THE UNIVERSITY OF CHICAGO MAGAZINE

FALL 2017, VOLUME 110, NUMBER 1


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THE UNIVERSITY OF CHICAGO MAGAZINE

FALL 2017
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Features

Departments

***Nuclear Thresholds*, an installation piece by Ogrydziak Prillinger Architects, evokes the complex legacy spiraling out from the Chicago Pile-1 experiment—see "Core Stories," page 22, and "Elemental," page 34. Photography by Drone Media Chicago.**

See the print issue of the *University of Chicago Magazine*, web-exclusive content, and links to our Facebook, Twitter, and Instagram accounts at mag.uchicago.edu.

Illinois governor Bruce Rauner and Chicago mayor Rahm Emanuel joined President Robert J. Zimmer at the October 19 announcement of the University of Chicago's partnership with the University of Illinois at Urbana-Champaign to develop and commercialize new technology addressing society's greatest challenges, from fighting cancer to producing clean water. A new and expanded Polsky Center for Entrepreneurship and Innovation (see rendering above) will house the initiative, which will initially focus on advanced analytics and advanced materials. At left, John Flavin, UChicago associate vice president for entrepreneurship and innovation and head of the Polsky Center (left), with University of Illinois chancellor Robert J. Jones.

PHOTOGRAPHY BY JEAN LACHAT; ARCHITECTURAL ILLUSTRATION BY WEXFORD SCIENCE AND TECHNOLOGY

THE UNIVERSITY OF CHICAGO MAGAZINE

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Chain reflections

BY LAURA DEMANSKI, AM'94

When the world transformed 75 years ago this December, only a few people knew it. The pursuit of the first self-sustaining, controlled nuclear chain reaction had been a closely guarded secret on the UChicago campus, run under cover of the Metallurgical Laboratory as Enrico Fermi and his colleagues raced against Hitler's physicists to unlock nuclear power.

As pure science, their achievement was astonishing. As applied science, of course, it was and remains an ambivalent milestone.

This fall the University of Chicago community is hosting and inviting public reflections on Chicago Pile-1 and its complex legacy, and so is the *Magazine*. The University's commemorative series of events, Nuclear Reactions—1942: A Historic Breakthrough, an Uncertain Future (see mag.uchicago.edu/cp1-events), brings lectures and colloquia to campus as well as cultural events, including the premiere of an original composition by University Professor **Augusta Read Thomas**, "Plea for Peace," during the culminating program December 1 and 2 at the Reynolds Club and the William Eckhardt Research Center (see mag.uchicago.edu/reactions-event). This program and most of the other events are free and open to the public.

The December 1 opening keynote address will be delivered by historian Richard Rhodes. Rhodes's celebrated book *The Making of the Atomic Bomb* (Simon & Schuster, 1986) provided my education—and many of yours, no doubt—in the thread of science and world history for which December 2, 1942, was a pivotal marker. We are proud to publish a new essay by Rhodes here, on the uneasy relationship between the experiment's two principal architects, Enrico Fermi and Leo Szilard ("Clashing Colleagues," page 24). It illustrates how inseparable the thinking that pushes science forward is from the personalities—strengths and frailties alike—of the thinkers.

Fermi and Szilard were only two of hundreds whose curiosity, passion, and ingenuity created the chain reaction. In four short profiles we look at how Szilard and a handful of others with UChicago ties came to join the Manhattan Project and where their paths led. We then turn to four current faculty members who are grappling with the experiment's repercussions today, from life-saving medical technology to life-threatening radiation exposure and risks of nuclear war ("Pioneers and Inheritors," page 26).

The making of Henry Moore's sculpture *Nuclear Energy* is the subject of "Elemental" (page 34), marking the 50th anniversary of its dedication on the site of the reaction. And in *Inquiry*, the publication of the Division of the Physical Sciences and a special section of this issue, the story "Manhattan's Critical Moment" (page 56) chronicles how the experiment proceeded on that consequential day. ◆

LETTERS

Remembering a giant

The Summer/17 issue brought shocking news of Philip Gossett's passing (Deaths). No doubt, those who loved this man for his scholarship and talent must be saddened by this loss. Remembering Humanities Day in 2010, where my eyes lay for the first time on this giant, I was utterly awestruck.

No doubt, those who loved this man for his scholarship and talent must be saddened by his loss.

A session presentation was to be made on the top-floor lecture hall in Goodspeed, but we were all locked out. Gossett ushered us into a regular music classroom containing a grand piano, where he staged an aria and self-composed libretto of lecturing, singing, and playing the piano.

The last time I saw Gossett he was on stage with a nurse helping him. He gave us the latest news of his doings at Santa Fe, critical volumes of music published or to be published, Verdi and Rossini, and performances in the works. He was sharing his enthusiasm and joy in the subject.

Oh, Philip, you will be missed. Thanks. Many, many, many thanks.

Roy D. Schickedanz
GLENWOOD, ILLINOIS

Binding books

I was only on campus for one year, and often feel more like a visitor than an alumna when reading about iconic UChicago people and places in the *Magazine*. "Book Smart" (Summer/17) changed that. Those labyrinthine plywood stacks at the Co-op, the books I discovered there that have traveled with me ever since, these are my UChicago icons. I applaud Jeff Deutsch's vision and look forward to supporting the Co-op's mission for years to come.

Mary Branick Ujda, AM'94
ATLANTA

Back to the (eco)garden

The article and pictures celebrating the 20th year of the University's status as a botanic garden ("Evergreen," Summer/17) are a beautiful description of how a 1961 landscaping project morphed into a 217-acre designated botanic garden (hereafter "garden"). There is an even more interesting backstory when one looks further back, reexamines the landscaping choices, and considers more immediate environmental concerns.

In 1891 the grounds of the University of Chicago varied from low areas with standing water to flat, dry areas covered with several species of oaks, some 50 years old. The native oaks were adapted to the sandy soil and local climate, but the trees interrupted the overall landscaping plan. A conservation-minded trustee, Judge Daniel Shorey, prevented the destruction of the black oaks, and some survive to this day. Praise for Shorey came from professor Henry C. Cowles, PhD 1898, a nature lover often called the father of American ecology.

Cowles was supportive of the first University landscaper, O. C. Simonds, whose innovative use of native plants and winding paths got him fired. Cowles's groundbreaking studies of Indiana's marshes and dunes had provided the University's botany department with immense prestige. But, despite calling them "distinctive," the University disdained its own marshes and dunes. University websites describe the original lakefront marsh ecosystem as "large tracts of swampland," "characterized by infertile soil," and as a "somewhat troublesome marshland." These negative views explain the casual destruction of what today is recognized as an ecologically significant and biologically productive lakefront marsh ecosystem.

Reversing some of that destruction is possible. The Rice Native Gardens of Chicago's Field Museum are sustainable landscapes that replace the turf grass, annuals, perennials, and other nonnatives. By highlighting plants native to Illinois, the same species that grow wild in the state's prairies and woodlands, the museum campus is a living exhibit and scientific laboratory on conservation, ecology, and climate change, and a refuge for migratory birds and animals. The University of Washington Botanic Gardens's 80 acres of restored marsh and swamp wetland have become critical habitat for hundreds of species of birds in Seattle. Restoration required destruction of UW's married student housing, and closing and emptying out the highway construction debris that filled the city's largest garbage dump.

I suggest that the University remember Simonds and replace its nonnative landscaping with plants native to Illinois, and consider restoring portions of the lawn's "often saturated and sterile soils" to the original swamp white oak and marsh wetland. These changes will enable wonderful things to happen. Students and faculty, including researchers in the ecology and evolution department—alarmed about the existential threat posed by global climate change—will applaud, and perhaps help with, restoration of wetland that stores up to or in some cases even more than 40 percent soil carbon. A natural carbon sink will enhance the campus, and restored wetland provides reproduction opportunities to many of Illinois's 100 butterfly species, and stopover sites for migrating birds to rest, eat, and breed. Vulnerable butterflies that specialize in, or heavily use, wetlands will find places to lay eggs.

Their caterpillars will benefit the caterpillar-eating offspring of millions of local and migrating birds whose spring and fall routes from and to Central and South America pass directly though Chicago. Hundreds of wetland plant species provide benefits to dwindling Lepidoptera (butterfly and moth) populations. These include swamp milkweed, host to the at-risk monarch butterfly, whose migration route to Mexico passes directly though Chicago, and marsh violet, a host for many fritillary butterfly species, including the Illinois endangered

regal fritillary. Restored wetland benefits at-risk plants, like the threatened queen of the prairie, whose colorful flowers reward bees and other at-risk pollinators with abundant pollen. The 20th anniversary is the right time for the University and its botanic garden to undertake living up to their 21st-century environmental potential.

Charlotte Adelman, AB'59, JD'62
WILMETTE, ILLINOIS

Grotesquely mistaken

How distressing to have the green man on Stuart Hall called a "grotesque" (cover, Summer/17). It is, indeed, a classical copy of a Green Man, a very significant pagan character carved on many English and European churches. (Does anyone at UChicago know where the Stuart Hall design was found originally?)

Congratulations to the artist, Jeff Nishinaka, for the excellently empathetic paper rendering of the design.

Crow Swimsaway, AB'54, AM'58
NEW MARSHFIELD, OHIO

We erred in calling the carving a grotesque, usually a fanciful and often a hybrid creature. We should have simply called it a figure. According to the AIA Guide to Chicago *(University of Illinois Press, 2014), Stuart Hall, which originally housed the Law School, "is carved with figures of kings and magistrates (predemocratic dispensers of justice)." We regret the error.*—Ed.

Nesting habits

While I loved the Summer 2017 *Core* cover, the photo of the juvenile hawk inside the magazine and Helen Gregg's (AB'09) story ("Birds and Prey") might have left your readers with an erroneous understanding. Cooper's hawks, unlike peregrine falcons, do not routinely continue to use the same nest year after year. The fact that a nest near Harper Memorial Library was used this year by no means permits the conclusion that it will be a continuing "home on the UChicago campus."

We were honored to have Cooper's hawks nest in a pine tree in our yard in Philadelphia in 2016. They were a delight, especially as they taught the fledglings to fly and hunt. We saw nothing in 2017. In contrast, there is a nest in city hall across the street from my husband's office that has been used by the same pair of peregrine falcons for over five years.

It would be interesting to hear if the Cooper's hawks return to Harper.

Elise Singer, AB'75
PHILADELPHIA

Covering the coverage

The football scrimmage with its very small crowd of about 200 that you showed (Alumni News, Summer/17) was the lead story of the *Maroon* on October 26, 1956. As the managing editor, I received a bound volume, in which I was able to look it up. I want to call attention to a paragraph in our story, which also pictured a sparse crowd: "*Tribune* and *Sun-Times* photographers, present for the game, bunched the students together in the stands to take pictures of them. One *Tribune* photographer even led the students in Chicago cheers."

I don't remember how our liberal friends at the *Sun-Times* pictured us, but our enemies at the very reactionary *Fibune* (as we called them) showed the bunched-up students without showing any empty seats—thus implying that the radical U of C was becoming "normalized." Little did they know.

Norman Lewak, SB'57
BERKELEY, CALIFORNIA

Themistocles, Thucydides ...

I read with interest Hanna Holborn Gray's "Self Portrait" (the *Core*, Summer 2017). Although she was not president when I was a student, I did have one interesting contact with her during her term.

President Gray mentions her interview with the *New York Times* in which she notes that she did not know the University football coach had left until her Christmas card was returned with the notation "Moved: Left no forwarding address." This was an apparent exemplar of her attitude toward sports in the College, an attitude that sports were play as opposed to students' more serious work. As a graduate of the College and the father of a student in the College (AB'90) who threw the discus for the University track team, I wrote President Gray to suggest that students who were members of varsity athletic teams, like my son, did so because they felt a real pride in representing the University as athletes and truly enjoyed what they were doing. Certainly my son wore his varsity letter jacket with pride during his time on campus. But he did wonder whether participating in sports was worthwhile if the University president didn't know when a varsity coach had left his position.

Students in the College participate in a variety of activities that give meaning and richness to their educational experience. I spent three years doing theater work in the Blackfriars,

BLAST FROM THE PAST

Your ad compositions, although attractive, are hardly intellectual, to-wit: Your ad which appears on the inside front cover. [*The two campus scenes which we agree to deliver "to your door for an even $13.00." We forgot to add "each."*] Will you please advise me what sort of an intellectual yardstick or slide rule one needs to read the ad and then come up with the answer as to whether the mentioned photographs are $13.00 for a pair or apiece? At any rate they happen to capture two of the moods (not nudes), memories of which I have always relished. I am, therefore, enclosing my check and I would appreciate it if you would fill in the appropriate amount to cover both photographs in sepia.

—Paul R. Kitch, JD'35, Dec/50

P.S. If your ad had been coherent I would have paid no attention to it. P. R. K.

University Theater, and Court Theatre without receiving any academic credit for my activities, just as my son spent three years as a varsity athlete without receiving any academic credit for his efforts. But we both look back at our extracurricular activities with pride, because for us "fun" in the College had not died but taken a nonacademic form.

Jim Best, AB'60
KENT, OHIO

No urban legend

"How to Run for Office" (the *Core*, Summer 2017) quotes Christian Mitchell, AB'08: "There's a common saying in Chicago: 'We don't want nobody who nobody sent.'" This is followed by your footnote, "According to legend, a ward committeeman said this to a young Abner Mikva, JD'51, when he tried to sign up as a campaign volunteer."

In a compilation of oral history interviews with Chicago politicians, political scientist Milton Rakove, AM'49, PhD'56, quotes Mikva: "The year I started law school, 1948, was the year that Paul H. Douglas and Adlai Stevenson were heading up the Democratic ticket in Illinois. I was all fired up from the Students for Douglas and Stevenson and passed this storefront, the 8th Ward Regular Democratic Organization. I came in and said I wanted to help. Dead silence. 'Who sent you?' the committeeman said. I said, 'Nobody.' He said, 'We don't want nobody nobody sent.'"

So this is not a legend, it is a direct quotation from the person involved—except that in your version the language is slightly prettified. By the way, the name of Rakove's book of oral history interviews is *We Don't Want Nobody Nobody Sent* (Indiana University Press, 1979).

Bob Michaelson, SB'66
EVANSTON, ILLINOIS

The University of Chicago Magazine *welcomes letters about its contents or about the life of the University. Letters for publication must be signed and may be edited for space, clarity, and civility. To provide a range of views and voices, we encourage letter writers to limit themselves to 300 words or fewer. Write: Editor,* The University of Chicago Magazine, *5235 South Harper Court, Suite 500, Chicago, IL 60615. Or email: uchicago-magazine@uchicago.edu.*

Serious inquiry, engaged scholarship

BY LAURIE ZOLOTH, DEAN OF THE DIVINITY SCHOOL AND THE MARGARET E. BURTON PROFESSOR

Why study religion?

Let me make the argument that there is perhaps no field of global inquiry so deeply important in our time, and no public question that does not intersect with the question of religion. Interested in climate change, immigration, free speech, or politics? Consider the narratives of Hebrew Scripture, the Upanishads, the New Testament, or the Quran, where the serious challenges of human societies, the yearning for freedom, the prophetic calls for justice were among the first articulated.

The Divinity School at the University of Chicago has long been the place for the most serious scholarship on the issues of theology and religious studies. We are building on our distinguished history and reputation as the leading institution in our field to rigorously and critically explore questions of central importance to every human being, in every field of study and inquiry, at a moment when interdisciplinary public discourse and engaged scholarship are more vital than ever.

This year we are turning outward, toward both our local neighborhood and our global society, with new initiatives and innovative research. The rigor, the integrity, and the excellent scholarship of this school and the serious intentionality of the faculty's research have earned top rankings for decades. We are a place that pays attention to the existential, moral, and practical claims of religion, rather than bracketing them.

What it means to be a leader in our field is a long-standing and enduring question. Consider a second-century debate, recorded in the Babylonian Talmud, in which the question is raised—a scholar who wants to be regarded as a leader of scholars must be able to answer questions from any text, even obscure ones, "to answer from anywhere." A scholar must be able to "build the world."

