poet and take the lyrical side of my work more seriously,” she says. “I was so fortunate to be accepted into her course. It was an enlivening and life-changing experience for me.”



**BY ENCOURAGING OUR CREATIVITY** and ability to channel inspiration, music can help us transcend our smallness and unite us with what's beyond. It can ignite hope as well.” —SASHA SIEM





**THERE IS A RECOVERABLE WHOLENESS** once we've been through a healing process, and a holiness—a divinity—at the core of our existence, which is unbreakable no matter what we've been through.” —SASHA SIEM

Siem also explored the University's Department of Visual and Environmental Studies, taking a course in poetry writing from a visual arts perspective taught by Damon Krukowski, AM '88, poet, publisher, and drummer for the legendary Boston dream pop band Galaxie 500.

“Sasha was unusual in her willingness to experiment outside her expertise, despite being well on her way at the time toward her graduate degree,” Krukowski says. She outdid even college freshmen in her openness to new ideas, new sounds, and new techniques. And yet she already had the skills to apply those to professional work—a valuable skill of its own!”

While Siem was exploring poetry and art at Harvard, she also met the late British composer Jonathan Harvey, whose works *Passion and Resurrection* and *Weltethos* often explored religious and theological themes. Reviewing one of Siem's compositions, Harvey saw a kindred spirit.

Siem remembers Harvey telling her, “You know there's something really unusual here. Most pieces are built of harmony and melody as distinct components. But with your work it's as though there is no distinction—all elements are unified in one embellished line.”

“He saw almost a philosophical idealism in my music,” Siem says. “And he was right. I have a motivating desire for wholeness.” By the time she received her PhD in 2011, Siem had recorded and released a six-song version of her debut album *Most of the Boys*. The pursuit of wholeness—and a kind of holiness—had become central to her work and life.

## How the Light Gets In

After graduation, Siem continued to compose, fulfilling commissions for the Royal Opera House, the Rambert Dance Company, and the London Philharmonic Orchestra. In 2008, she also took part in the Panufnik Scheme, a program run by the London Symphony Orchestra (LSO) for young composers at the outset of their careers. “Sasha wrote for the full orchestra under the mentorship of a distinguished group of composers and individual members,” says Kathryn McDowell, managing director of the LSO. “Her work impressed the orchestra with its color and flair. As a result, her composition *Ojos del Cielo* was recorded for release on our LSO Live label.”

For her work, Siem received both a British Composer Award and the Royal Philharmonic Society Composition Prize. She was delighted by her success, marveling at what she described as the “spectacular nineteenth-century voices” singing the music she wrote for the Royal Opera House. Still, she wanted to convey a more contemporary sentiment, one best expressed, she said, through her own “fragile, vulnerable, less than perfect voice.” She decided to embrace singing and songwriting.

In 2015, Siem released her first full-length album—an augmented version of *Most of the Boys*, produced in Iceland by Valgeir Sigurðsson, whose previous collaborations included Björk's Oscar-nominated score for director Lars Von Trier's film *Dancer in the Dark* and Feist's 2011 album *Metal*. Calling it “a brazen take on womanhood that's also pleasing to the ear,” *Boston Globe* music critic Maura Johnston described Siem's record as a dive into “the dichotomies that women have to navigate, sometimes begrudgingly, in twenty-first-century society; personal and public selves, acting mannerly and offering honesty, showing confidence while nursing wounds.”

Helping to heal humanity's wounds has increasingly become an aspiration of Siem's in recent years. It was the driving force behind her 2020 album *wHOLeY*—and the Jerusalem-based video for the album's title track. “I wanted to play with the idea of wholeness,” she says. “Leonard Cohen wrote ‘There is a crack in everything / That's how the light gets in.’ Equally, there is a recoverable wholeness once we've been through a healing process, and a holiness—a divinity—at the core of our existence, which is unbreakable no matter what we've been through. In the album, I wanted to explore the relationship of those three phrases, to present them almost as a pathway that all of us can travel if we wish to.”

*wHOLeY* is built around the “miracle tone” of 432 Hz, an alternative tuning standard for music purported to be more natural or spiritually resonant than the standard 440 Hz. “We live with quite an artificial tuning system in the West that developed with Bach's *Well-Tempered Clavier*,” Siem explains. “The equal partition of tones is, in a sense, actually out of tune when you compare it to the different proportions you find in the natural world. There's a lot of controversy about whether the miracle tone is real or not but in my lived expe-





rience—and I did some informal testing—it has a profound healing effect on the body and the mind.”

## Healing and Hope

Beginning this year, Siem hopes to bring the healing power of sound to new audiences by merging her creative work with her vocation as a teacher. She recently launched five new online courses accessible through her website [www.sashasiem.com](http://www.sashasiem.com). (She hopes to teach the courses in person as well at various times and locations.) The classes include *From Harm to Harmony*, which teaches participants to use songwriting or the creation of vocal sound to work through trauma; *The Music of Motherhood*, which facilitates mother-child bonding through song; and *The Sacred Power of Songwriting*, an anthropological and historical journey through sound that considers practical ways to bring its healing force into everyday life.

Siem also creates bespoke “sound ceremonies.” In the video for her song “Eve Eyed (Women’s Circle),” for instance, women in white robes gather in a candlelit sacred space where they sing, lay hands on one another, and rest with each other. “It’s a celebration of womanhood, of sisterhood,” Siem says. “We wanted a place they could enter with reverence, appreciating the spark of life in one another, leaving the everyday hustle and bustle outside. All the ladies were on a high for at least a week after they left, able to bring that same

nourishment and gratitude to all our other interactions.”