Laurie Zoloth became dean of the Divinity School July 1, 2017.

Who is a scholar and who is a leader? How are we in the world? How do we build a world? For generations of American scholars of religion, UChicago has been the place that can answer "from everywhere," both from every obscure canon and from every public location.

It is this excellence that calls us to the work before us. We live at an hour in which that work is urgent. In our country, in our city, we are called to attention in what many have argued is a newly critical time for democracy, civility, and urbanity. What makes it a distinctive time for scholars of religion is that our field—the texts we study, the practices we encounter, the scriptures, the literatures, and the images on which we are focused—speaks in the languages of the current public discourse.

These languages are often inexplicable without understanding the arguments of faith. The ethical and moral dilemmas that surround us as we create the ideas that will shape the future, these too are opaque without the languages of faith traditions. We live in a secular modernity. But we know that the promise of the future (genetics, robotics, genetic technology) and the serious threats to it (violence, injustice, ecological instability) cannot be fully addressed without arguments in the languages of religion.

The Divinity School teaches fluency in these languages. As scholars of religion and theology, we know ideas matter, we know that the words, sentences, and arguments that emerged in and were preserved in these languages should be heard in the public square, in the face-to-face encounters that make being, and then civic life, possible.

We will continue to teach the next generation of complexly trained, dedicated scholarly leaders. For the University, in which we are a professional school and a central carrier of the ideas and values, pellucid and powerful, that are its drivers of excellence, we will be an even greater partner, a site of truthful inquiry. We will do our part to answer the greatest questions of the academy: What does it mean to be human? What does it mean to be free? What must I do about the suffering of the other?

For the good city in which we are privileged to live, amid a plurality of communities and social locations where religion is the site of meaning, we can listen, even more carefully, to what faith might bring, and what service justifies our work. For our country, for all the publics that surround this university, we will insist that the world that is illuminated by intellectual inquiry can have a voice, can speak to our shared future.

Why study religion and what can the thoughtful, serious, and engaged study of religion do for us? It can answer from every text, it can answer from every place. In this great university, in this great city, it can "build the world." ◆

PHOTOGRAPHY BY SETH JOEL

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UChicago Journal

Students went hunting for 121 items hidden across Hyde Park as part of an O-Week alternate reality game.

PHOTOGRAPHY BY FREDDY TSAO

CAMPUS LIFE

Game time

The ParaSite turned incoming students into sleuths.

When members of the Class of 2021 received their welcome letter in May, a cryptic message at the bottom directed them to an equally puzzling page on the Orientation Week website. "There is only one question you need to ask," the website read. "What is the parasite?"

Over the next several months, more clues appeared. For instance: "They don't like to be called 'red monks.'" Hyperlinks pointed to xeroxed transcripts of conversations alluding to a secret society and an interdimensional portal at the University. Hints hidden in the documents guided students toward yet more riddles and puzzles. Online, incoming students began working together to unfurl the mystery.

Though the students didn't know it yet, they were playing an alternate reality game designed by **Heidi Coleman**, director of undergraduate studies in theater and performance studies; **Patrick Jagoda**, associate professor in English and cinema and media studies; and **Kristen Schilt**, associate professor in sociology. Called *The ParaSite*, the game spanned social media, virtual reality, and real life and helped students get to know their new school—and one another—through playing it.

The game concluded on September 17 with a massive multi site scavenger hunt, but for its players, the effects have been lasting. "We were all pushed outside our comfort zone from the beginning to talk with people we didn't know online, but once we were on campus, we really had to put ourselves out there," says first-year **Justine Shih**. "My closest friends have come from this."

—Susie Allen, AB'09

GEOMETRY

Line items

A mathematician tackles gerrymandering.

Gerrymandering—the hijacking of the redistricting process by redrawing a voting district's lines to favor a specific person, group, or agenda—takes its name from Elbridge Gerry. As governor of Massachusetts in 1812, Gerry approved a party-serving district plan that critics mocked as looking like a salamander.

The opportunity for gerrymandering arises every 10 years, when district lines may need to be redrawn to reflect population shifts noted in each census. The next US Census takes place in 2020, so in 2021, we could see a fresh crop of districts resembling salamanders, lobsters, or, as one federal judge described a Maryland district, "a broken-winged pterodactyl, lying prostrate across the center of the state."

Although many people agree that partisan gerrymandering is, as Justice Samuel Alito has described it, "distasteful," it's also hard to prevent. Federal rules governing redistricting are minimal, and many state-level regulations are murky. For instance, 37 states require that districts be "compact," but only two bother to specify what that means.

Tufts University professor **Moon Duchin**, PhD'05, thinks she can help—both in providing a better definition of compactness, and in bringing her fellow mathematicians into the legal conversation about redistricting. Duchin founded the Metric Geometry and Gerrymandering Group at Tufts. The Boston-based team is studying how geometry (Duchin's specialty) and computing can be applied to redistricting, and training scholars in quantitative fields to serve as expert witnesses in court cases about gerrymandering.

THERE ARE YET NO AGREED UPON SUBSTANTIVE PRINCIPLES OF FAIRNESS IN DISTRICTING.

"Mathematicians have definitely thought about gerrymandering before," says Duchin. "What's new here is getting geometers together with computer scientists, and working with lawyers to understand how the math fits with practical measures we can take."

Gerrymandering has reemerged as a subject of public discussion and judicial scrutiny, thanks to a case currently before the US Supreme Court. *Gill v. Whitford* argues Wisconsin's legislative districts favor Republicans so much that voters' rights are violated.

It's one of several redistricting cases to appear before the court since the 1960s. In that time, the justices have intervened against racial gerrymandering but hesitated to take a decisive stance on partisan gerrymandering—in part because, as Justice Anthony Kennedy wrote in 2004, "there are yet no agreed upon substantive principles of fairness in districting" and no "clear, manageable, and politically neutral standards" with which to evaluate districts.

Duchin and her collaborators are trying to meet Kennedy's challenge

PHOTOGRAPHY BY ALONSO NICHOLS/TUFTS UNIVERSITY

"It just so happens, by what I feel is a truly lucky coincidence, that the kind of math that I do is ideally suited" to addressing gerrymandering, Duchin said at a lecture at Bowdoin College this fall.

by proposing redistricting standards that are fair and rigorous enough for judges to adopt.

Their first line of attack is to develop a more sophisticated measure of compactness, because judges have made clear they care about it—even if they don't know how to measure it. Existing definitions, rooted in 19th-century mathematics, have typically focused on how far the shape of a district is spread out from its center, or how relatively smooth or jagged its boundaries are. For example, a circle is more compact than a star. The more tortured a district's shape, the theory goes, the more likely it is to have been gerrymandered.

But there may be good reasons why a district looks strange. For instance, if a natural feature such as a mountain range cuts across a district, its edges could appear contorted. In some states, lawmakers are required to keep groups with shared interests together—racial and ethnic minorities, people who share a school district, even beachfront property owners. So rather than just looking at a district's shape to determine whether it has been gerrymandered, Duchin wants to focus on "where the people are in the shape and how the shape slices the population," she explains.

That idea is one basis of the refined definition of compactness she hopes to devise using contemporary geometrical techniques. By drawing a network of lines based on population density within a district and then digitally "folding" along those lines like origami, mathematicians can identify a district's curvature—essentially, how "bendy" it is. And how districts look and bend when they are turned into origami, Duchin thinks, is a much better and more mathematically sound way to evaluate compactness.

Compactness isn't the only way to evaluate whether a district is well or badly drawn, fair or unfair. **Nicholas Stephanopoulos**, assistant professor of law at UChicago, has proposed another measure called the "efficiency gap," which uses the number of votes each political party "wastes" in an election to determine whether one has a systematic advantage over the other. A vote is considered "wasted" if it doesn't contribute to a victory—such as a vote for a losing candidate or an unneeded, "extra" vote for a winning candidate.

Duchin's group is partnering with computer scientists who are developing programs that can factor in any combination of these parameters—compactness, shared interest groups, the efficiency gap, and others—and use them to produce a variety of reasonable redistricting plans. If the maps actually drawn by legislatures don't resemble any of the computer-generated options, that's a red flag that gerrymandering might be at work. The approach is relatively new, but Duchin believes it holds promise, if its theoretical underpinnings can be explained well in court—hence her group's focus on expert witness training.

Duchin got interested in gerrymandering while teaching a 2016 course on the mathematics of social choice, which examined the math underlying complex and shared decision making, such as voting. It took her just over a year to design a workshop she led this August, which brought together some 500 experts in various quantitative fields to think about the real-world subtleties of redistricting—including **Shmuel Weinberger**, the Andrew MacLeish Distinguished Service Professor of Mathematics at UChicago.

Weinberger sees gerrymandering as "a mixture of a philosophical and political problem with mathematical overtones. The challenge is to figure out which kinds of maneuverings are genuinely illegitimate, and then to develop mathematical methods to [prove] it."

In search of those quantitative methods, Duchin's gerrymandering group is hosting workshops this fall and winter in four redistricting hot spots: Wisconsin, North Carolina, Texas, and California. And they're gearing up for the redistricting to come in 2021.

"I think we're producing good map drawers—from teachers to coders, scholars, and professionals—but if that fails for reasons of political gridlock and the like, my hope is we're producing good testifying witnesses for the court cases that will follow," says Duchin. "It would be better to be on the front end of drawing good maps, but if we have to, we'll be on the back end keeping the bad maps in check."

—Megan E. Doherty, AM'05, PhD'10

WILLIAM RAINEY HARPER'S INDEX

CHICAGO STYLE ICONS

Release date of *The Chicago Manual of Style* (*CMOS*), 17th edition:

09.12.17

Initial print run:

75,000

Years since the 16th edition was published:

7

Page count of the 1906 first edition:

202

Page count of the 17th edition:

1,146

Total copies of *CMOS* sold (in millions):

1.5

Correct number of hyphens in *email*, per *CMOS* 17:

0

MEDICINE

Cell power

A new type of immunotherapy is helping UChicago Medicine patients battle cancer.

"It was like seeing your first child being born," says **Michael Bishop**. On May 28, 2016, Bishop and members of his team watched several million modified white blood cells surge through an IV and into the waiting arm of 53-year-old Scott McIntyre.

"To see them flow in is exciting, even amazing," says Bishop, director of the Hematopoietic Cellular Therapy Program at the University of Chicago Medicine. "My first thought was: Is that it? That's all it takes, that little amount of cells?"

It was the first chimeric antigen receptor T-cell (CAR T) infusion, a new form of immunotherapy, at the University of Chicago Medicine, and McIntyre was patient 1. The cells he received were his own, harvested three months earlier and modified at a lab in Switzerland to help fight his cancer.

The process began around 9:30 a.m. Just after 10, the lymphocytes arrived in a metal cooler packed with liquid nitrogen. The cell processing lab technician removed the small packet of frozen cells and gently began to thaw them. The infusion itself took just 10 minutes.

McIntyre had been waiting a long time for this. He was diagnosed with diffuse large B-cell lymphoma, stage III, in September 2013, after developing a swollen lymph node in his right groin area. Another scan a month later revealed a swollen node in his neck and another under his arm. Thomas Reid, an oncologist based in South Bend, Indiana, confirmed the lymphoma diagnosis in November 2013.

I BEAT THE ODDS. I MADE IT OVER A YEAR. NOW WE'RE TALKING ABOUT A CURE. I'LL TAKE IT.

Today, almost 18 months after the CAR T infusion, McIntyre is cancer-free, and the procedure that saved him received approval from the Food and Drug Administration in August. UChicago Medicine is one of the first sites in the Midwest certified to provide CAR T-cell therapy.

The standard treatment for McIntyre's cancer is a chemotherapy regimen including a monoclonal antibody, three chemotherapy agents, and a steroid—many drugs, with many side effects. McIntyre made it smoothly through the first few cycles. Then he developed appendicitis, delaying his fourth round. After all of that, his remission lasted just two months.

In 2014 Reid referred him to a trusted colleague, **Sonali Smith**, the Elwood V. Jensen Professor in Medicine and director of UChicago Medicine's lymphoma program. (Bishop joined the team a year later.)

At that time, CAR T-cell therapy was being investigated in a few select centers. The short-term goal for McIntyre's doctors was to control his cancer, make him as healthy as possible, and keep him alive. In February 2015, McIntyre had a stem cell transplant. He was in remission but, again, only for a few months. Two more clinical trials and some precisely targeted radiation therapy bought a little more time, but by late 2015 his lymphoma was gaining on him.

Then three good things happened.

The first was watching his beloved Notre Dame football team play in the 2016 Fiesta Bowl. The Fighting Irish lost to Ohio, but at least McIntyre was at the game to see it.

A few weeks later, the McIntyres' oldest son wed his longtime fiancée. They had postponed the wedding for years, McIntyre says, "because I kept getting so sick." This time he managed to stay well, take classes to become an ordained minister, and officiate the wedding.

Then, in early February, McIntyre's medical team got the go-ahead for CAR T-cell treatment and began harvesting his T cells. They took out blood, extracted the lymphocytes, and returned everything else. They put the collected cells on ice and awaited the next step: conversion at the Swiss pharmaceutical company Novartis, one of only a few labs worldwide certified to convert a patient's T cells into chimeric antigen receptor T cells, a potent anticancer weapon. Because each batch is designed for a different patient, they must be produced one at a time. It takes about three weeks to prepare a patient's cells.

These modified T cells search out specific cells—in this case, those that display a surface protein called CD19,

Four years after receiving his cancer diagnosis, and more than a year after receiving CAR T-cell therapy, Scott McIntyre is in remission. The procedure that saved his life received FDA approval this summer.

UCHICAGO MEDICINE

found on cancerous white blood cells. When the modified T cells detect and connect with these dysfunctional cancer cells, they annihilate them.

The process has proved remarkably effective. In 80 to 90 percent of cases, patients with acute lymphoblastic leukemia get a complete remission. About 40 to 50 percent of patients with McIntyre's disease, diffuse large B-cell lymphoma, have complete lasting remissions. CAR T-cell therapy has also been successful in treating pediatric acute lymphoblastic leukemia, a cancer affecting blood and bone marrow.

On April 12, 2016, Novartis at last asked the Chicago team to send them his cells. A few weeks later the modified cells came back and the date for the infusion was set.

"This is scary," McIntyre said, days before his infusion, "but exciting."

By this time he had already surprised his care team several times. When cancer comes back after a stem cell transplant, for example, life expectancy is about six months. "I beat the odds," he says. "I made it over a year. Now we're talking about a cure. I'll take it."

The new therapy is not without risks. Once the T cells enter the body, each one multiplies rapidly, producing thousands of offspring. Then they launch a vigorous assault. This rapid destruction of a large volume of cancerous cells can cause severe flu-like symptoms: fevers, swelling, low blood pressure. It sometimes causes neurologic effects such as delirium. McIntyre experienced this briefly, but a short course of steroids brought his immune system back in line.

Despite that episode, his course was "relatively uncomplicated," Bishop says. "It fit our mantra: boring is good."

Patients who have a complete response, meaning no evidence of disease for three months or more, are unlikely to have a recurrence. McIntyre is now well outside that window, back at work, and once again attending college football games.

"This is going to change how we treat hematologic malignancies," Bishop says. "Right now, we use this for the sickest patients, those with refractory disease. But it could become standard therapy, with significantly improved prognosis. This is just the infancy of this approach."

—John Easton, AM'77

PHOTOGRAPHY BY LLOYD DEGRANE

ORIGINAL SOURCE
A LOST LETTER, FOUND

In the late 1950s, hotelier Louis H. Silver, JD'28, made a donation to the Law School of rare items about and belonging to early Supreme Court justices. The letters, portraits, and legal documents from figures including Oliver Wendell Holmes and John Jay were carefully tucked away in the Law School's rare books collection, where their existence gradually faded from institutional memory—a not uncommon fate in the era before digital library records.

Almost 60 years later, Sheri Lewis, director of the D'Angelo Law Library, rediscovered the Silver collection after seeing it referenced in a 1958 article in the *University of Chicago Law School Record*. She had a hunch the collection was important, but what she found in it still surprised her. Among the 75 letters was one from John Marshall, later the chief justice of the Supreme Court, to George Washington. Although its contents are relatively mundane—Marshall was representing Washington in a dispute over a piece of land on the Ohio River and wrote with an update—the letter was sent 22 days after the ratification of the new Constitution, as Washington waited for the final results of the first presidential election.

While scholars were aware from other records of a March 26, 1789, letter from Marshall to Washington, no one knew what had happened to it or what it said. Alison LaCroix, the Robert Newton Reid Professor of Law and a specialist in early legal history, was among the first to see the note after it resurfaced. It's a peek at Washington's daily life as he was preparing "to be the chief magistrate of this unknown experiment," she says. The letter's loss and rediscovery are a reminder of how much our historical knowledge is shaped by what evidence survived. "There's always this question of what has been preserved and why it's been preserved," LaCroix says. "Sometimes things that are 'lost' don't stay lost, and when we find them, we have new evidence. But what's interesting, and important, to remember is how much of it is chance."—*Susie Allen, AB'09*

After a field trip to the Adler Planetarium, campers discussed whether humans should colonize space.

EDUCATION

Up for debate

Two undergraduates believe playful wars of words can teach kids empathy and critical thinking.

On a quiet summer afternoon, a group of soon-to-be third graders is engaged in a spirited discussion: about when their promised snack of Goldfish crackers will arrive, who took whose pencil, and whether criminals should have access to a lawyer.

They're sitting in the library of a Hyde Park synagogue, around a table strewn with lunch boxes, notebooks, and hand-decorated drawstring backpacks. As they talk, the kids fiddle with handfuls of squishy Playfoam. "Lawyers are *expensive*," one child points out. "It's hard to find good ones," another agrees.

Debate it Forward is the rare program where you'll find eight-year-olds weighing the merits of an adversarial legal system and, moments later, shoving Playfoam into their own hair. A summer camp and semester-long afterschool program founded by fourth-year **Leah Shapiro** and third-year **Josh Aaronson** last fall, Debate it Forward uses the skills of debate to foster critical thinking, empathy, and confidence in elementary and middle schoolers.

"The more you get up there, you use your voice, your opinion, the more you'll find that you have a voice to give, and the more you'll be able to take ownership of yourself and your learning," Aaronson says.

Each day of the weeklong camp begins with a debate question such as "Should people who have committed serious crimes have access to a lawyer?" and a related field trip. This morning, for instance, the roughly 30 campers, a mix of rising third and eighth graders, visited the Cook County courthouse, met with Illinois circuit court judge Alison Conlon, and sat in on a real trial. Now, after lunch and some quick debate-focused games, the third graders are divided into teams and prepare to face off in a 10-minute structured debate: argument from Team Affirmative, argument from Team Negative, question time, rebuttal. ("But what's a *buttal*?" one camper asks.) Outside, the eighth graders are preparing for a brief debate of their own.

At times the discussion resembles *Kids Say the Darndest Things: Criminal Justice Edition*. One debater sagely points out that criminals shouldn't get lawyers because, as the person who committed the crime, "no one knows more about the case than they do." Another has more pragmatic concerns: "A lawyer wouldn't want to defend someone who would kill them if something went wrong."

But through all the silliness, Aaronson and Shapiro are confident the kids are learning essential skills: how to listen, how to evaluate ideas, how to speak with conviction. And they believe their program can be especially helpful for students who are typically "overlooked by the traditional debate

PHOTO COURTESY LEAH SHAPIRO AND JOSH AARONSON

circuits," Aaronson says—students with learning and developmental differences, ranging from autism to attention deficit hyperactivity disorder.

Shapiro was a successful high school debater and debate coach, but the idea of teaching debate skills to kids didn't occur to her until a year and a half ago. She was in the car with her six-year-old cousin when he began to throw "the tantrum of all tantrums." On the fly she devised a game that resembled exercises she used as a coach: she would make a statement, and her cousin had 20 seconds to tell her why she was wrong. "What kid isn't going to take you up on that?" Shapiro says. The game quickly distracted the six-year-old out of his tantrum—and gave Shapiro an idea.

I STARTED THINKING IF YOU COULD FIND A WAY TO DEEMPHASIZE THE COMPETITIVE NATURE OF DEBATE YOU COULD PROBABLY EXPAND IT TO A MUCH BROADER BASE OF KIDS.

"I started thinking if you could find a way to deemphasize the competitive nature of debate you could probably expand it to a much broader base of kids," she explains. Shapiro took the idea to her classmate Aaronson, who had spent a gap year after high school working in a Milwaukee public school through the City Year program.

Together they developed a curriculum of debate-focused games and exercises. Students especially love the "infomercial game," in which they're given a worthless item, like a snapped rubber band, and have to explain why it would make a great birthday present. "That's mainly where we work on persuasive speaking," Aaronson says. Today's campers played a game where they had to justify absurd statements, such as "clocks do not tell time."

This year, with help from a staff of fellow UChicago students, they're offering Debate it Forward at nine schools in the Hyde Park area. The program concludes with a mock trial or debate, but competition isn't the main focus—these are intended as a "showcase of skills," Aaronson says.

Shapiro and Aaronson met at summer camp when they were 13 and reconnected when they found themselves living on the same floor in DelGiorno House. Now they're both roommates and business partners ("I can't get rid of him," Shapiro jokes). Their living room has become the Debate it Forward headquarters, complete with what Aaronson describes as "a fancy whiteboard, which we're really excited about," where they brainstorm new ideas for games.

Their ambitions for the program have expanded as they've seen its effects. Shapiro remembers one student with a diagnosed learning difference who started out reluctant but by the end of the program was "the first one to raise his hand." His parents later told her it was the first time the boy had enjoyed an activity that called for verbal skills. "It was a huge breakthrough for him," she says. Aaronson recalls how proud students at the UChicago Charter School Woodlawn Campus felt when they performed well in a mock trial with students from the Laboratory Schools. "The total 180 in their entire self-confidence, their demeanor, was incredible," he says.

What Shapiro and Aaronson thought would be a college extracurricular is now their postgraduation ambition and a nonprofit with a 10-year plan. Their hope is to expand Debate it Forward nationally and even internationally and reach as many students as they can. They're also raising money for scholarships that will allow them to waive the program's fee for students and schools in need.

Today, however, they've got their hands more than full with 30 young debaters. After a spirited back-and-forth among the eight-year-olds (featuring a long discussion of whether someone could commit a crime unknowingly while asleep) the counselors declare Team Negative the winner. They tell both teams how close a call it was and how much they struggled with the decision. It was, they emphasize, a real debate.

—Susie Allen, AB'09

Shapiro and Aaronson first met when they were 13. Now roommates and business partners, they're planning to expand Debate it Forward nationally and even internationally after they graduate.

PHOTO COURTESY LEAH SHAPIRO AND JOSH AARONSON

CRIMINAL JUSTICE

Rethinking release

A new program helps inmates transition out of Cook County jail.

Unlike state and federal prisons, where inmate releases might be planned months or years in advance, leaving Cook County jail is an unceremonious affair.

Inmates are turned out of the sprawling eight-block complex at all hours and with little warning. It's not uncommon for the recently released to walk several miles home from 26th and California.

"People just wander out into the night," says **Harold Pollack**, the Helen Ross Professor at the School of Social Service Administration, who studies poverty and public health.

Some, especially those who are homeless and suffer from mental illness, are rearrested soon after release; others overdose, participate in violence, or become the victims of violence within the first few days and weeks of leaving jail.

This state of affairs has long troubled Cook County sheriff Tom Dart. In fact, nearly every aspect of the modern criminal justice system troubles Dart ("my seven-year-old would come up with better ideas," he says), but the problem of release has been particularly frustrating.

"People come in on things that aren't even crimes, they sit there for outrageously extended periods of time"—one woman spent more than 200 days in the jail awaiting trial for shoplifting—"and the way it was operating was, we just dump them all into communities and then act puzzled why (a) they're coming back and (b) why they are causing more harm in that community," he says.

In his 11 years as sheriff, Dart has come to view jails as "dumping grounds for all the problems of our society that people don't want to deal with": substance abuse, poverty, mental illness. Jails, he often points out, have become the largest mental health providers in the state. He estimates that at least a third of the inmates in Cook County jail suffer from mental illness.

Rather than fighting this reality, Dart decided to embrace it. "If that's what, as a society, we've decided to do" about mental illness, he thought, "Well, [Cook County jail] is going to be the best mental health provider." He's instituted reforms including a mental health transition center that offers therapy and job training. He appointed a clinical psychologist, Nneka Jones Tapia, as the jail's warden. As a result of these measures, more inmates began getting some of the treatment they needed.

PEOPLE EXPERIENCE THE MAXIMUM PERSONAL VULNERABILITY AT THE EXACT MOMENT THAT THEY ARE PASSING BETWEEN ADMINISTRATIVE SYSTEMS, AND THEY—IF WE'RE NOT CAREFUL—WILL SLIP THROUGH OUR FINGERS.

But too often the progress ended the minute inmates left the front gate. Dart wanted a better pathway out of jail, so in 2015 the sheriff's office applied for grant funding from the University of Chicago Urban Labs. Two other organizations, Treatment Alternatives for Safe Communities and Heartland Health Outreach, submitted similar proposals.

The three groups ultimately teamed up and suggested a simple but powerful intervention, the Supportive Release Center (SRC), which offers former inmates identified as high risk a safe place to sleep, have a meal, wash clothes, and make phone calls on the night of their release. It also connects people to the services they need to stay out of jail. An on-site nurse and caseworker can order prescription refills, make follow-up appointments at community clinics, and provide referrals to service providers for housing assistance and mental health counseling. On its face, it's nothing fancy—the facility is housed in a repurposed mobile home just blocks from the jail—but it offers a softer landing to those who need it most.

The SRC ultimately received $1 million in start-up funding from Ur-

UCHICAGO NEWS OFFICE

Following the ribbon-cutting ceremony for the Supportive Release Center, Harold Pollack planted flowers in the center's garden.

ban Labs and the Pritzker Foundation. That grant supports a study led by professor of medicine **David Meltzer**, LAB'82, AM'87, PhD'92, MD'93, and Pollack. The two are codirectors of the UChicago Health Lab, which helps governments and community organizations identify programs and policies that improve health outcomes. Together they're running a randomized study of the center, tracking factors such as rearrest, homelessness, and hospitalizations among people who were invited to use the center's services and a control group of those who were not.

Release is "such a critical moment in people's lives," says Pollack. "People experience the maximum personal vulnerability at the exact moment that they are passing between administrative systems, and they—if we're not careful—will slip through our fingers."

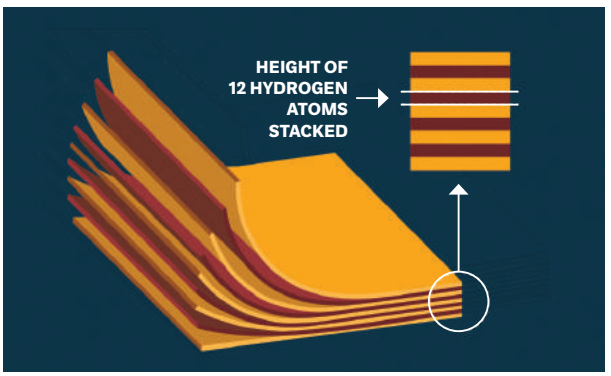
Not everyone needs every service the SRC provides—some only need to make a quick phone call, or to rest for a few hours. But for others, a night off the streets, something to eat, and access to medication may prevent a tragic outcome or another trip to jail. "We want to just make sure that they make a healthy and safe transition to whatever comes next," Pollack says. And if it works, he hopes other cities will adopt a similar model.

In its first four months, 150 people used the SRC's services. Three-quarters of them stayed overnight—a telling statistic, in Dart's mind. "That sort of screams out to you, what would have happened but for this?" he says.

Pollack has a social scientist's circumspection about declaring the program a success before his study is complete, but Dart is not so reserved. "It's so logical," he says. "I'm beyond optimistic. I'm convinced this will succeed, and I'm convinced as we go along our biggest issue will be expansion—it won't be, do we continue this or not? It will be, how do we ramp this up even further?"

—Susie Allen, AB'09

CITATIONS



Better, cheaper, tinier: UChicago scientists developed a new technique for making super-small semiconductors.

GRAPHIC BY UCHICAGO CREATIVE

LITTLE BUT FIERCE

To make electronics such as cell phones smaller and faster, scientists need to make semiconductors smaller too. A team led by **Jiwoong Park**, professor in chemistry, the Institute for Molecular Engineering, and the James Franck Institute, has developed a new and cost-efficient way to make stacks of semiconductors that are just a few atoms thick. The research was published September 20 in *Nature*. Rather than the common technique of growing stacks of film-like semiconductors, one on top of the other, Park and his collaborators, including postdoctoral scholar **Kibum Kang**, grew individual films, put them into a vacuum, then stuck them together like Post-It notes. This technique, which works with a variety of materials, protected the pristine surfaces between each semiconductor layer better than the existing method. The researchers believe semiconductors created with this technique could be used in computer chips.

EARLY BIRDS GET THE JOB

If you're hunting for a new job, don't wait to submit your résumé: employers in the technology sector accept applications for an average of just nine days after posting a job online, according to a March 7 working paper from **Steven J. Davis**, the William H. Abbott Distinguished Service Professor of International Business and Economics, and **Brenda Samaniego de la Parra**, AM'12, PhD'17. Although it takes an average of 45 days to fill a position, their research showed the majority of the hiring process is devoted to screening and interviewing the initial batch of candidates, rather than continuing to look through incoming applications. To conduct the study, the researchers drew on raw data from a group that operates online job-posting platforms for computer-related industries and created a database that matched 66 million applications to around eight million online job postings using second-by-second data.

WORK WORKS

A program that connects Chicago youth with summer jobs led to a decrease in violent crime arrests, new research from UChicago's Urban Labs has found. **Jonathan Davis**, AB'09, PhD'16, a doctoral fellow at the Crime Lab and Education Lab, and the University of Michigan's **Sara Heller**, PhD'13, coauthored the *National Bureau of Economic Research* working paper, published in May. Davis and Heller followed participants in One Summer Chicago Plus, which provides teens and young adults with six-week minimum-wage jobs, mentoring, and social-emotional training. The program did not affect participants' academic performance, but it led to a 33 percent reduction in violent crime arrests for participants in the two to three years following the program. Among younger school-going participants, One Summer Chicago Plus increased formal employment rates by 40 percent.

SKIN CARE

The latest breakthrough in gene therapy is only skin deep. In the August 3 *Cell Stem Cell*, a team led by assistant professor **Xiaoyang Wu** used genetically engineered cells to treat obesity and type 2 diabetes in mice. They focused on a gene that produces glucagon-like peptide 1 (GLP1), a hormone that triggers the pancreas to release insulin and can reduce appetite. The GLP1 gene was modified—to increase the hormone's half-life and to attach a tool that allowed the gene to be turned on and off—then inserted into skin cells and grafted onto mice. Mice with the modified GLP1 hormones gained less weight and had lower blood glucose levels and higher insulin levels than the control group. Administering gene therapy by skin may offer "a long-term safe option for the treatment of many diseases," Wu says.—*Kaitlyn Akin, '19*

POETRY

Side by side

Tyehimba Jess's contrapuntal poems.

In 1985 **Tyehimba Jess**, an undergrad from Detroit, wanted to be a jazz DJ on WHPK. "All the cool cats knew what jazz was," he says. "The guys who knew about jazz were the hippest people." But he wasn't one of those guys. And to get a slot, you had to submit a sample playlist.