Inspired by her experience at Harvard Griffin GSAS, Siem continues to develop as a literary artist as well. Working with poet Kim Noriega, a finalist for Joy Harjo and Edna St. Vincent Millay poetry prizes, Siem developed and completed her first collection of poems, *The Way of Light on Water* (as yet unpublished). “It’s a slim and stunning volume that explores the complexities of motherhood from the devastation of miscarriage through the beautiful mess that is parenting a small child,” Noriega says. “Sasha’s musicality is immediately evident in her poetry. Her use of imagery, especially auditory imagery, often imbues her work with a distinctive magical realism that I find compelling.”

Siem looks forward to the release in 2024 of *True*, her fourth album in the last five years. Stripped back and spare, the songs bring her back to her roots of piano and voice. All address the nature of the stories around which we build our lives, where they begin and where they end. “Stories are crucial, but they can keep us contracted,” she says. “It’s being able to see them as stories that enable us to step across divides.”

Through songwriting, teaching, and ceremony, Siem hopes to empower those who don’t think of themselves as musicians to create their own songs as a practical way to unlock—and heal—the parts of their lives that often cannot be put into words.

“With music, our physical boundaries can dissolve,” she says. “It can be a portal into different perspectives on our life. By encouraging our creativity and ability to channel inspiration, music can help us transcend our smallness and unite us with what’s beyond. It can ignite hope as well. As a musician, a mystic, and a mother, I want my life’s work to ignite that healing and hope.” ♡



THE SOUNDS OF HEALING



# Sound Mind

AARON BERKOWITZ'S EFFORT TO IMPROVE  
NEUROLOGICAL CARE IN SOME OF  
THE WORLD'S MOST IMPOVERISHED  
REGIONS WAS SHAPED BY HIS STUDY OF  
MUSICOLOGY AT HARVARD

**By Steve Neumann**

*“I present to you patient Janel, a 23-year-old male student with no prior medical history, born and currently living in Savanette, presenting for evaluation of headaches evolving over several months, a sense of vertigo when he stands, and difficulty walking.” So began an email that would intertwine the lives of Dr. Martineau Louine, the patient he described, and me.*

—Aaron Berkowitz, *One by One by One: Making a Small Difference Amid a Billion Problems*

In his 2020 book, *One by One by One*, Aaron Berkowitz reflects on life as a young physician working in Haiti and following in the footsteps of his teacher and role model Paul Farmer, PhD '90. A neurologist, Berkowitz first traveled in 2012 to the Caribbean nation—one of the poorest in the world—at the suggestion of his colleagues at Brigham and Women's Hospital in Boston. He was asked to teach in a country where there was only one other doctor in his field.

During his time in Haiti, Berkowitz often had to improvise, both with his treatments and his pedagogy. Fortunately, improvisation was the subject of his dissertation as a PhD student in music at the Harvard Kenneth C. Griffin Graduate School of Arts and Sciences (GSAS), from which he graduated in 2009. It's also the story of his career—from Haiti to director of global neurology at Brigham and Women's Hospital to clinician-educator at the University of California San Francisco (UCSF) today.

## The Improvising Mind

Berkowitz grew up with a love of classical music, especially the works of piano romantics like Chopin and Rachmaninoff. He also had a passion for medicine so after majoring in both music and biology as an undergraduate, he enrolled at the Johns Hopkins University School of Medicine. By his third year, however, the high pressure, long hours, and little sleep began to wear him down. “I decided to get out,” Berkowitz says. “I thought I could study musicology and become a music professor at a small liberal arts college. The lifestyle of a graduate student in the humanities would be a welcome change from medical school.”

In 2003, Berkowitz came to Harvard to pursue a PhD with a focus on ethnomusicology. Combining manuscript studies with ethnography, anthropology, and neuroscience, he studied brain activity among people from different musical traditions who learn to improvise or teach improvisation. His dissertation yielded his book, *The Improvising Mind: Cognition and Creativity in the Musical Moment*, in which Berkowitz defines musical improvisation as “the spontaneous rule-based combination of elements to create novel sequences that are appropriate for a given moment in a given context.”

Most of the neuroscience literature on music and the brain focused at that time on the perception of music rather than on the production of music. “There are essentially two basic questions in music cognition,” says Berkowitz. “First, what parts of the brain are involved and how do they interact when people listen to or perform music? Second, what can studying music tell us about the brain?”

When music is heard or played, the brain calls on many more general cognitive processes—for example, perceiving patterns in sounds or converting visual information to auditory or motor information. To explore this phenomenon further, in 2009 Berkowitz teamed up with Daniel Ansari, a neuroscientist at the University of Western Ontario, to design an experiment that would attempt to isolate the brain regions responsible for the creativity underlying musical improvisation.

The duo had 12 classically trained pianists in their 20s perform a series of 4 musical tasks while inside a functional magnetic resonance imaging machine. The study participants played a small, plastic piano-like keyboard that had five keys.

**AARON BELIEVES IN THE NEED TO WORK IN PROXIMITY TO MARGINALIZED COMMUNITIES IN ORDER TO FIGHT STRUCTURAL VIOLENCE. JANEL IS A PATIENT WHO EPITOMIZED THAT STRUGGLE.”**

—DR. MICHELLE MORSE, CHIEF MEDICAL OFFICER OF THE NEW YORK CITY DEPARTMENT OF HEALTH AND MENTAL HYGIENE

Berkowitz and Ansari found three regions of the brain that were activated during all tasks that involved improvisation: the anterior cingulate, which is involved in most cognitive tasks, including decision-making; the dorsal premotor cortex, which acts as a type of command center for executing movements; and the inferior frontal gyrus/ventral premotor cortex, which has long been known as an area involved in language production.

“During a task like improvisation, a musician is flooded with multiple choices for what to play at any given moment,” Berkowitz says. “So it made sense that the anterior cingulate region lit up during improvisation. We expected the dorsal premotor cortex to be involved, too, because it was already active during the playing of memorized melodies. But we were the first to show that the inferior frontal gyrus/ventral premotor cortex activates when people create music.”

Even as he wrote the dissertation, the path of Berkowitz’s own life and work was changing once again. At the urging of his faculty advisor Professor Kay Shelemay, he enrolled in a class co-taught by anthropology professor Arthur Kleinman, AM ’74 and Partners in Health (PIH) cofounders Paul Farmer and Jim Yong Kim, PhD ’93. (Kim later went on to lead Dartmouth College and the World Bank.) The course focused on PIH’s work in Rwanda, Haiti, and other places around the globe plagued by inadequate access to health care and by extreme poverty.

“I was just blown away,” Berkowitz says. “I had never heard of ‘global health’ or ‘medical anthropology.’ For me, medicine had been biochemistry in the classroom and spending long hours in the operating room. I went back to Johns Hopkins for the last year of medical school after I finished my PhD in

music. Then, I applied for a residency in neurology with the idea of doing work in global health and health equity inspired by Paul Farmer’s work. That’s what led me to Haiti.”

## A Partner in Health

Paul Farmer described the chief tension of PIH’s work as the struggle to serve those in front of you while simultaneously working to improve public health in the long term. In *One by One by One*, Berkowitz writes that he grappled with that challenge in Haiti—exemplified by the case of Dr. Louine’s patient, Janel.

“With Janel right in front of us, it actually didn’t seem like that much of a tension to me. I knew I couldn’t come up with a sustainable, cost-effective solution that would solve enormous problems like global poverty and inequitable access to modern health care—I would have to leave that to the Paul Farmers of the world. But as a doctor, couldn’t I try to help this one patient?”

Janel was diagnosed with the largest brain tumor Berkowitz had ever seen. Because the surgery would have been impossible in Haiti, the young neurologist flew his patient back to Brigham and Women’s Hospital. Dr. Michelle Morse, chief medical officer of the New York City Department of Health and Mental Hygiene, was part of the team that treated Janel in Boston. She calls Berkowitz a visionary and a brilliant clinician with a passion for helping those the world has left behind.

“Aaron believes in the need to work in proximity to marginalized communities in order to fight structural violence,” she says. “Janel is a patient who epitomized that struggle. We worked for years to push for the best care possible, and in Janel’s case that required a medical evacuation.”

Janel was young and there was hope he might respond well to treatment—perhaps recovering and returning to school. He needed five surgeries, repeated hospitalization, and long-term rehabilitation, but he was walking, talking, eating, and even singing by the time Berkowitz left Haiti. Sadly, Berkowitz hasn’t seen his former patient in several years due to the strife that has gripped the country.

“In 2021, the president of Haiti was assassinated, and it has become extremely violent there,” he says. “My colleagues



Berkowitz’s patient Janel [seated] with his mother outside of their home in Haiti in 2018. Several years prior, Janel had a brain tumor removed through surgery at Brigham and Women’s Hospital with the support of Partners In Health. His journey is detailed in Berkowitz’s book, *One by One: Making a Small Difference Amid a Billion Problems*.



## MY PHD WORK TRAINED ME TO BE ABLE TO TRY TO TRULY LISTEN TO COLLEAGUES AND PATIENTS IN DIFFERENT CONTEXTS.” —AARON BERKOWITZ

at Partners in Health have said they don't feel it's safe for outside travelers, given the security risks. They tell me that Janel is still doing as he was at the end of the book. It's not the huge save we were hoping for, but he's still alive after what was likely to have been a deadly condition, and we're grateful for the small victories.” (Berkowitz continues to support his colleagues in Haiti through online teaching and consultation and hopes to return when it is safe to do so.)

Although Berkowitz and colleagues in Boston were able to provide lifesaving treatment for Janel's brain tumor, it couldn't have been replicated at scale. So, improvising once more, Berkowitz taught neurology in Haiti, which previously had almost no specialists in the field. He began by teaching groups of primary care doctors until his Haitian colleagues suggested the country would be better off if they trained even a small group of experts who could start their own neurology program.

Berkowitz encountered many challenges teaching in a setting very different than the one he was used to in the US. “First of all, the epidemiology of disease is different,” he says. “There's lots of tuberculosis in Haiti whereas I saw none in residency in Boston.” To make matters worse, the country experienced an outbreak of the Zika virus in 2016 when Berkowitz had barely finished training its first neurology graduate, Dr. Francois Roosevelt. When cases of Zika-related neurologic disease started to proliferate, however, his former pupil began to shine.

“Francois diagnosed Haiti's first cases of Guillain-Barré syndrome due to Zika infection,” Berkowitz says. “He even published a report on this, which led to a scholarship to the American Academy of Neurology annual meeting in Boston where he was the first Haitian national to give a lecture presenting his work. We worked together to best integrate neurology education and care into the country's medical system.”

### Deep Listening

Today, Berkowitz continues to uphold his commitment to teaching neurology while serving patients as a professor at UCSF. His roles there are varied but interconnected—from being a neurohospitalist and a general neurologist to his work as a clinician-educator at the San Francisco Veteran's Admin-

istration Medical Center and San Francisco General Hospital. “It's great to be part of a huge university medical system,” Berkowitz says, “but also to be serving two very uniquely underserved populations—the veteran population and the underserved population of urban San Francisco.”

His previous experience as director of global neurology at Brigham and Women's Hospital continues to inform his work, particularly his emphasis on improving access to neurologic care. But Berkowitz's influence extends beyond the classroom and the hospital ward. In recent years, he has taken what he learned in Haiti to the Navajo Nation and the international humanitarian organization Doctors Without Borders, which provides lifesaving medical care around the world to those who need it most.