So Jess, AB'91, went to Spin-It, a now-defunct record store on 57th Street, and flipped through the jazz section. "Who's this guy? Charles Mingus, OK. Pick something off the back. The funny thing about jazz records, you really can judge them by the covers." He turned in his playlist and was immediately given a slot. "They said it was one of the best jazz playlists they'd ever seen."

Jess had a radio show for 10 years: "One of the best things I ever did," he says. He worked his way through the station's 7,000-record jazz collection; later he added blues to his show, as well as interviews with political prisoners and activists. He took almost as long, seven years, to graduate. He changed his major from English to public policy, dropped in and out, and spent hours "in Regenstein in the E185s, black history, just reading all kinds of stuff—old *Jet*s, W. E. B. DuBois letters."

Jess's deep knowledge of African American music, history, and culture defines his two collections of poetry, *Leadbelly* (Verse Press, 2005) and *Olio* (Wave Books, 2016). A winner of the 2004 National Poetry Series, *Leadbelly* was named one of the best poetry books of 2005 by *Library Journal*. *Olio* won, among other awards, the 2017 Pulitzer Prize for poetry. (The finalists were *Collected Poems: 1950–2012* by the late Adrienne Rich and *XX* by **Campbell McGrath**, AB'84.) He's also an associate professor of English at City University of New York's College of Staten Island.

Jess's first book, which he worked on while doing an MFA at New York University, focuses on legendary blues musician Huddie William Ledbetter (1888–1949), known as Leadbelly or Lead Belly. The collection is experimental yet accessible, encompassing such forms as contrapuntal poems, prose poems, and erasure poetry (created by erasing words from a found text). "I would like people to understand what is going on in the first reading," Jess says, "and then to come back and enjoy and discover new things in the poem."

In high school Tyehimba Jess worked at a parking lot overlooking the Detroit River. One of his poems about the city won second prize in an NAACP contest.

Jess employs the contrapuntal form—two columns of text, printed next to each other, that can be read either down or across—to tell the story of Leadbelly's fractious relationship with folklorist John Lomax. Lomax met and recorded Leadbelly when he was in Angola Prison; later they signed a contract giving Lomax two-thirds of the profits from Leadbelly's performances. In "lomax v. leadbelly in new york: letters to home, 1934," for example, Jess juxtaposes an excerpt from one of Lomax's actual letters (he comes off rather badly) with an imagined version of the story from Leadbelly's perspective.

Jess's next poetry collection, *Olio*, took eight years to complete. The book reaches even earlier into African American musical history, to the era before recorded music. Jess writes about such forgotten figures as "Blind" Tom Wiggins (1849–1908), an autistic piano player who remained in slave-like conditions, "managed" by his former masters, throughout his life, and Millie and Christine McKoy (1851–1912), conjoined twins who sang duets. Running throughout the book is a series of invented interviews with acquaintances of ragtime composer Scott Joplin, whose syncopated rhythms provided inspiration for Jess's poems.

Described on Literary Hub as a "magnum opus," the 235-page collection begins with a definition of *olio*: a hodgepodge; a miscellaneous literary or musical collection; the second part of a minstrel show, which featured a variety of acts and evolved into vaudeville.

As in *Leadbelly*, Jess includes heartbreaking examples of found text from his exhaustive historical research: The names of African American churches and the dates they were burned. Pages of titles of "coon songs"—ragtime songs that mocked "coons," a slur for African Americans. A table of reasons given for black lynchings, including "Acting suspiciously," "Quarreling," "Living with white woman," "Voting for wrong party," and "Unpopularity."

There's a broad range of literary forms in *Olio*—prose, found text, and what Jess calls "syncopated sonnets"—but he returns again and again to contrapuntal poetry. "The idea was to stretch contrapuntal to the absolute limits that I knew how to stretch it," he told Lit Hub. At the end of the book he gives instructions for how to tear certain poems out of the book and fold them, roll them, or twist them into a Möbius strip: "One's words flow into the other's and back again, and on and on like an ever-bending act, a joke that never (ever?) never ends."

Jess, a former slam poet, writes his poems by hand. Starting this semester, he plans to require his students—who often write poems on their phones—to do the same. "There's a value in it, about feeling the poem organically come out of your body in that way," he says.

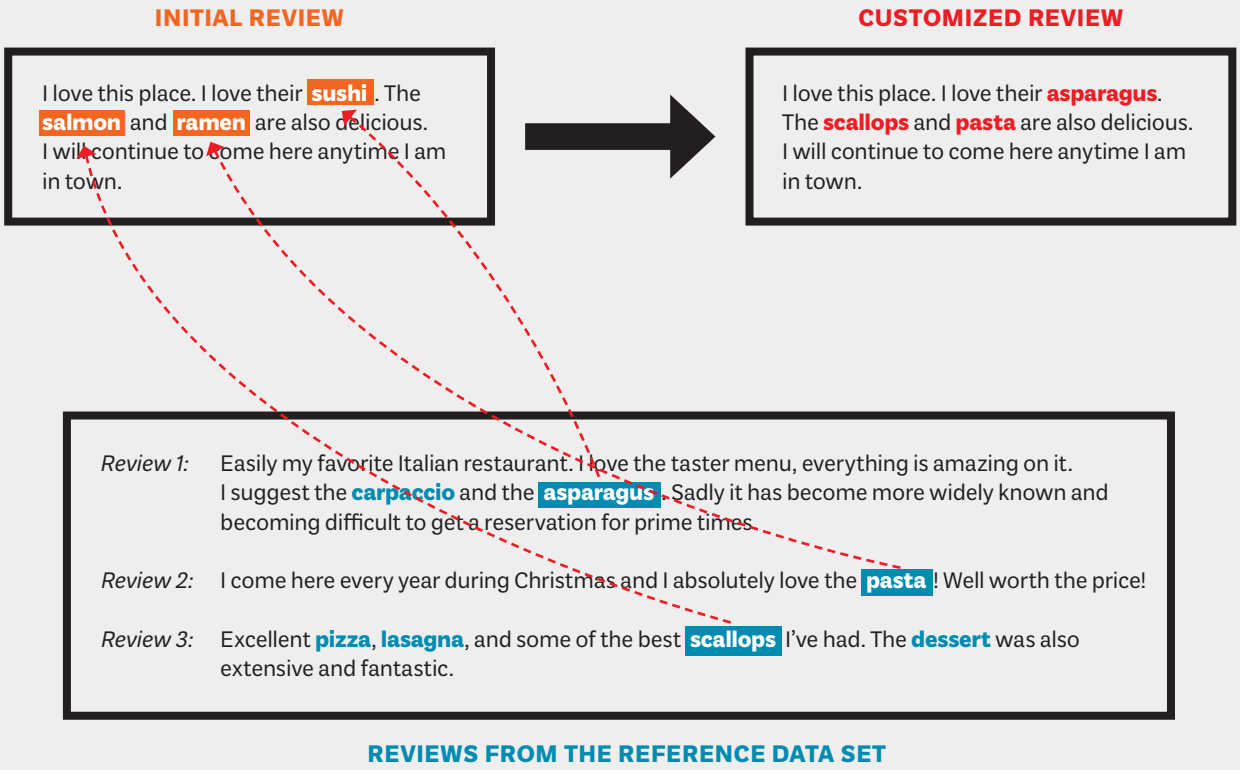
He hasn't started a new project yet: "I have some ideas. I'm in the exploratory phase." It's not easy to begin. Sometimes writing poetry feels like "throwing myself down a flight of concrete stairs," he says, "getting up and being unbruised."

—Carrie Golus, AB'91, AM'93

PHOTOGRAPHY BY JOHN MIDGLEY; COVER COURTESY WAVE BOOKS

FIG. 1

EVERYONE'S A CRITIC



GRAPHIC BY LAURA LORENZ (DATA FROM YAO, ET AL., 2017)

The robots are here, and they've got strong opinions about food. In a paper to be presented at the Association for Computing Machinery Conference on Computer and Communications Security on November 1, UChicago computer scientists showed that artificial intelligence can be used to generate fake Yelp reviews so convincing that users found them to be indistinguishable from, and just as useful as, human-written reviews. Even plagiarism detection software usually couldn't spot the difference.

Using Recurrent Neural Networks (a machine learning technique) and a diet of real Yelp reviews, the team—graduate students Yuanshun Yao and Jenna Cryan and Neubauer Professors Haitao (Heather) Zheng and Ben Y. Zhao—"trained" a computer program to generate convincing fakes and swap in the appropriate menu items for each restaurant. For instance: "The food here is freaking amazing, the portions are giant. The cheese bagel was cooked to perfection and well prepared, fresh & delicious! The service was fast. Our favorite spot for sure! We will be back!"

While it's nice to know that artificial intelligence enjoys a cheese bagel as much as the next guy, this type of software poses a serious threat to companies that rely on online reviews to attract and retain their customers—and wouldn't take much time or expertise for a savvy cyber attacker to develop. "I want people to pay attention to this type of attack vector as [a] very real and immediate threat," coauthor Zhao told *Business Insider*. Fortunately, the team discovered a telltale statistical sign of reviews created using Recurrent Neural Networks and developed an algorithm to detect it.—*Susie Allen, AB'09*

NEWEST NOBELIST

Richard H. Thaler received the 2017 Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel on October 9. The Royal Swedish Academy of Sciences honored Thaler, the Charles R. Walgreen Distinguished Service Professor of Behavioral Science and Economics at the University of Chicago Booth School of Business, for his contributions to behavioral economics. Thaler is widely considered one of the founders of that field, which unites economics and psychology.

GIVING BACK TO BOOTH

University of Chicago Booth School of Business alumna **Amy Wallman**, MBA'75, and alumnus **Richard Wallman**, MBA'74, have made a $75 million gift to the University, building upon their legacy of philanthropic support of students and faculty. In recognition of the gift, Chicago Booth will name its academic high honors distinction after the Wallmans. This group of top students will be known as the Amy and Richard F. Wallman Scholars at Chicago Booth. The designation will be permanently bestowed upon graduating MBA students who earn high honors at Booth, as well as all alumni who have already achieved this distinction.

PRESS ON

Garrett P. Kiely began his third term as director of the University of Chicago Press—the nation's largest academic press—on September 1. The press publishes 73 journals and more than 350 new books a year, including the *Chicago Manual of Style*, whose 17th edition was released September 12. Under Kiely's leadership, the press has begun releasing all new titles simultaneously in print and e-book editions, and has expanded its print-on-demand program.

A NEW DEVELOPMENT

Sharon Marine was named vice president for alumni relations and development at UChicago. Most recently Marine served as vice president for development of Cornell Tech. During her tenure, Cornell Tech raised $460 million. At UChicago, Marine will help set the overall strategy, direction, and organization for development, alumni relations, and campaign planning. Her appointment took effect October 15.

LAB LEADERSHIP

Nigel Lockyer has been reappointed as the director of the US Department of Energy's Fermi National Accelerator Laboratory, the University announced September 27. Lockyer's second five-year term, which begins September 3, 2018, comes as Fermilab, which is comanaged by the University through the Fermi Research Alliance, begins building its flagship project that will send neutrino particles underground from Illinois to South Dakota to unlock new insights into the origins of the universe.

PARTNERS IN RESEARCH

UChicago and the University of Illinois at Urbana-Champaign launched a partnership on October 19 dedicated to research and technology development for some of society's most pressing challenges. The partnership will bring about 100 faculty, researchers, and students from Urbana-Champaign to collaborate with UChicago colleagues, entrepreneurs, and industry leaders, and will be based at the Polsky Center for Entrepreneurship and Innovation complex in Hyde Park. The primary goal of the partnership will be developing and commercializing groundbreaking technology.

SOUND INVESTMENT

The UChicago Startup Investment Program has made its first investment, designating $500,000 for ExplORer Surgical, a start-up founded by Chicago Booth students and surgeons at UChicago Medicine. The company's interactive software offers tools to improve teamwork and coordination for surgical teams. Launched in December with $25 million from the University endowment, the UChicago Startup Investment Program coinvests alongside established venture funds in start-ups led by UChicago faculty, staff, students, and alumni.

HONORING A PIONEER

A lecture hall in the Kersten Physics Teaching Center has been named in honor of the late Maria Goeppert-Mayer, whose research on the structure of atoms earned her the 1963 Nobel Prize in Physics. A permanent exhibition about Goeppert-Mayer now sits outside the lecture hall. "This will acknowledge not only her work but will also celebrate and inspire women in the sciences," said **Edward "Rocky" Kolb**, dean of the Division of the Physical Sciences.

CHICAGO ARCHITECTURE

The US Department of State selected UChicago and the School of the Art Institute of Chicago (SAIC) to serve as cocommissioners of the United States Pavilion at the 2018 Venice Architecture Biennale. **Niall Atkinson**, associate professor of architectural history at the University of Chicago, will cocurate *Dimensions of Citizenship*, a showcase of works by architects, designers, thinkers, and artists exploring the concept of citizenship.

DEATH BEFORE DECAF

UChicago students are the nation's most caffeinated, according to data released by the food delivery service GrubHub. Analyzing orders placed during fall 2016 and spring 2017 by users with ".edu" email accounts, they found UChicago students ordered caffeinated drinks 138 percent more than the national average. MIT finished a jittery second; 16th-place Northwestern was only mildly buzzed.

ARTIST ON THE RISE

Theater director, performer, and visual artist **Dado Gyure**, MFA'14, is this year's recipient of the Claire Rosen and Samuel Edes Foundation Prize for Emerging Artists, for her multimedia project based on the Hans Christian Andersen story "The Little Match Girl." The Edes Prize provides a one-year $30,000 award to select students and recent alumni from four universities, including UChicago, to help advance their artistic practice. Gyure said the project will "examine the shifting terrain of American empathy."

CLOCKWISE FROM TOP LEFT: CHICAGO BOOTH; UCHICAGO NEWS; PHOTO COURTESY DADO GYURE; PHOTO COURTESY ART AND ALEX PHOTOGRAPHY

Art for all

Alison Gass wants you to feel welcome at the Smart Museum.

In her 12-year career as a museum curator, **Alison Gass** has crisscrossed the country, with stops at the Jewish Museum in New York, the San Francisco Museum of Modern Art, the Eli and Edythe Broad Museum at Michigan State University, and, most recently, Stanford's Cantor Arts Center. Gass was "swearing up and down to everyone I would never leave California" when she heard the Smart Museum was seeking a new director. After visiting, "I was totally enamored of the really deep intellectual curiosity that I found everywhere I turned." The 43-year-old museum felt like the right home for the politically engaged and risk-taking work Gass champions.

Even before she officially started at the Smart in May, Gass set to work planning *Welcome Blanket*, a project by artist and Pussyhat Project cofounder Jayna Zweiman that invites participants to send in handmade blankets for newly arrived immigrants and refugees with notes of welcome. (The blankets and notes are on view until December 17, 2017.) Gass, now the Smart's Dana Feitler Director, spoke to the *Magazine* about that project and her ambitions for the museum. Her comments have been condensed and edited.—*Susie Allen, AB'09*

What drew you to the Smart Museum?

My curatorial career has been very much bound up in thinking about art as a lens onto social and political issues and the way that artists help us understand those stories or shift our thinking. I really felt that the University of Chicago was the perfect place for a museum committed to thinking about the world through the lens of artistic practice and telling stories in the museum through art, in a way that not all universities and not all university museums are.

The Smart feels so ready for a reinvention into its next phase of life. University museums are free, so they're not driven by the door—meaning you don't have to do a huge blockbuster exhibition every summer. You can be a little risky. And that's a lot of what we're doing this fall. What if we shake up the way we install our permanent collection? We're not installing it chronologically at all. We're installing it thematically, which is definitely a different approach.

What are some of your plans?

My biggest goal is to make the Smart feel welcoming. One of the things I'm focusing on in this first year is the visitor experience. How does every visitor, no matter where they're from, whether they're on the faculty, or they're a student, or they're from the local community, or they're a kid who's never even been to a museum—how do we make sure we meet them exactly where they are and let them know that art is for everyone and relates to their life? So we're doing things like rethinking the signage that helps you find your way into the museum and moving walls in galleries to make it a more open space that feels more comfortable for thinking and learning and socializing.