Berkowitz engages with the wider neurology community through his role on the editorial board of the journal *Continuum: Lifelong Learning in Neurology*. In addition to *One by One* and *The Improvising Mind*, he has contributed to the *Oxford Manual of Humanitarian Medicine*, penning the neurology chapter, and has authored the neurology textbook *Clinical Neurology and Neuroanatomy: A Localization-Based Approach*. Berkowitz's many awards and honors include the Mridha Spirit of Neurology Humanitarian Award from the American Brain Foundation in 2018 and the Viste Patient Advocate of the Year Award from the American Academy of Neurology in 2019.

When asked how his Harvard Griffin GSAS experience served him in Haiti, Berkowitz says the core of ethnomusicology is deep listening, a skill that he has taken with him to medical practice at the bedside. “I wasn't studying the music of Haiti, but my PhD work trained me to be able to try to truly listen to colleagues and patients in different contexts.”

And so, like the romantic composers he adored as a child, Berkowitz has uniquely orchestrated the different aspects of his career, seamlessly transitioning between different movements. Each phase, from Harvard to Haiti and now UCSF, resonates with the core principles of his life's work—serving his patients and democratizing neurologic care and education. Inspiring and powerful, Berkowitz's story is a testament to the ability of an individual player to harmonize with different voices in very different environments to make a difference in the world. 🎶



**MEDICINE, MUSIC, AND MAKING A DIFFERENCE**  
(clockwise from top): Berkowitz (middle) with new Haitian neurology graduates (left to right) Dr. Roosevelt Francois, Dr. Bregenet Lamour, Dr. Ronald St. Jean, and Dr. Louis Lafleur; the late Paul Farmer with a copy of Berkowitz's 2020 book, *One by One by One*; Berkowitz as a PhD student in music at Harvard Griffin GSAS (2009).





A PASSION FOR

# Science, Community

A CONCERN FOR

Through DNA analysis and advocacy, Roslyn Curry hopes to reconnect communities of color to lost ancestors.

**BY PAUL MASSARI**

Photographs by John Soares

ROSLYN CURRY



Visit Roslyn Curry's Harvard web page and you immediately get a sense of how central her background is to her identity. *Shí éi Roslyn Curry yinishyé*, the page reads in the Diné language. *Tábqahá nishlǫ́, Naahilii bashishchiin, Yé'ii dine'é Tá-chii'nii dashicheii, Naahilii dashinalí. K'ai'bii'tó déé'naashá. Ákót'éego Diné asdzáán nishlǫ́.*

Translation: "My name is Roslyn Curry. I am Edgewater born for African American. My maternal grandfathers are the Giant People of the Red Streak Running into Water clan, and my paternal grandfathers are African American. I am from Kaibeto, Arizona. This is how I introduce myself as a Navajo woman."

"I value my culture," she says. "The greeting is very representative of who I am, where I'm from, and how I grew up."

As a PhD student in human evolutionary biology at the Harvard Kenneth C. Griffin Graduate School of Arts and Sciences (GSAS), Curry combines her connection to the communities from which she comes with a passion



**PATHBREAKER:** The first in her family to graduate from a four-year college, Curry spent her undergraduate years at the University of Arizona where she participated in several research programs and became fascinated with life science.

for science. Through genetic research and analysis, she works to address health inequities, help heal the wounds of colonialism and slavery, and recover histories long lost to Indigenous and Black Americans.

### CHARACTERIZING A KILLER

The first in her family to graduate from a four-year college, Curry spent her undergraduate years at the University of Arizona (UA), where she participated in several research programs and became fascinated with life science. Through the Partnership for Native American Cancer Prevention and the university's Postbaccalaureate Research Education Program, Curry joined the lab of William Mont-

fort, a professor in UA's Department of Chemistry and Biochemistry.

Montfort's group studies the structure and function of proteins—particularly the role of the signaling molecule nitric oxide (NO) in heart disease and cancer. Curry was part of the group's efforts to understand how NO interacts with soluble guanylyl cyclase (sGC), a protein that behaves like a receptor for the molecule. When

NO binds to one end of sGC, it causes a change or activation at the other end that ultimately causes blood vessels to relax and expand. It may also help with forming memories in the brain.

"We had Roslyn work on the role of NO in a particularly aggressive form of cancer: triple-negative breast cancer, which strikes earlier and more aggressively in indigenous women," Montfort says. "She helped purify and characterize the sGC protein to understand its structure and properties. The work provided a detailed description of how a central coil-shaped part of sGC, the coiled-coil signaling helix, rearranges and repacks itself during the activation process."

The research also provided Curry with her first coauthor credit on a scientific study published in a 2019 issue of the journal *Protein Science*. She continued to study nitric oxide, exploring changes in cells with high NO and their links to the progression of cancerous tumors. As she began thinking about the next steps in her career, she decided to combine her interest in the genetic characterization of disease with her concern for Indigenous and Black populations.

"I encouraged Roslyn to find a home for such studies and join the field," Montfort says. "This led to research work at Harvard, and now graduate studies in

human evolutionary biology. I couldn't be more pleased for her."

### FINDING LOST ANCESTORS

Montfort connected Curry with David Reich, professor of human evolutionary biology at Harvard's Faculty of Arts and Sciences and of genetics at Harvard Medical School. Curry joined the Reich lab as a participant in Harvard Griffin GSAS's Research Scholars Initiative, a nondegree-granting postbaccalaureate program that provides mentored research and training for individuals interested in pursuing doctoral studies and that strongly encourages applications from students from groups underrepresented in the academy.

Before she did, though, Curry spent three months interning at 23andMe, a biotechnology company that provides direct-to-consumer DNA testing services. There she worked with Éadaoin Harney, PhD '20, on a project that analyzed the DNA of enslaved and free African Americans who worked at the Catoctin Iron Furnace in Maryland during the nineteenth century. Harney says the Catoctin study was the first of its kind to search for direct connections between historical and present-day individuals using genetic data from research participants in a direct-to-consumer genetic database.