We're also focused on diversity and inclusion in the collection and our programs. This is a museum on the South Side of Chicago, and we want everybody who comes in to see art that reflects their own experience of identity in the world. We will be looking at telling a more serious story about the history of African American art, getting more women into this collection, and getting more Latin American art, so that the museum is reflective of the place that it's in.

Has the role of museums changed in the 21st century?

We live in a world where images are ubiquitous and can be shared immediately. You don't have to go to a museum to see an object, although I think everyone who loves art objects would argue that seeing something in person is always totally different. There's something very special about standing in front of a work of art and doing some close looking, and thinking about the way things are made and the moment that they were made.

PHOTOGRAPHY BY JEAN LACHAT

The other thing that happens in museums is that you see objects in proximity to one another and you can begin to forge some connections. I think people start to unpack what they're seeing or notice things that are different. It's also important to have wall texts that aren't overly didactic but prompt you with a way in.

What was the first piece of art that made an impression on you?

Growing up I had a poster in my room of a Mary Cassatt painting from the Museum of Fine Arts in Boston of a little girl sort of smushed into a chair. I remember loving that painting because the little girl wasn't all prim and proper. That's where I got hooked.

How did *Welcome Blanket* come together?

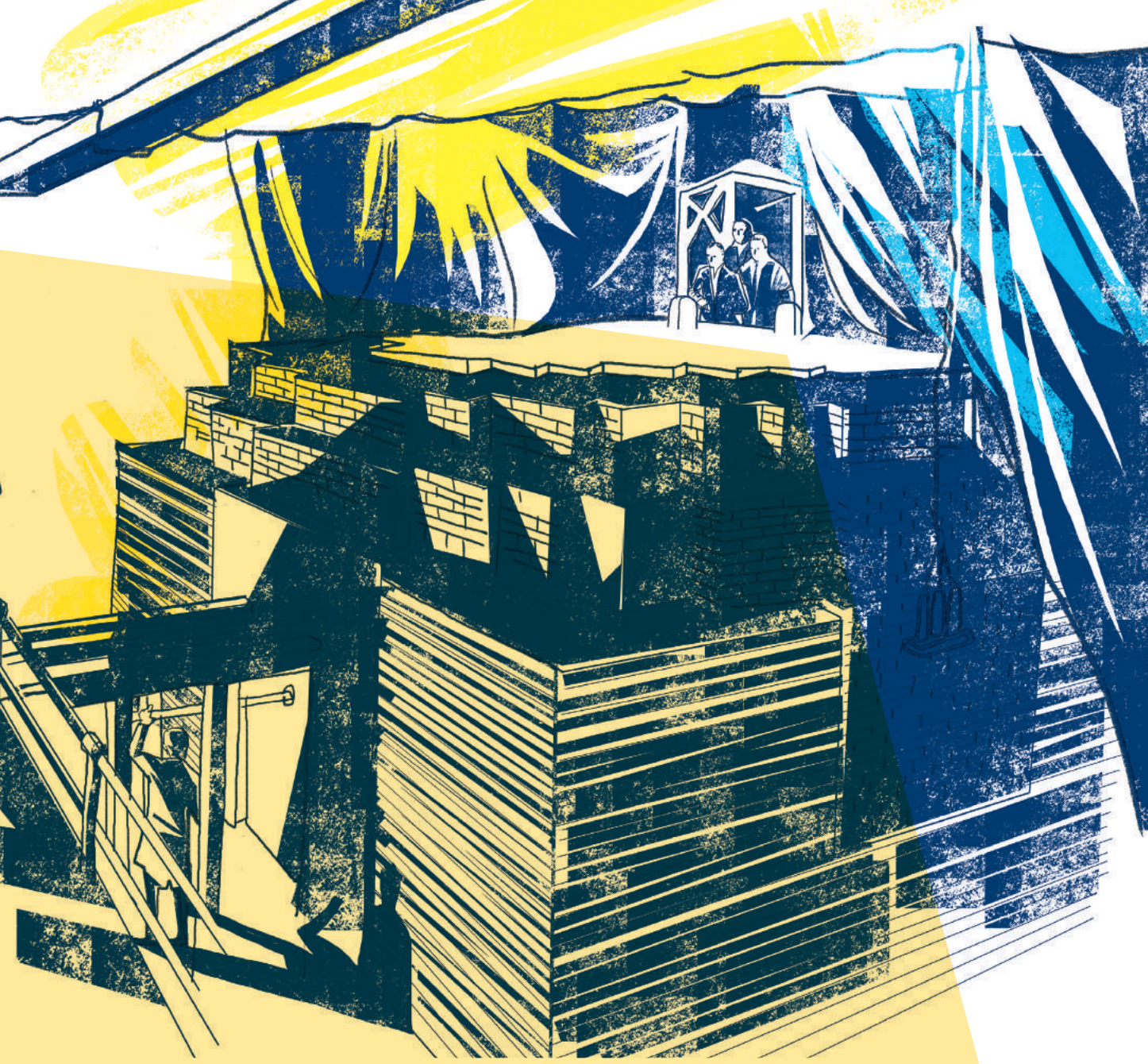
Jayna Zweiman reached out to me because she knew about my interest in social and political art practice. Normally projects like this would take at least a year for a museum to pull off. But I am so grateful to this amazing staff, who took on this challenge and said, "Sure, we'll figure out a way to hang 3,000 blankets in the gallery." I thought that *Welcome Blanket* was a wonderful, tangible example of what it means to have a politically engaged museum. It felt like the perfect starting project.

history

CORE STORIES

The story of the first controlled, self-sustaining nuclear chain reaction is one of science, of war, and of people—those who made the experiment a success, those who strove to inform the public about the threats the breakthrough posed, and those tending its ambivalent legacies today.

ILLUSTRATIONS BY JOHN JAY CABUAY



CHICAGO PILE-1 1942–2017

To mark the 75th anniversary of Chicago Pile-1 this December 2, the *Magazine* offers glimpses of eight individuals and one critical relationship connected with the experiment. In an opening essay Richard Rhodes, author of the definitive history of the atomic bomb, describes the friction between Enrico Fermi and Leo Szilard, the experiment's main intellectual authors, and how their science survived it.

Profiles of Szilard and three more Manhattan Project scientists follow—none household names like Fermi, but all notable contributors to the experiment or the stewardship of its broad repercussions. That stewardship continues today, in part through the work of four UChicago faculty members in the physical sciences, social sciences, public policy, and the humanities. Together these scientists and scholars' experiences illuminate how the reaction was achieved, and how it remade our world.

essay

CLASHING COLLEAGUES

Enrico Fermi and Leo Szilard were comparable scientific visionaries but opposite personalities.

BY RICHARD RHODES

CP-1 scientists gathered at Eckhart Hall four years after the experiment. Fermi is in the front row, far left; Szilard is second from right in the middle row.

UCHICAGO PHOTOGRAPHIC ARCHIVE, APF3-00232, UNIVERSITY OF CHICAGO LIBRARY

Two physicists, one Italian, one Hungarian, shared the US patent for the first man-made nuclear reactor. Enrico Fermi's and Leo Szilard's skills were complementary, but their personalities clashed. They collaborated on their last joint experiment in May 1939, only five months after the discovery of nuclear fission and more than three years before the start-up of Chicago Pile-1 on December 2, 1942. Fortunately for the world, the two men respected each other's judgment, or that millennial outcome might have been dangerously delayed.

Fermi, winner of the 1938 Nobel Prize in Physics, had used the occasion of the award ceremony in Sweden to escape Fascist Italy with his Jewish wife, Laura, and their two children, taking up an appointment as a professor of physics at Columbia University in New York. Szilard, who had left Nazi Germany in 1933 when Adolf Hitler came to power, was one of a group of extraordinary Hungarian Jewish émigrés to the United States that included John von Neumann, Eugene Wigner, and Edward Teller. (Wigner, von Neumann, and Teller would contribute to the invention of the first atomic bombs; Teller would coinvent the hydrogen bomb; von Neumann would devise the basic architecture of the digital computer.)

Fermi and Szilard came together in the spring of 1939 to explore the unique properties of uranium. Two German radiochemists, Otto Hahn and Fritz Strassmann, working at an institute in Berlin, had discovered nuclear fission just at Christmastime 1938. When they published a scientific report of their discovery, early in the new year, physicists everywhere spread the word of the energetic new reaction.

Nuclear fission embodied a long-sought dream of releasing the energy locked into the atomic nucleus, energy several million times as intense, gram for gram, as the energy of merely chemical reactions. That release, however, depended on initiating a self-sustaining cascade of fissions, one causing two, two causing four, four causing eight, and so on, each releasing energy, an exponential process the physicists called a chain reaction. Should a uranium chain reaction be possible, then energy for power would be possible as well—and so also might energy for bombs, each capable of destroying an entire city. In spring 1939 Nazi Germany, where fission was discovered, was preparing for war. A Third Reich made invulnerable with atomic weapons was a nightmare that had to be forestalled.

The last experiment Fermi and Szilard conducted together involved measuring the production of "secondary" neutrons. Fission was produced in the first place by bombarding uranium atoms with neutrons, one of the three basic nuclear particles (along with electrons and protons) discovered in the previous 40 years of intense and exciting worldwide research. Neutrons induced fission in the uranium nucleus; the fissioning nucleus then ejected neutrons as well. The question Fermi and Szilard needed to answer was how many such secondary neutrons, on average, were released per fission, because it would be such neutrons, cascading from nucleus to nucleus, that would induce a chain reaction and multiply a microscopic energy release to one capable of lighting cities or burning them down.

The experiment the two physicists designed involved packing 500 pounds of greasy black uranium oxide powder into 52 pipe-like metal cans each two inches in diameter and two feet long, then submerging the sealed cans in a large tank containing a 10 percent mixture of manganese

dissolved in water. A neutron source set in the center of this lattice of cans would release a shower of neutrons; the water would slow them down; they would encounter the uranium oxide and cause fissions; and any secondary neutrons the fissions produced would induce a characteristic three-hour radioactivity in the manganese. How much the manganese was activated would give Fermi and Szilard a measure of secondary-neutron production.

Packing cans of greasy black uranium oxide and mixing manganese solutions was hard work. So was staying up half the night taking readings of manganese radioactivity as the experiment progressed. Fermi, the son of a railroad inspector, was a short man but sturdy and indefatigable. He enjoyed the physical work of experiment. Not so Szilard. The son of a prosperous civil engineer, he grew up with servants and governesses and considered physical work a waste of time.

"Szilard made a mortal sin," the two physicists' mutual friend Emilio Segrè told me. "He said, 'Oh, I don't want to work and dirty my hands like a painter's assistant.'" A more charitable colleague, Herbert Anderson, said Szilard "thought he ought to spend his time thinking." The Hungarian physicist hired an assistant to do the dirty work for him. The man was "very competent," Anderson remembered. But Fermi was offended. He and Szilard never again worked together staging an experiment.

FERMI, THE SON OF A RAILROAD INSPECTOR, WAS A SHORT MAN BUT STURDY AND INDEFATIGABLE. NOT SO SZILARD. THE SON OF A PROSPEROUS CIVIL ENGINEER, HE GREW UP WITH SERVANTS AND CONSIDERED PHYSICAL WORK A WASTE OF TIME.

How then did they win a joint patent? Fermi consulted with Szilard. Together they designed a reactor to be assembled of uranium metal slugs dropped into blind holes drilled into heavy graphite blocks the size of planter boxes. As they moved into what would become the Manhattan Project, Fermi worked at Columbia with burly members of the university football team to assemble a series of partial "piles," as he called them, each a little larger than the last as the materials came available, each giving better measurements of the large volume of materials they would need to create a critical mass and a chain reaction using natural uranium.

Materials procurement became Szilard's unique contribution to their joint work. To help Fermi without the friction the two generated when they worked side by side, Szilard applied his special talent for enlightened cajolery to the problem of procuring supplies of purified uranium and graphite. The record is thick with his correspondence with American graphite manufacturers dismayed to discover that what they thought were the purest of materials were in fact hopelessly contaminated, usually with traces of boron. "Szilard at that time," Fermi wrote later, "took extremely decisive and strong steps to try to organize the early phases of production of pure materials. … He did a marvelous job which later on was taken over by a more powerful organization than was Szilard himself. Although to match Szilard it takes a few able-bodied customers."

More deeply, Fermi and Szilard differed in their attitudes toward scientific authority. Szilard believed that scientists were responsible for the social consequences of their discoveries and therefore ought to participate in the political decisions that followed from those discoveries. Fermi, more conservative, believed, as he wrote in 1952, that "the problems posed by this world situation are not for the scientist alone but for all people to resolve."

Fermi thought Szilard arrogant. Szilard thought Fermi cynical. They managed nevertheless to work together to create the first successful man-made nuclear chain reaction, in a machine that in the course of years would come to produce 14 percent of the world's electricity, with no release of carbon and with a record of safety unsurpassed by any other form of primary energy. ◆

Richard Rhodes is the author of 25 books, including *The Making of the Atomic Bomb* (Simon & Schuster, 1986), which won the Pulitzer Prize for nonfiction, a National Book Award, and a National Book Critics Circle Award. On December 1 he will speak on campus about the 75th anniversary of CP-1. For more details, see mag.uchicago.edu/reactions-event.

PIONEERS AND INHERITORS

LEO SZILARD

The idea man

Leo Szilard, the physicist who conceived the possibility of a nuclear chain reaction and the humanist who fought to control its destructive power, had eccentric, sometimes contradictory, habits. Arriving one night in Washington, DC, he called fellow expat Hungarian Edward Teller to ask for a ride from the train station. Teller's wife, Mitzi, insisted he stay in their home. In their guest room Szilard bounced on the bed and said he remembered from a previous visit that the mattress was too hard, so he hied himself off to a hotel.

Another time, he invited himself for an overnight stay with the British physicist Jim Tuck and his wife, Elsie. When the couple forgot to put a mattress on their guest's bed, Szilard slept on the box spring and pronounced himself well rested in the morning.

"Leo was a man of surprises," concluded Leona Woods Marshall Libby, SB'38, PhD'43, who recalled these stories in her memoir *The Uranium People* (Crane, Russak, and Company, 1979).

Szilard lived much of his life out of hotel rooms or friends' spare bedrooms, and the surprises he left behind included suitcases full of books and papers labeled with his name. "Like a cow bird, which lays its eggs in nests of other birds," Libby wrote, he would flit from place to place encumbered with little more than his thoughts.

Few people in history have had thoughts so consequential. They came to him during long baths or leisurely walks around Berlin and London and, later, New York and Chicago.

After serving in the Austro-Hungarian army in World War I, Szilard left his native country for Germany in 1919. At the University of Berlin he impressed professor Albert Einstein with a mathematical proof that solved a stubborn problem in thermodynamics. Szilard's paper on the subject was accepted as his PhD thesis after just one year of undergraduate physics.

In 1933, walking in London, where he had fled after Hitler's ascent to power, he was struck with the idea for a nuclear chain reaction—something he'd meditated on since hearing that no less an authority than Ernest Rutherford, known as the father of nuclear physics, considered such a thing "moonshine." Szilard did not suffer from doubt or dwell on conventional wisdom.

Collaborating with Einstein, he helped push the United States toward a program to develop atomic power more than two years before the country entered World War II. An August 2, 1939, letter to President Franklin D. Roosevelt that Szilard drafted with Einstein and sent with Einstein's signature described the state of the art in nuclear physics and warned that Germany might be pursuing an atomic bomb.

That letter inspired what became the Manhattan Project, to which Szilard was a key contributor and, at times, a perceived antagonist. He believed scientists, not military officers, should control the decision making. General Leslie Groves, the project's military leader, took Szilard's resistance to his authority as disloyalty. Suspecting he might be a spy, Groves put Szilard under government surveillance.