“I worked with my colleagues to ensure that the [Catoctin] research happened respectfully . . . The experience showed me that I can be a researcher who is helpful, not harmful, to those I want to serve.”

—ROSLYN CURRY



**EARLY DAYS:** Still in the first years of her PhD program, Curry focuses her research on the statistical and computational analysis of genetic data from ancient people who lived in the Maya region of Central America, northwest Mexico, and colonial-era North America.

“At 23andMe, we combined ancient-DNA research techniques with the company’s genetic database to tell stories about the African American community at Catoctin,” Harney says. “Through a collaboration between my team, Professor David Reich’s group at Harvard, and the Smithsonian’s National Museum of Natural History, we uncovered a lot of information that was not in the historical record: connections within the community, such as mothers and children; connections with people living today through a common ancestor; and even connections with people living today whom we believe may be direct descendants.”

During her 23andMe internship, Curry wrote “Ethics and the Study of Historic DNA of African Americans Buried at the Catoctin Furnace,” an overview of the project that addressed questions and con-

cerns those from a variety of backgrounds might have about the work. The product of internal interviews Curry conducted with the project, the overview posted on the 23andMe blog simultaneously with the Catoctin study’s publication in the journal *Science*.

“During her internship, Roslyn demonstrated a particular interest in the ethical considerations associated with the project,” Harney says. “She continued to be involved in these discussions after she joined the Reich Lab.”

Curry joined Harney and five other members of the Harvard and 23andMe teams in producing an ethics paper that accompanied the Catoctin Iron Furnace study, bringing a different perspective to the editing process and to the group’s concerns. “On the Catoctin project, I helped advocate for those from tradi-

tionally marginalized communities and get them the information they were interested in,” Curry says. “I worked with my colleagues to ensure that the research happened respectfully. I was able to explain to a wider audience what the study was about and how it was done. The experience showed me that I can be a researcher who is helpful, not harmful, to those I want to serve.”

Margaret Briehl, a professor at UA College of Medicine and director of the research training programs in which Curry participated, says her former student’s work matters because the histories of Black and Indigenous Americans have mostly been filtered through the perspec-

the disrespectful research conducted on peoples of the Havasupai tribe earlier this century. Roslyn’s work in this area could make a difference.”

### TO FORGE A HEALTHIER FUTURE

Still in the early years of her PhD program, Curry’s research focuses on the statistical and computational analysis of genetic data from ancient people who lived in the Maya region of Central America, northwest Mexico, and colonial-era North America. She also works on statistical analysis of DNA data from ancient populations in the territory of what is now the United States—including from her own region of the Southwest. Reich, her

rigorous way. Roslyn is equally rigorous when it comes to the ethical issues and community engagement imperatives that arise when analyzing genetic information from communities that have been marginalized.”

At this point in her career, Curry says she’s focused on “becoming the best-trained scientist I can be.” As an Indigenous woman as well as a geneticist, however, she feels a responsibility to use science respectfully to restore what has been taken from those who have historically been marginalized and improve their well-being going forward.

“Genetic ancestry isn’t a replacement for traditional knowledge via oral story-

“Genetic studies on American Indians are banned by most and maybe all of the nations and tribes in Arizona due to the disrespectful research conducted on peoples of the Havasupai tribe earlier this century. Roslyn’s work in this area could make a difference.”

—DR. MARGARET BRIEHL, UNIVERSITY OF ARIZONA COLLEGE OF MEDICINE

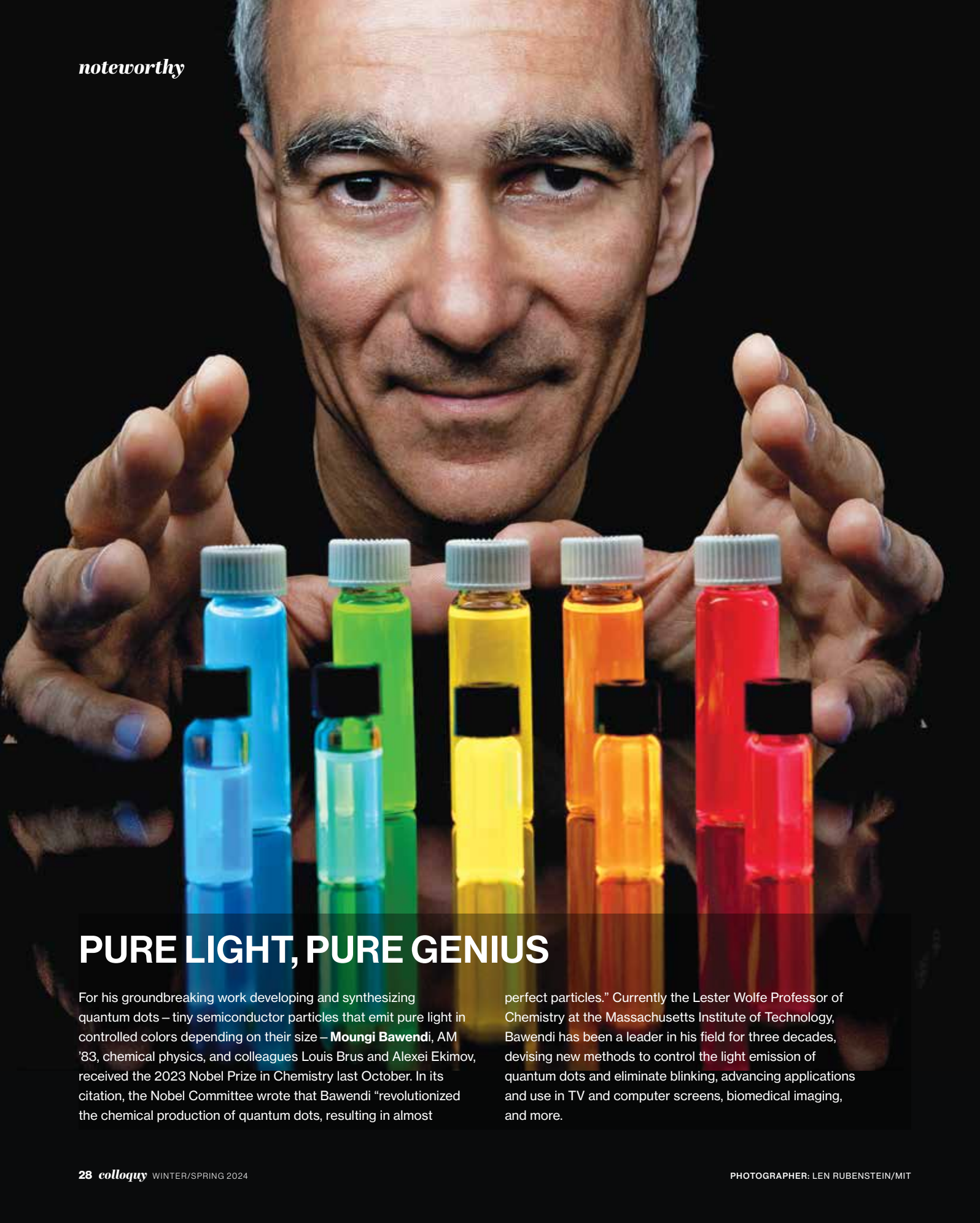
tives of the dominant white culture.