Once an atomic bomb had been developed, the man who conceived its scientific feasibility lobbied against its military use. On July 17, 1945, unaware of the successful Trinity test the day before, Szilard wrote a petition to new president Harry S. Truman urging him not to deploy the bomb against Japan. "A nation which sets the precedent of using these newly liberated forces of nature for purposes of destruction," he wrote, "may have to bear the responsibility of opening the door to an era of devastation on an unimaginable scale." The petition, signed by about 70 scientists, never reached Truman.

When the bomb fell on Hiroshima, Szilard wrote a note on Quad Club stationery to Gertrud Weiss, the physician and professor of medicine he would marry in 1951, calling it "one of the greatest blunders of history."

After the war he advocated for arms control and his itinerant intellectual interests drifted toward biology. He became a professor of biophysics at UChicago and eventually helped establish the Salk Institute for Biological Studies in La Jolla, California. The developer of the first polio vaccine, Jonas Salk, called Szilard an "artist of science." The men's shared desire to create a place "for evolvers rather than maintainers of the status quo," as Salk put it, led to a deep scientific kinship.

Being an evolver—and so unconventional in his way of life that Robert Maynard Hutchins, learning of Szilard's marriage, said his wife must have done it for the tax benefit—may have overshadowed Szilard's scientific contributions. Aware as his contemporaries were of his quirks, they also respected how he exercised his influential intellect.

As Nobel Prize–winning biochemist Jacques Monod put it: "He knew that meaningful ideas are more important than any ego, and he lived according to these ethics."—*Jason Kelly*

LEONA WOODS MARSHALL LIBBY

The pathbreaker

They were changing out of lab coats blackened with graphite dust into heavy jackets for a subzero Chicago night when Eugene Wigner arrived with a bottle of wine and paper cups.

The scientists of the Manhattan Project's Metallurgical Laboratory had just produced a triumph of pure science, but one with tragic, even apocalyptic, potential. About 20 people remained in the abandoned squash courts under the west stands of Stagg Field on the monumental afternoon of December 2, 1942. One was Leona Woods Marshall Libby, SB'38, PhD'43, a 23-year-old student of Enrico Fermi's, one of the youngest scientists to work on the experiment.

Whether theirs was the world's first chain reaction, the researchers did not know. If Germany had beaten the United States to the breakthrough, as they feared, the Allies could be fatally far behind in the secret World War II race to build an atomic bomb.

So the celebration in the Met Lab was not just muted but mute. Sipping the drops rationed from the single bottle of chianti, nobody mustered so much as a "cheers."

"There was a greater drama in the silence than if words had been spoken," Libby wrote in *The Uranium People*. "Everyone was thinking—if we did it, haven't the Germans already achieved the chain reaction?" Libby had completed her course work toward her PhD only months before under Robert Mulliken, and her expertise in vacuum technology had made her a member of the team.

Her knowledge was necessary to construct the boron trifluoride detectors ("one of my better creations," she called them) that measured neutrons in the reactor known as CP-1. Libby, who had earned an undergraduate degree at 18, was ahead of her time, the only woman scientist on Fermi's team in a world where the highest compliment was to be regarded worthy of a man's work. Fermi's wife, Laura, recalled her as "a tall young girl built like an athlete, who could do a man's job and do it well." Not that she was allowed to do all such jobs.

Although physicist Walter Zinn refused to let her participate in building the pile itself—arguing that the necessary dust masks would disguise her face and he might direct his salty epithets at a girl—Libby had plenty to occupy her: "Preparing the counters, learning the nuclear physics that had already been developed, and trying to understand the steady stream of theoretical papers issuing from Wigner's group."

She worked in Eckhart Hall on her own graphite pile, measuring the sensitivity of boron trifluoride to neutrons emerging from the pile at different temperatures to develop her detectors. On December 2 they clicked more and more quickly as the cadmium control rod was drawn out of the pile in stages, growing to a roar as the reaction approached criticality.

Afterward, Libby continued her measurements of boron trifluoride's neutron absorption and the effect of graphite's thickness on neutron energy, working when the pile wasn't in use by other scientists, from 7 p.m. until early morning. As a graduate student, she had keys to several campus physics and chemistry labs, the better to scrounge equipment in the dark emptiness of night. Vacuum grease, pumps, stove wire, stopcocks. The recently established Met Lab had little of its own, forcing Libby into a creative cobbling of components to make her measurements.

In 1943 Libby married fellow Met Lab physicist John Marshall and soon became pregnant, a condition that her baggy work overalls and equipment-filled pockets helped conceal. She told only Fermi she was expecting. By then the experiment, now known as CP-2, had moved to the forest preserve west of Chicago, far enough away that Fermi asked his wife for instructions on delivering a baby, just in case.

"When he told me he was ready," Libby writes, "it stiffened my resolution that under no circumstances would he get the chance to practice midwifery, which, in retrospect, was no doubt a disappointment to him."

She delivered son Peter at the University's Lying-In Hospital and was back to work near the thermal column atop CP-2 within a week. To the Manhattan Project scientists, little else in the world felt as important at that moment.

Libby had a brother and brother-in-law fighting in the

Pacific. She believed they wouldn't have survived an Allied invasion of Japan that the August 1945 dropping of the atomic bombs precluded. Interviewed in 1986, the year she died from a stroke at age 67, she expressed only pride, no pangs of conscience for the consequences of the Manhattan Project's achievement. She noted the misgivings of many who thought the second bomb, which fell on Nagasaki days after the devastation visited upon Hiroshima, unnecessary. Those critics are "the guys who cry on shoulders," Libby said. "When you are in a war, to the death, I don't think you stand around and ask, 'Is it right?'"—*Jason Kelly*

JAMES FRANCK

The conscience

James Franck didn't have to leave Germany. Because he had fought for the country in World War I, Franck was—for the time—exempt from civil service laws enacted in 1933 that forced Jews from government work.

A 1925 Nobel Prize recipient, he could have remained at the University of Göttingen, where he was a professor and institute director, but his conscience compelled him to resign. Years later Franck said the most persuasisve argument in favor of his self-imposed exile came from Danish physicist Niels Bohr.

"Bohr insisted that individuals really were responsible for the political actions of their societies," historian Richard Rhodes writes in *The Making of the Atomic Bomb*, and Franck refused to show even tacit acquiescence to the anti-Semitic sentiment on the rise in Hitler's government.

So in 1933 he left for Bohr's Institute of Theoretical Physics at the University of Copenhagen, then on to the United States, first at Johns Hopkins University before arriving in 1938 at the University of Chicago, where the interdisciplinary James Franck Institute is named for him. At UChicago, his political courage continued to shape his professional life. Franck became synonymous with the effort among scientists to convince the US government to resist using a nuclear bomb in a surprise attack on the citizens of Japan.

As chair of a panel of Metallurgical Laboratory scientists tasked with evaluating the social and political implications of atomic power, Franck drafted a memorandum, signed by Szilard and five other scientists, that would come to bear his name. *The Franck Report*, delivered to secretary of war Henry Stimson's office in June 1945, argued that unleashing such force without warning would have far-reaching negative implications even beyond its "indiscriminate destruction upon mankind." The consequences would include a reduced chance for an international agreement restricting the use of nuclear weapons, the report cautioned, and an arms race would ensue.

The signatories to the report called for the military to demonstrate the power of the bomb with a test in an uninhabited area. Choosing that course, they reasoned, would alert the Japanese people (perhaps warning enough to inspire surrender) or at least allow the United States to assess world opinion before causing such destruction. "In this way," the report read, "other nations may assume a share of responsibility for such a fateful decision."

With victory in Europe secure, Franck considered the bomb's use unnecessary to defeat Japan, or even to significantly shorten war in the Pacific. Arthur Compton, who oversaw the Met Lab, disagreed, arguing in the cover letter to Stimson that accompanied *The Franck Report* that the report did not place enough importance on lives that would be saved if the bomb hastened the end of the war.

The report, of course, did not persuade President Truman and may never have reached him. There was no test, no warning, only sudden death and widespread destruction delivered from the sky over Hiroshima and, days later, Nagasaki in August 1945.

Although the report did not prevent use of the bomb, Franck's efforts made him a symbol of the ideal that scientific discoveries should be used only for constructive ends. His Nobel Prize biography states that *The Franck Report*, "although failing to attain its main objective, still stands as a monument to the rejection by scientists of the use of science in works of destruction."

For Franck, those principles extended beyond science. He refused to return home after the war, turning down an offer to become chair in experimental physics at Heidelberg because he could not work with those who "watched the [Nazi] crimes with indifference." At the same time, he could not close his eyes to the country's suffering citizens, and advocated for US aid to help his native country rebuild.—*Jason Kelly*

JOHN A. SIMPSON JR.

The responsible scientist

In December 1945, John Simpson stood before the US Senate to testify on the need for civilian control of nuclear energy. Formerly a scientific group leader on the Manhattan Project, Simpson was emerging as a moral leader in the effort to educate lawmakers and the public on the nuclear age that he had helped usher in.

In the months since the United States had dropped atomic bombs on Hiroshima and Nagasaki, Simpson had been appointed the first chair of nuclear watchdog the Atomic Scientists of Chicago, coauthored an article in *Life* that gave many Americans their first sober assessment of the dawning nucleonic era, and stalled his budding scientific career to lobby Washington for the peaceful use of the new technology. He was 29 years old.

Like his fellow scientists at the University of Chicago's Metallurgical Laboratory, Simpson had spent 1944–45 racked by a profound twofold anxiety: first, about the need to outpace the Nazis in developing an atomic bomb and second, about the possibility that the United States might actually use the bomb if their efforts proved successful. The surrender of Germany in the spring saw the first fear eclipsed by the second.

Simpson was by this time helping organize a series of private seminars for Met Lab scientists to discuss the consequences of their work—creatively disguised as innocuous office meetings after the idea met with Army disapproval. He also joined 66 other scientists in signing Szilard's petition, which followed on the failure of *The Franck Report* and also urged President Truman to encourage Japan to surrender by demonstrating the bomb in an unpopulated area. To use the bomb in an act of war, Simpson believed, would precipitate an arms race with only one logical outcome.

When the scientists' strategy on Japan did not carry the day, Simpson led the Atomic Scientists of Chicago—as part of the emerging Federation of Atomic Scientists (later rebranded the Federation of American Scientists)—in an energetic campaign to educate lawmakers and the public on their area of collective expertise. Their key victory, winning the civilian control of nuclear energy and weapons in 1946, owed in no small part to Simpson's role as unofficial adviser to democratic senator Brien McMahon of Connecticut, chair of the Senate Special Committee on Atomic Energy. This is what brought the young Simpson to Washington at the end of a long year in the lab.

Simpson displayed the same effectiveness and political savvy in his work as a scientist. In addition to heading the executive committee of the *Bulletin of the Atomic Scientists*, he did pioneering work on cosmic rays, cofounded the University's space research program, and sent his instruments on numerous missions throughout the solar system.

One noteworthy mission placed Simpson's cosmic dust detectors on two Soviet spacecraft headed for Halley's Comet in 1986. Simpson deftly brokered a series of arrangements with NASA, the Reagan administration, the University of Chicago, the Russians, and the German Max Planck Institutes as an intermediary to enable scientific collaboration between two countries that could not officially work together. The specter that had haunted Simpson since the Manhattan Project—nuclear brinksmanship—did not defeat the spirit of camaraderie that comes naturally to scientists working on a problem of mutual interest.

Simpson once spoke of the "necessary irresponsibility" of the scientist: the freedom to investigate nature objectively, without regard to convention or politics. Such

THE "NECESSARY IRRESPONSIBILITY" OF THE SCIENTIST: THE FREEDOM TO INVESTIGATE NATURE OBJECTIVELY, WITHOUT REGARD TO CONVENTION OR POLITICS.

freedom complements rather than contradicts the responsibility that Simpson believed scientists should take for the consequences of their work. For him, the scientist was by turns neutral investigator and moral pathfinder.

Until his death in 2000, Simpson projected this ethos of responsible freedom like few others. In the words of **Edward W. "Rocky" Kolb**, dean of the Division of the Physical Sciences, "He accomplished a great deal, and he never lost his voice."—*Lucas McGranahan*

CHIN-TU CHEN

The radiologist

Growing up in Taiwan, **Chin-Tu Chen**, PhD'86, wanted to study nuclear physics. His heroes were the Chinese scientists Chen-Ning Yang, PhD'48, and Tsung-Dao Lee, PhD'50, who both worked with Enrico Fermi as students and who shared a Nobel Prize in 1957 for their research on radioactive decay in subatomic particles. Theirs was technical, disciplinary work.

Chen followed suit, enrolling in a physics doctorate program at Northwestern. He spent long days and nights at Argonne National Laboratory, cooped up near the accelerator machine, bombarding targets, trying to make calculations of the nucleus model. Repetition and abstraction took their toll.

"After a while, I started to think, 'this is really very remote from your daily life,'" he remembers now. The prospect of moving home to join the Taiwanese academy, which he'd considered, lost its appeal. The wider his reach, the more satisfied he'd be.

Robert Beck, AB'54, SB'55, gave Chen the push he needed. Beck, a UChicago radiology professor and a pioneer of modern nuclear medicine, had gotten his start at the Argonne Cancer Research Hospital, which the US Atomic Energy Commission had established as part of its Atoms for Peace program to identify socially beneficial uses for ionizing radiation.

In 1960 Beck authored a major theoretical study speculating that gamma rays, specifically those produced by the radioisotope technetium 99m, could be used to scan the brain for abnormalities. Today it's used tens of millions of times a year worldwide. He'd go on to design scanning devices for radionuclide imaging, helping doctors and diagnosticians see areas inside the body that are inaccessible with standard X-rays.

In the early 1980s, when Chen was waffling, second-guessing his career path, he sought out Beck, who offered the young scholar a summer job and then a slot in UChicago's medical physics program. "You can do some good to others and eventually do [some good] to yourself too," Chen remembers Beck telling him. "It connects physics with life, basically."

Chen's office today is nestled deep inside the University's medical center. The setting is decidedly more busy hospital corridor than sterile science lab, which Chen relishes. A faculty member and researcher in radiology and medical physics for over three decades, he's published more than 300 scientific papers and secured six patents related to molecular imaging, which noninvasively generates detailed pictures of the body representing life and life processes at the molecular level.

Molecular imaging technology has grown far more sophisticated since Chen started. In 1981, with Beck, he helped build one of the Midwest's first positron emission tomography (PET) scanners, which wouldn't become standard in clinical practices until around 2000, the same time that magnetic resonance imaging (MRI) was gaining currency. These days Chen and his colleagues develop and deploy radioisotopes for diagnostic imaging—of neurological diseases or cancer, for instance—and for image-guided radiation therapy to treat diseased organs or to shrink or eliminate tumors in a highly targeted way. The group is also a leader in multimodality imaging, combining the superior detail of MRI images, say, with the ability of PET scans to reveal cellular-level metabolic changes—how tissue or organs are functioning.

For the past year Chen's department has begun to operate a state-of-the-art cyclotron, a particle accelerator that produces medically usable radioisotopes, an $8.4 million investment that Chen had lobbied for since the University's original particle accelerator was decommissioned in 1997. "You use probes to assess biology and biochemistry," he says. "Everybody is going in that direction."

Chen is constantly rewarded by the collaborative nature of his chosen profession. He can take a five-minute walk and sit right beside the physicians reviewing the images his lab produces. His group tries to push their work into clinical practice as much as possible. "I really think this is the best work you can do from the physics perspective," he says. "You apply the fundamental science to saving lives."—*Adam Doster*

NORMA FIELD

The activist

As a child in Tokyo, born in the wake of World War II, **Norma Field** became aware of the nuclear threat early. The professor emeritus of East Asian languages and civilizations remembers feeling "the terrifying force of the images" from Hiroshima and Nagaskai, and being particularly haunted by the iconic photo of a Hiroshima man's silhouette imprinted like a shadow on a granite stair by the heat of the blast.