“It’s very important to have history also told by the Native Americans and African Americans themselves,” Briehl says. Moreover, genetic studies must be done in collaboration with the communities being studied. “This type of research, in particular, raises concerns with American Indians,” she continues. “Currently, genetic studies on American Indians are banned by most and maybe all of the nations and tribes in Arizona due to

doctoral advisor, says Curry brings to his group an intense interest in how genetic data can be used to learn about human history and biological change over time in Indigenous and African Americans.

“Compelling research on the genetic history of these populations demands a unique combination of skill and sensitivity,” Reich says. “Roslyn is rapidly mastering high-powered computational techniques, which she brings to bear on ancient DNA data in a scientifically

telling—and certainly doesn’t replace one’s sense of self or identity, whether as a part of a tribe or some other community,” Curry says. “Also, looking at ancient DNA isn’t a direct way to find out who someone’s ancestors were. But it can provide some idea of where people come from. By recovering obscured family lines and gaining novel biological insights, I hope to reconnect people to their past—and forge a healthier future for Indigenous people and communities of color.”



## PURE LIGHT, PURE GENIUS

For his groundbreaking work developing and synthesizing quantum dots – tiny semiconductor particles that emit pure light in controlled colors depending on their size – **Mounqi Bawendi**, AM '83, chemical physics, and colleagues Louis Brus and Alexei Ekimov, received the 2023 Nobel Prize in Chemistry last October. In its citation, the Nobel Committee wrote that Bawendi “revolutionized the chemical production of quantum dots, resulting in almost

perfect particles.” Currently the Lester Wolfe Professor of Chemistry at the Massachusetts Institute of Technology, Bawendi has been a leader in his field for three decades, devising new methods to control the light emission of quantum dots and eliminate blinking, advancing applications and use in TV and computer screens, biomedical imaging, and more.



**Alice E. Hill**, PhD '91, business economics, received a 2023 Harvard Alumni Association (HAA) Award for Extraordinary Service. Given each year since 1990, the award recognized Hill, a widely respected nonprofit leader and former HAA board president, for her efforts to increase global alumni outreach and bolster inclusion and belonging across continents and generations.



**Lucy Hutyra**, PhD '09, earth and planetary sciences, received a 2023 “genius grant” from the John D. and Catherine T. MacArthur Foundation. Spread over five years, the \$800,000 grant will support Hutyra’s work on the impacts of urbanization on climate and ecosystems, how urban environments influence trees and the carbon cycle, and how to meet climate action and emission reduction goals.



**Valerie Lambert**, PhD '99, anthropology, received the Labriola National American Indian Center Book Award at the Arizona State University Library for her 2022 book *Native Agency: Indians in the Bureau of Indian Affairs*, which explores the complicated history of the oldest federal agency in the US Department of the Interior. The annual award recognizes scholarship in American Indian and Indigenous studies.



Harvard Kennedy School Professor **Elizabeth Linos**, PhD '16, public policy, received the 2023 David N. Kershaw Award and Prize for her research on how governments can build a more effective workforce and provide better public services. Presented by the Association for Public Policy Analysis and Management, the award honors persons under 40 who have made distinguished research-driven contributions to the field of public policy analysis and management.



**Srujan Meesala**, PhD '19, applied physics, was awarded a 2023 Boeing Quantum Creators Prize for his contribution to the effort to connect superconducting qubits with optical photons. The prize, which recognizes early-career researchers for work that moves the field of quantum information science and engineering in new directions, includes a monetary honorarium, a certificate, and reimbursed travel to the annual Chicago Quantum Summit.



**Imani Perry**, PhD '00, history of American civilization, was named a 2023 MacArthur Fellow for her work “giving fresh context to history and the cultural expressions forged by Black Americans in the face of injustice.” Perry, who won the National Book Award for Nonfiction in 2022 for her book *South to America*, joined Harvard last summer as a professor in the Faculty of Arts and Sciences.



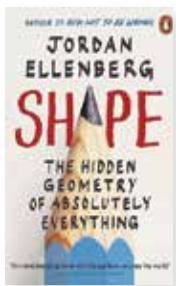
**Reed Pyeritz**, PhD '72, biochemistry, received the 2023 David L. Rimoin Lifetime Achievement Award in Medical Genetics from the American College of Medical Genetics and Genomics (ACMG). In its press release, ACMG commended Pyeritz’s “decades of pioneering work on Marfan Syndrome, his commitment to helping patients and their families . . . [and] his extraordinary contributions to furthering the field of medical genetics.”