Around the breakfast table, over the morning headlines, Field's parents regularly debated the merits of atmospheric testing, her anticommunist American father arguing the pro side against her pacifist Japanese mother. Her mother's views "had so much more credibility for me" and, reinforced by the photo, created a sense of urgency to do something to help prevent another devastating war between the two countries. What she could think of, as a child, was to teach about Japan in the United States.

For much of the decade before she retired in 2012, Field focused on Japanese proletarian literature, a prewar artistic movement by and for the working class. That research interest resulted in her coedited book *For Dignity, Justice, and Revolution: An Anthology of Japanese Proletarian Literature* (University of Chicago Press, 2016).

And it brought a class consciousness to her lifelong concerns about nuclear technology's effects on human beings and human bodies—and not only through nuclear warfare. She began to think about the inequitable burdens of nuclear experimentation and fallout. Those burdens can be not only biological but economic and social: "Who is able to do what? Who is able to get away from disasters?" Survivors of Hirsohima and Nagasaki worried about being discriminated against in hiring and marriage, and the same concerns plague Fukushima residents today.

The 2011 meltdown of Japan's Fukushima Daiichi Nuclear Power Plant has become a focusing event for Field. "I think it combined almost everything I was ever interested in." It made her want to capture in her writing "the kinds of anguish a nuclear disaster brings," she says. "I want to share that, I want people to read that and think twice about it." She had already been challenging the distinction between nuclear weapons as existentially dangerous and nuclear power as safe and clean, including in a UChicago course that she started teaching in 2004, Hiroshima, Nagasaki, and Beyond.

Field regularly asked students in the course to collaborate on archival projects about the CP-1 scientists, work that highlighted for Field a decline in awareness of nuclear risks in the ensuing decades, perhaps now mitigated by tensions with North Korea. "There was a lot of mindfulness among the early atomic scientists here and around the country about the immeasurable potential harm of this technology, which has really faded," she says.

Public education hasn't moved past teaching that "there was Pearl Harbor, then Hiroshima—or, it ended the war earlier so it was a humanitarian act." And few are aware how US citizens themselves have been exposed to radiation, whether by working in nuclear facilities, living near plants as "downwinders," or as experimental subjects at research institutions.

Following her retirement, Field has continued to slowly and comprehensively research the political issues surrounding Fukushima. She flies to Japan as often as she can manage, interviewing people and getting a sense of how they cope with the possible consequences of exposure.

In Chicago she lectures, hosts symposia, and shares information through Atomic Age (lucian.uchicago.edu/blogs/atomicage), a website she maintains with friends. This fall she's finalizing a grant proposal for a book project on Fukushima's aftermath. The author of three previous books in English, including the award-winning *In the Realm of a Dying Emperor: Japan at Century's End* (Pantheon, 1991), Field believes in the power of literature to create understanding. "Even if you don't directly experience something yourself," she says, "literature can prepare the ground for empathy."

Having spent most of her career teaching at UChicago, home to the CP-1 experiment, gives her an added sense of mission. It's hard for Field to walk past *Nuclear Energy*, the Henry Moore sculpture on Ellis Avenue, without feeling a twinge: "This is part of what began here on December 2, 1942."—*Adam Doster*

THERE WAS A LOT OF MINDFULNESS AMONG THE EARLY ATOMIC SCIENTISTS, ... WHICH HAS REALLY FADED.

ROBERT ROSNER

The physicist

Ask **Robert Rosner** to explain the building blocks of astrophysics, and he'll spin stories of Galileo and Newton, of rainbow spectrums and Fraunhofer lines and subatomic particles—how the insight that the physics of our world also applies to the cosmos unspooled an entire field. The William E. Wrather Distinguished Service Professor in the Departments of Astronomy and Astrophysics and Physics, Rosner develops high-performance computer simulation tools that model astrophysical phenomena. "Astrophysics per se started because you could finally, without ever traveling to the sun, figure out what the sun was made of," he enthuses. "How cool is that?"

Rosner, who directed Argonne National Laboratory (a descendent of the Met Lab) from 2005 to 2009 and co-chairs the *Bulletin of the Atomic Scientists* board that sets the Doomsday Clock, was a natural choice to deliver the Aims of Education lecture this anniversary year. He took as his subject December 2, 1942, and all that rippled out from it. From the Rockefeller Chapel pulpit Rosner spoke to the Class of 2021 about the experiment's scientific and broader legacies, both "the good and bad that flowed from the portentous moment" when Fermi declared the reaction had achieved self-sustainment.

For many of the physicists involved, Rosner noted, the sense of achievement was mingled with foreboding and followed by efforts to inform the public and government of the technology's dangers. Signers of the "amazingly prescient" *Franck Report* volunteered their advice unsolicited, Rosner emphasized. Scholars must speak truth to power, and be accountable for the consequences of their research.

When Rosner arrived in Chicago 30 years ago, the University's nuclear heritage was not lost on him. "I think it's fair to say that [CP-1] is the most important experiment that was ever done here, at the University, in the city of Chicago, in the state of Illinois, in the Midwest," he says. "It's singular in terms of its impact on human life on this earth."

Much of his work is inextricably linked to that experiment. Rosner established the Flash Center for Computational Science, whose simulation codes for modeling supernovae mirror the challenges of the US Department of Energy's science- and simulation-based efforts to determine the reliability of the nation's nuclear weapons stockpile without randomly testing weapons: Much like their ground-based colleagues from the Department of Energy, astrophysicists cannot blow up their objects of study.

The work persuaded Rosner of the usefulness of the unratified test ban treaty. For the United States, the Soviet Union, and the other declared and undeclared weapons states to stop testing, he says, "really sharply reduced the ability" of countries that wanted to start nuclear weapons programs.

His work on Flash and as Argonne lab director fueled an ongoing interest in public policy, especially around nuclear nonproliferation and renewable energy. Thus his ongoing service to the *Bulletin of the Atomic Scientists*, which the University convinced to move its headquarters back to Hyde Park after three years in downtown Chicago. An independent entity, it now has its offices in the University of Chicago Harris School of Public Policy. Rosner likens the *Bulletin* to a canary in the mine, a forum for experts to debate whether a given conflict or development should give the wider world pause.

For someone who so intimately understands the dangers that nuclear weapons pose, this is a tenuous political moment. It's not so much the nuclear powers' stockpiles that keep Rosner up at night. Rather, it's the possibility of suicidal nonstate actors getting their hands on those arsenals, and the threat of tactical nuclear weapons—"the threshold for using them is potentially much lower," he says. "And the distinction between strategic and tactical, in countries like India and Pakistan, is almost vanishingly small."

One of the two founding directors of the Energy Policy Institute at the University of Chicago, Rosner also ponders the potential for clean energy through nuclear technology. He finds the science feasible but the problem of nuclear waste unresolved and, for understandable reasons, the political will lacking. "You may want to think that as a scientist, whatever you do is really just a world unto its own," he says. "But the fact of the matter is we live in an environment where what we do and say matters and has consequences."—*Adam Doster*

JOSEPH MASCO

The anthropologist

As a graduate student in the early 1990s, UChicago anthropology professor **Joseph Masco** went to New Mexico to study the legacy of CP-1 and the Manhattan Project at the end of the Cold War. The effort to create a nuclear bomb, he discovered, can be found in technological, scientific, and industrial infrastructures; in traces of radiation found in human bodies; and in individual psyches and the very idea of the nation.

WE'RE AT AN UNUSUALLY DANGEROUS MOMENT HISTORICALLY, PRECISELY BECAUSE NUCLEAR POLITICS ARE PLAYING OUT WITHOUT MUCH PUBLIC ATTENTION.

"Nuclear politics," Masco says, "involves not just the technologies, but also the ideologies, imaginaries, and the affects that support them." Among these are American exceptionalism and emotions like fear, pride, and shame. The idea of the bomb "distills across these areas, because it both holds the promise of ultimate protection to the nation-state and is the ultimate danger."

Using the nuclear bomb as a lens through which to examine US nation building and culture since the mid-20th century, Masco looks at its broad effects on society and its effects on government in particular. Those include the post–World War II transformation of the Department of War to the Department of Defense and the formation, a decade later, of the Defense Advanced Research Projects Agency, or DARPA, which Masco describes as a commitment to "unending Manhattan Projects on behalf of the United States."

"These are huge structural changes in the concept of what security is," Masco says, "and at the center of all of these programs and desires and fears is the atomic bomb."

Masco's books, *The Nuclear Borderlands: The Manhattan Project in Post–Cold War New Mexico* (Princeton University Press, 2006) and especially *The Theater of Operations: National Security Affect from the Cold War to the War on Terror* (Duke University Press, 2014), elucidate how Cold War ideologies, beginning with the bomb, were repurposed for the ongoing war on terror.

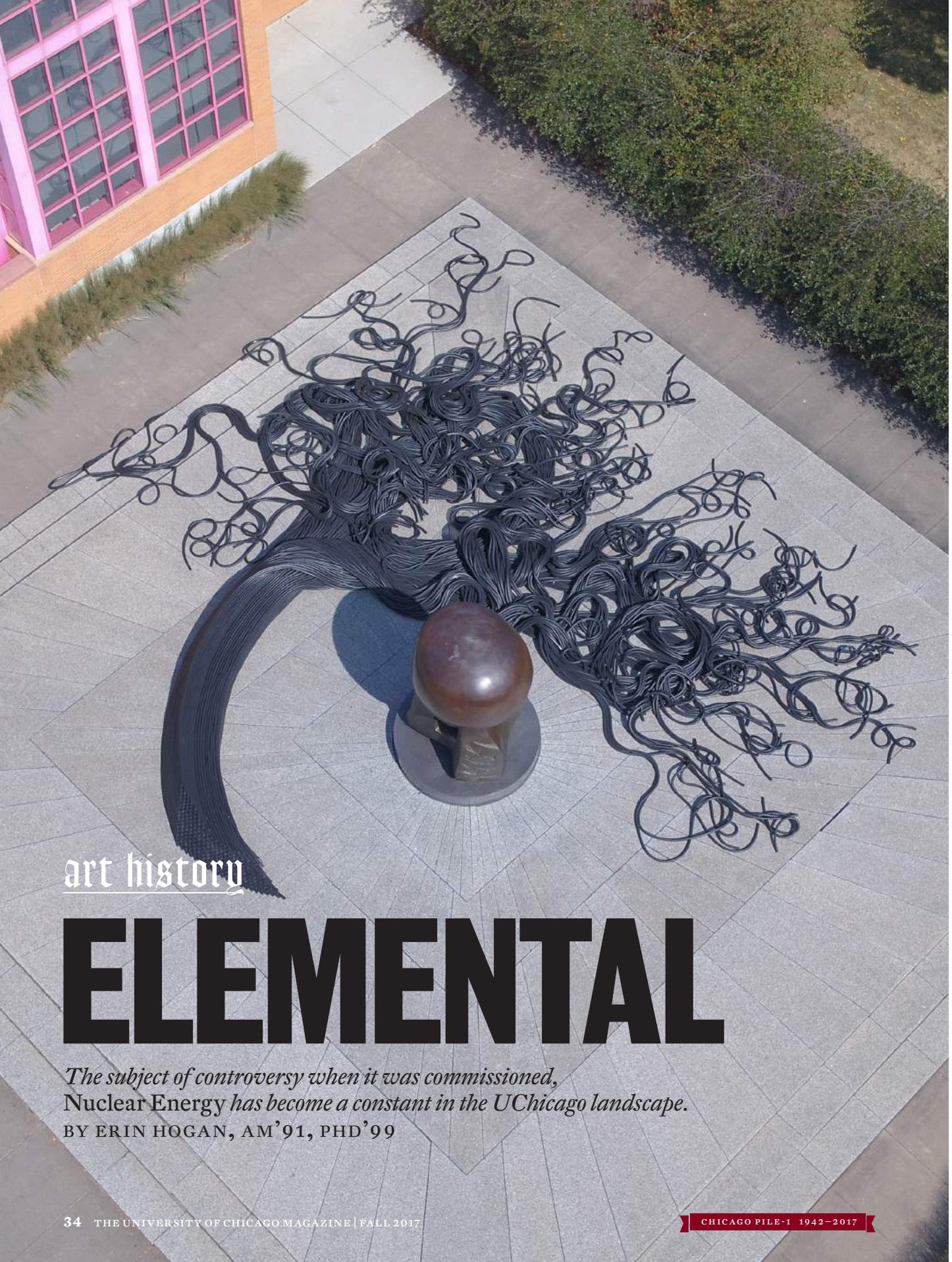
The lurking fear of nuclear Armageddon that arose after World War II, Masco says, helped usher in an era of constant imagined threats to the nation and its people—threats from which only the government could offer protection.

At the same time, the Manhattan Project introduced new levels of secrecy into military protocol. While there have always been military secrets, Masco says, the idea of maintaining a population of nearly five million people with security clearances and generating a significant portion of knowledge that is never shared widely and has vast consequences beyond the military, was a development of the nuclear age. This compartmentalized secrecy "creates the image of a state that always knows more than it's telling."

In the current environment, government officials, themselves shrouded in secrecy, act on "threat-based reasoning." Instead of responding to risk—an evaluation of known and quantifiable factors—Masco argues, the government says that it and its citizens must be vigilant against a terrorist threat that's "purely in the imaginary," often focused on worst-case-scenario game exercises. "The whole idea of the worst-case scenario in a threat-based world," Masco says, "is that the danger hasn't happened yet."

Masco often encounters people who are inclined to put the politics of nuclear weapons in the past—threats from and against North Korea notwithstanding. But as the United States spends billions of dollars on modernizing its nuclear arsenal, Masco says, "we're at an unusually dangerous moment historically, precisely because nuclear politics are playing out without much public attention."

A more beneficial legacy of CP-1, for him, is the foundational linkage between science, universities, and the state. These institutional relations figure in his research on the closely linked science behind climate crisis and nuclear crisis: the modern notion of ecology, which grew out of efforts in the 1950s to study nuclear fallout, also led to understandings of complex systems and ultimately climate change. Today many geologists believe the mid-20th century ushered in a new geological era—the Anthropocene—and date it from the presence of plutonium in the atmosphere from nuclear testing. In other words, the CP-1 experiment was "the start of a transformation of science and geopolitics but also led to an indelible mark in the earth system—the nuclear age has entered into geological time."—*Jeanie Chung* ◆



art history

ELEMENTAL

The subject of controversy when it was commissioned, Nuclear Energy *has become a constant in the UChicago landscape.*

BY ERIN HOGAN, AM'91, PHD'99

Opposite: *Nuclear Thresholds*, an architectual installation at the site of Moore's sculpture, runs through January 7. Above: The bronze pieces that comprise *Nuclear Energy* were cast and welded in West Berlin before being shipped to Chicago for the dedication.

Henry Moore's sculpture *Nuclear Energy*, which turns 50 in December, marks the site of the world's first controlled, self-sustaining nuclear reaction. Just as Enrico Fermi's achievement can never be decisively celebrated nor indicted, ambiguities and paradoxes are embedded in the form, origins, title, and interpretations of the artwork made to commemorate it.

An object that appears unitary but is actually composed of some 60 pieces of welded bronze, *Nuclear Energy* presents both mass and emptiness, solid and void. The sculpture is a monumental object that commemorates a microscopic reaction—invisibly small particles set in motion by a 400-ton pile of graphite bricks. And there remain contradictions in the origin story of the sculpture's form. Was it based on a series Moore made a decade before the commission? On contemporaneous British anti-nuclear posters that featured a mushroom cloud and a human skull? On an elephant skull Moore had himself photographed with, working on the *Nuclear Energy* model, years after the sculpture was completed?

The idea for a landmark was born in 1963, as history professor William H. McNeill, LAB'34, AB'38, AM'39, on the way to his office, passed the weed-strewn lot on Ellis Avenue that once was the site of Stagg Field—and Chicago Pile-1. McNeill's sense of the site as a lost opportunity echoed the sentiments, according to various accounts, of the University's public relations office, president, and even the Italian prime minister at the time, who felt that Fermi and the University's role in the Manhattan Project had not been adequately recognized. A committee, spearheaded by McNeill, was formed to investigate the possibility of erecting a memorial in time for the 25th anniversary of the nuclear reaction.