**Dame Louise Richardson**, PhD '89, government, was honored with the Sutherland Leadership Award at Ireland’s Business and Finance Awards 2023 presented in association with KPMG. Richardson, an Irish-born political scientist who is currently president of the Carnegie Corporation and was the first female vice chancellor of the University of Oxford, was recognized for her “extensive contributions to academia and public policy.”

AUTHOR PROFILE

## HOW THE WORLD TAKES SHAPE



*Jordan Ellenberg, PhD '98, is a professor of mathematics at the University of Wisconsin-Madison and the author of the best-selling book Shape: The Hidden Geometry of Absolutely Everything. He talks about how geometry can be a way of measuring and explaining the world, how an understanding of its principles helped societies manage the COVID-19 pandemic, and how it can help preserve democracy by preventing incidences of minority rule fostered by gerrymandering.*

**What makes geometry different from other branches of mathematics?**

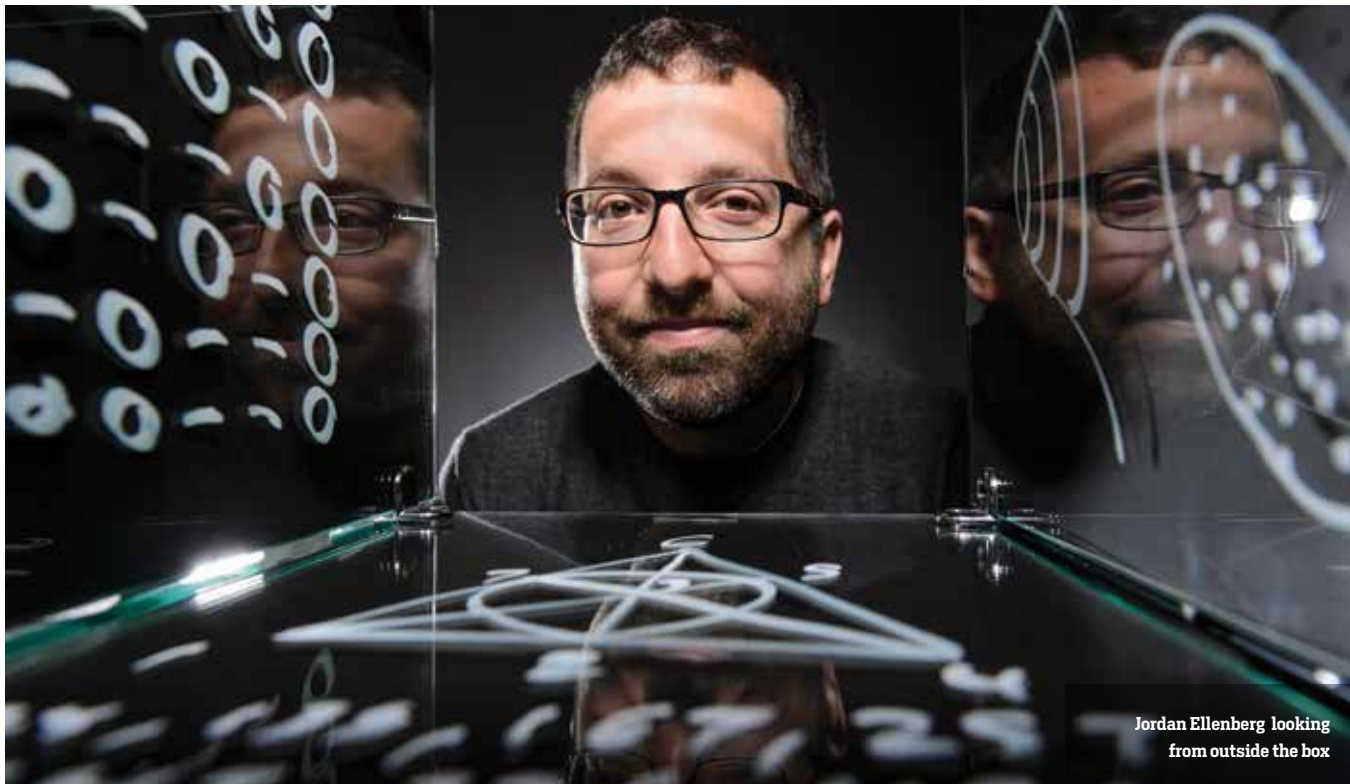
I think geometry is somehow the most primal and physical part of mathematics that we do. And maybe some evidence for that is that it's very old. What we recog-

nize as geometry is certainly thousands of years older than the use of anything we would call formal algebra with variables and things like that. That comes much later in the history of mathematics. In some sense, the more symbolic it is,

the less natural it is. (That's not a value judgment, by the way.) In some sense, the triumph of the human spirit is that we do all kinds of things we're not naturally built to do by building up this incredible extra cognitive infrastructure that we do in mathematics or many other areas as well. But it does kind of start from geometry.

**In the book, you say that "geometry is a form of honesty." What can it teach us about logic?**

I came to that formulation because I was reading about Abraham Lincoln and his interest in geometry. Before he was a politician he was a lawyer, and he was troubled by the fact that every day he



Jordan Ellenberg looking from outside the box



was asked to go to court and “prove” his case. And he wondered, what does prove mean? So he read the ancient Greek mathematician Euclid to understand how proofs work.

Now, we think of honesty as not saying things that we know to be false. But Lincoln argued for a much stronger version of honesty, which is not only can you not say things you know to be false, but also you can't say things that you don't know to be true. That's the standard of geometry. So, in the book, I say maybe we should call Lincoln “geometrical Abe” instead of “Honest Abe!”

**You devote an entire chapter to “the terrible law of increase.” What is it and how did it help us as a society deal more effectively with the COVID-19 pandemic?**

The terrible law of increase is a phrase that I sort of plucked from this parliamentary discussion in the 19th century about a cattle plague that swept across England and killed millions of animals. It's the idea that it's not that bad now, but it could get really bad just by the continuation of current trends.

I think that is pretty hard for the intuition to grasp, but I think people in the United States did it in March 2020. We were able to say nobody I know has this now, but from what we know we can see that that situation is not going to persist. It means that the terrible increase is already happening, and it will continue to happen unless trends change.

But “unless trends change” hides a lot, right? Things don't follow a perfect exponential law in real life. After all, trends do change because people react to what happens. If you hit a tennis ball, and you know physics pretty well, you

can predict where the ball is going to go but that doesn't mean you can predict the outcome of a tennis match.

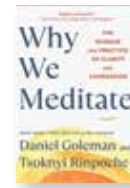
**Finally, algorithms in your state of Wisconsin have enabled minority rule by allowing the drawing of districts in ways that weren't possible before. How could geometry help political leaders create a less unfair system?**

Geometry can help us measure and compare different aspects of district shapes, such as area, perimeter, compactness, and contiguity. For example, one common measure of compactness is called the Polsby-Popper score, which is the ratio of the area of a district to the area of a circle with the same perimeter as the district. The closer this ratio is to one, the more compact the district is; the closer it is to zero, the more sprawling and distorted it is. So geometry can help us quantify how much a district deviates from a simple shape like a circle or a square.

But geometry alone cannot tell us which aspect is more important or fair. Some people may prefer districts that are compact and contiguous, while others may prefer districts that preserve communities of interest or reflect proportional representation.

So geometry can be a useful tool for redistricting. It can help us identify and avoid extreme cases of gerrymandering; it can help us generate and evaluate alternative maps; it can help us communicate and visualize the trade-offs involved in redistricting. But it's not a substitute for democracy. That is something that we have to decide as a society through an open and transparent process that involves public input and independent oversight. 🍷

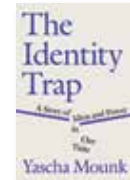
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**SAVE THE DATES!**

**Dean Dench in London**  
March 5, 2024

**Dean Dench in Amsterdam**  
March 7, 2024

**Alumni Day, Cambridge**  
April 6, 2024

**Harvard Horizons, Cambridge and livestreamed**  
April 9, 2024

**Centennial Medals Ceremony, Cambridge and livestreamed**  
May 22, 2024

●●● Be sure also to check out the **Harvard Griffin GSAS YouTube channel**, where you can find recordings of recent alumni events on artificial intelligence and writing as an academic for a popular audience: [youtube.com/@harvardgsas](https://youtube.com/@harvardgsas).

# Join us for Alumni Day!

COME TOGETHER WITH ALUMNI, FACULTY, STUDENTS, AND FRIENDS AT ALUMNI DAY, SATURDAY, APRIL 6, 2024!

Alumni Day, Saturday, April 6, 2024, brings together alumni and Harvard faculty to reconnect with the intellectual life of the University, renew old friendships, and build new ones. This year, you can engage with distinguished scholars and scientists, fellow graduates, and current students about groundbreaking research, including:



**Thomas Kane**, PhD '91, faculty director for the Center for Education Policy Research at HGSE, on how the pandemic impacted learning across the US and what schools and communities need to do to recover from learning loss



**Xiao-Li Meng**, PhD '90, Whipple V. N. Jones Professor of Statistics and founding editor-in-chief of the *Harvard Data Science Review*, on revolutions in data science and generative AI



**Karen Thornber**, PhD '06, Harry Tuchman Levin Professor in Literature and Professor of East Asian Languages and Civilizations on the intersections of environmental health, mental illness, climate change, and inequality within and between nations



**Alexandra Vacroux**, PhD '05, executive director of the Davis Center for Russian and Eurasian Studies at Harvard University, on developments in the Russo-Ukrainian war, Russia's economy and domestic support for the war, and impacts on the region and the world



**Steven C. Wofsy**, PhD '71, Abbott Lawrence Rotch Professor of Atmospheric and Environmental Science, on developing MethaneSAT (satellite) and MethaneAIR (aircraft) imaging spectrometers to measure greenhouse gas emissions worldwide

In addition, Dean Emma Dench will share details on the implementation of the Report on Graduate Admissions and Graduate Education (GAGE), maintaining competitiveness, efforts Harvard Griffin GSAS has undertaken with students to foster civil discourse, and more.

●●● [Learn more at \*gsas.harvard.edu/alumniday\*](https://gsas.harvard.edu/alumniday)

# MAKING AN IMPACT THROUGH OTHERS



EDGAR BARROSO PHOTO CREDIT: UDELL JIMINEZ

**“I give to Harvard so I can help others go. It’s the best investment I can make,” says Edgar Barroso PhD ’14.** Getting the chance to pursue a doctorate in music at Harvard Griffin GSAS changed his life. He shares that neither of his grandparents had access to education and marvels that Harvard invited their grandchild, “some dude from Mexico in the middle of nowhere and said, ‘Please come and we will take care of you.’”

Since Harvard, Barroso has worked as a composer, a professor of government, and a public entrepreneur. “I love being in this trans-disciplinary world. I learned that’s possible at Harvard,” he says.

Barroso has thought carefully about how to give back and make a bigger difference in people’s lives. “You have limited time and personal capacity,” he observes. “The only way you can have a bigger impact is through others.”

Dividing his time between Switzerland and Mexico, he stays deeply connected as a volunteer on the GSAS Alumni Council, craving those serendipitous conversations with people “smarter than me.” His advice to the next generation of graduate students? “You are going to be around brilliant people from all disciplines. Connect as much as possible and remember, you can build things together.”

## WHERE SCHOLARSHIP AND INNOVATION MEET

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