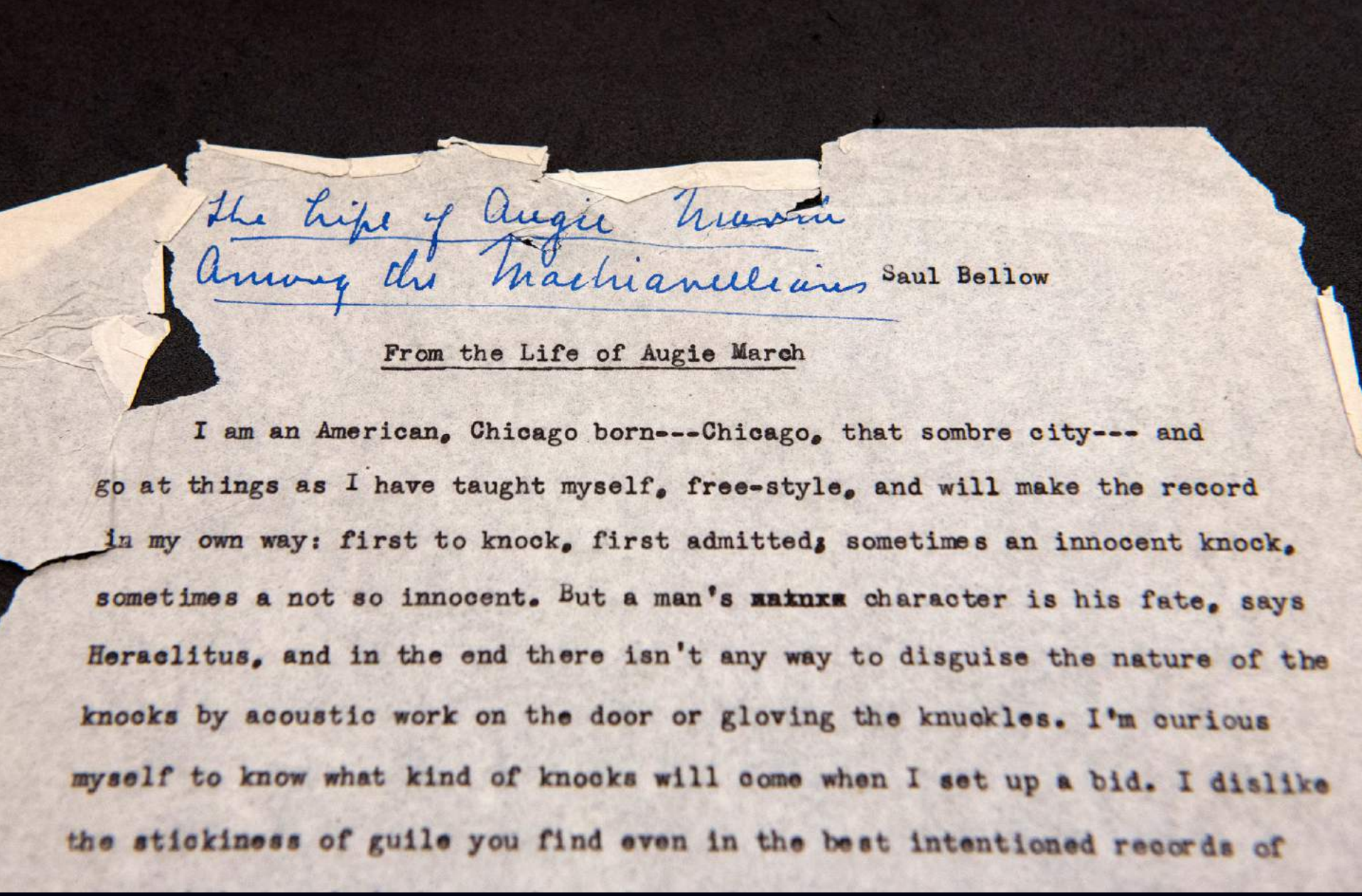
In November 1963 McNeill sent letters to two contemporary sculptors known for their public works, Jacques Lipchitz and Henry Moore. Moore, considered a "safe modernist master" according to one social historian, despite his own antinuclear stance, offered a tentative yes. In a year he had produced a four-foot-tall model, called *Atom Piece*, of what would become *Nuclear Energy*: a cavern or, as McNeill liked to call it, a "cathedral" surrounded by an armature of bronze. Others, particularly several scientists on the monument committee, saw the work as a skull or mushroom cloud—"more appropriate … at Alamogordo or Hiroshima," in the words of Samuel Allison, SB'21, PhD'23, one of the Manhattan Project scientists on the committee—and objected strenuously to Moore's model.

The sculpture was ultimately approved, but concessions were made to soften its more fatalistic interpretations, including installing a carefully worded plaque with it and asking Moore in 1965 to change his title, *Atom Piece*, to *Nuclear Energy* because McNeill felt the former sounded too much like "atom peace," a potentially inflammatory pun. Moore publicly agreed to the title change but continued to call the work "Atom Piece," even exhibiting it in Germany under that title before it arrived in Chicago to be unveiled on December 2, 1967, the 25th anniversary of the reaction.

At that unveiling, Harold Haydon, LAB'26, PhB'30, AM'31—associate professor of art, art critic for the *Chicago Sun-Times*, and member of the monument committee—spoke of *Nuclear Energy* in the future tense: "Nuclear energy, for which the sculpture is named, is a magnet for conflicting emotions, some of which inevitably will attach to the bronze form; it will harbor or repel emotions. … The test of any work of art will be its capacity to evoke a response and the quality of that response." As Haydon well knew, *Nuclear Energy* had already passed that test. ◆

Erin Hogan, AM'91, PhD'99, is the former director of public affairs and communications at the Art Institute of Chicago and the author of *Spiral Jetta: A Road Trip through the Land Art of the American West* (University of Chicago Press, 2008).

PAGE 34: PHOTOGRAPHY BY DRONE MEDIA CHICAGO; UCHICAGO PHOTOGRAPHIC ARCHIVE, APF2-05339, UNIVERSITY OF CHICAGO LIBRARY

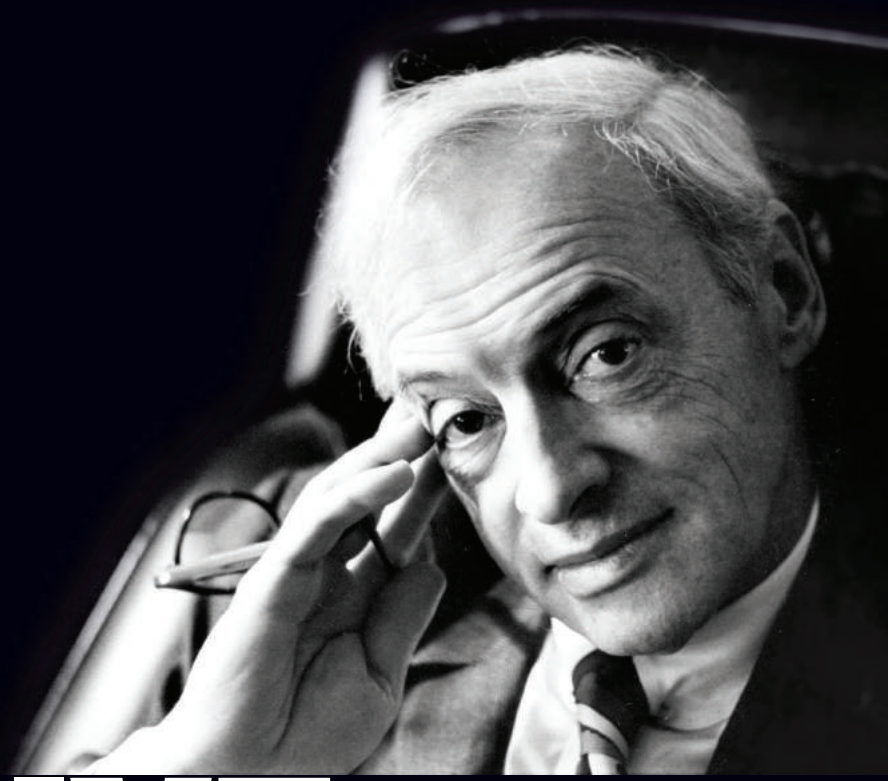

The Life of Augie March
Among the Machiavellians Saul Bellow

From the Life of Augie March

I am an American, Chicago born---Chicago, that sombre city--- and go at things as I have taught myself, free-style, and will make the record in my own way: first to knock, first admitted; sometimes an innocent knock, sometimes a not so innocent. But a man's ~~naknx~~ character is his fate, says Heraclitus, and in the end there isn't any way to disguise the nature of the knocks by acoustic work on the door or gloving the knuckles. I'm curious myself to know what kind of knocks will come when I set up a bid. I dislike the stickiness of guile you find even in the best intentioned records of

Bellow wrote to his editor in 1950 that he imagined *The Adventures of Augie March* as "a widening spiral that begins in the parish, ghetto, slum, and spreads into the greater world." Drafts of the 1954 National Book Award–winning novel are held in the newly opened Saul Bellow archive at the University of Chicago Library.

What is it like to sort through the personal papers of one of America's most celebrated writers?



literature

AN ARCHIVE, CHICAGO BORN

BY SUSIE ALLEN, AB'09

Saul Bellow, EX'39, wasn't known for brevity. Perhaps his most famous work, the modern picaresque *The Adventures of Augie March* (Viking Press, 1953), clocks in at 536 pages; *Humboldt's Gift* (Viking Press, 1975), about a rivalrous friendship between two writers, is a hulking 487. Even many of Bellow's short stories are on the hefty side.

The archive of his personal papers at the University of Chicago Library's Special Collections Research Center, which opened to researchers in March, is equally voluminous—254 boxes in all. Stacked on top of one another, they would reach four times the height of the Mansueto Library's dome.

Bellow began donating his papers to the University in bits and pieces during the 31 years he taught on the faculty. In 2006, a year after his death, UChicago acquired his remaining professional papers. It was the right match, Bellow's biographer Zachary Leader believes, "since he is the great novelist of Chicago."

At the request of Bellow's widow, **Janis Freedman-Bellow**, AM'90, PhD'92, for the next several years only a few scholars who'd received permission from the Bellow estate were allowed to look at them. Eventually, those restrictions expired, and **Ashley Gosselar**, a processing archivist in Special Collections, got the go-ahead to organize the collection's drafts, letters, photos, teaching materials, and ephemera for researchers to use. A gift from **Robert Nelson**, AM'64, and **Carolyn Nelson**, AM'64, PhD'67, underwrote the cataloging process.

Working on the papers of the 1976 Nobelist was a treat for Gosselar, an English major before she went to library school. "The English lit nerd in me is always thrilled to get to work on the personal papers of a writer and deal with literary manuscripts," she says. "I think my love of story fed my interest in archives, because that's what they do. They tell a story of somebody's life." Gosselar read Bellow's novels and previously published letters as well as several biographies of him in preparation for the project.

Faced with a fresh set of papers to catalog, Gosselar does a rough assessment of the materials and develops a broad organizational plan. Then comes the long process of sorting materials into boxes and folders and writing a detailed inventory. In the case of Bellow's papers, this last stage was especially thorough and took over a year from start to finish. It wasn't quite all Saul, all the time—Gosselar had a few other projects on the side—but "a large portion of my time was spent with Bellow."

One of Gosselar's most painstaking tasks was developing a comprehensive list of Bellow's hundreds of correspondents. It's a time-intensive step archivists don't always take, but it made sense given the writer's community of friends and admirers, which included writers (Don DeLillo, Annie Dillard) and politicians (senators Jacob Javits and Edward Kennedy, President John F. Kennedy)—even Pope John Paul II. Along with the drafts of Bellow's work, his letters make up what Gosselar calls "the scholarly meat of the collection," offering "a wonderful window into both his personal life and relationships as well as an excellent picture of his intellectual network."

In one letter, Bellow commiserated with **Philip Roth**, AM'55, about critics: "They have none of that ingenuous, possibly childish love of literature you and I have. They take a sort of Roman engineering view of things: grind everything into rubble and build cultural monuments on this foundation from which to fly the bullshit flag." Kurt Vonnegut, AM'71, jotted a note of appreciation for Bellow's essay "A Matter of the Soul" on a postcard featuring a photo of the poet Robert Lowell ("It is so resonant for me, a former Chicagoan, born in Indianapolis to cultivated parents whose tastes were European"). Another note contained 80th birthday wishes from John Updike: "The writing part of you seems immune to time."

I THINK MY LOVE OF STORY FED MY INTEREST IN ARCHIVES, BECAUSE THAT'S WHAT THEY DO.

Personal papers arrive in Special Collections in varying states of disarray. Bellow's were "pretty typical," Gosselar says—a mixture of tidy and, well, "*not* so tidy." His copious drafts were trickiest to organize: "Fragments of drafts had become jumbled and scattered. So I would open up one box and find one piece of a novel draft, and several boxes later find the next few pages." Piecing them back together looked like "a giant game of Memory," with stacks of paper spread across a long table.

After spending months with Bellow's drafts, Gosselar came to understand how he worked. "It was clear that he seemed to have an early sense of the story he wanted to tell. But what he revised over and over again was the way in which he was telling it."

Bellow often began his drafts in longhand, on a notepad or in a notebook, before turning them over to an assistant to type. In subsequent versions he would tweak sentences again and again, shift the perspective from third to first person and back, and tinker with characters' names (Bellow connoisseurs can debate the significance of the fact that Charlie Citrine in *Humboldt's Gift* was originally introduced as Thomas Orlansky, for instance). For Gosselar the paper trail suggested Bellow's genius wasn't the result of "direct dictation from the muse. This was labor for sure."

The reward comes when she sees researchers putting the archives to use. For the Bellow collection, that gratification was almost instant. "As soon as the guide went online and before we had even had a chance to publicize that, we had people in the reading room using it and requesting boxes," Gosselar says. A sizeable audience of Bellow scholars and fans, it seems, had been waiting hungrily.

For Gosselar, the feeling is different. When she finishes work on the personal papers of someone like Bellow who's no longer alive, she is "always a little bit sad that I will never meet them because I feel that I know them so well." Still, the intimacy that emerges between archivist and subject—knowing their handwriting, work habits, daily concerns—lives on for new generations of Bellow scholars and readers. ◆

Bellow, shown here browsing in Powell's Books, had an extensive network of friends and acquaintances that included many of the most celebrated writers of the 20th century. The archive contains correspondence with figures such as Edward Albee, Elie Wiesel, and Samuel Beckett.

PHOTOGRAPHY BY KEVIN HORAN/THE LIFE IMAGES COLLECTION/ GETTY IMAGES

hotel in the Broadway area. Having gone down at 2AM to empty his garbage pail, he was taken ill, a heavy disturbance in the chest, probably. He got off the elevator at the wrong floor and fell down in the corridor. The noise startled an old woman who did not ~~try to investigate.~~ leave her bed But a little later, the sounds continuing, she more looked under the bolt chain ~~and saw him~~ the was tearing open his shirt and pants in his struggle for breath. She later said that he didn't look like the usual drunk, or junkie. He had been a very handsome ~~man~~ ~~and~~ the might still have seemed so, in ~~a~~ the bad light, of the corridor

She phoned the desk. The police ambulance took Jonas to the hospital. He was D.O.A. The rest was metropolitan routine. No next of kin to notify. Two ex-wives, both out

Above: An edited draft of *Humboldt's Gift*. The archive reveals Bellow's exhaustive revision process. "It was kind of like listening to a jazz musician improvise," Gosselar says. "He wrote variation after variation of a sentence until it was the melody he wanted." Below: A letter to Bellow from Ralph Ellison, one of thousands in the archive. The two legendary novelists briefly shared a house in New York's Hudson Valley in the 1950s. In 1962, Bellow joined the faculty of the John U. Nef Committee on Social Thought, where he taught until 1993 (inset).

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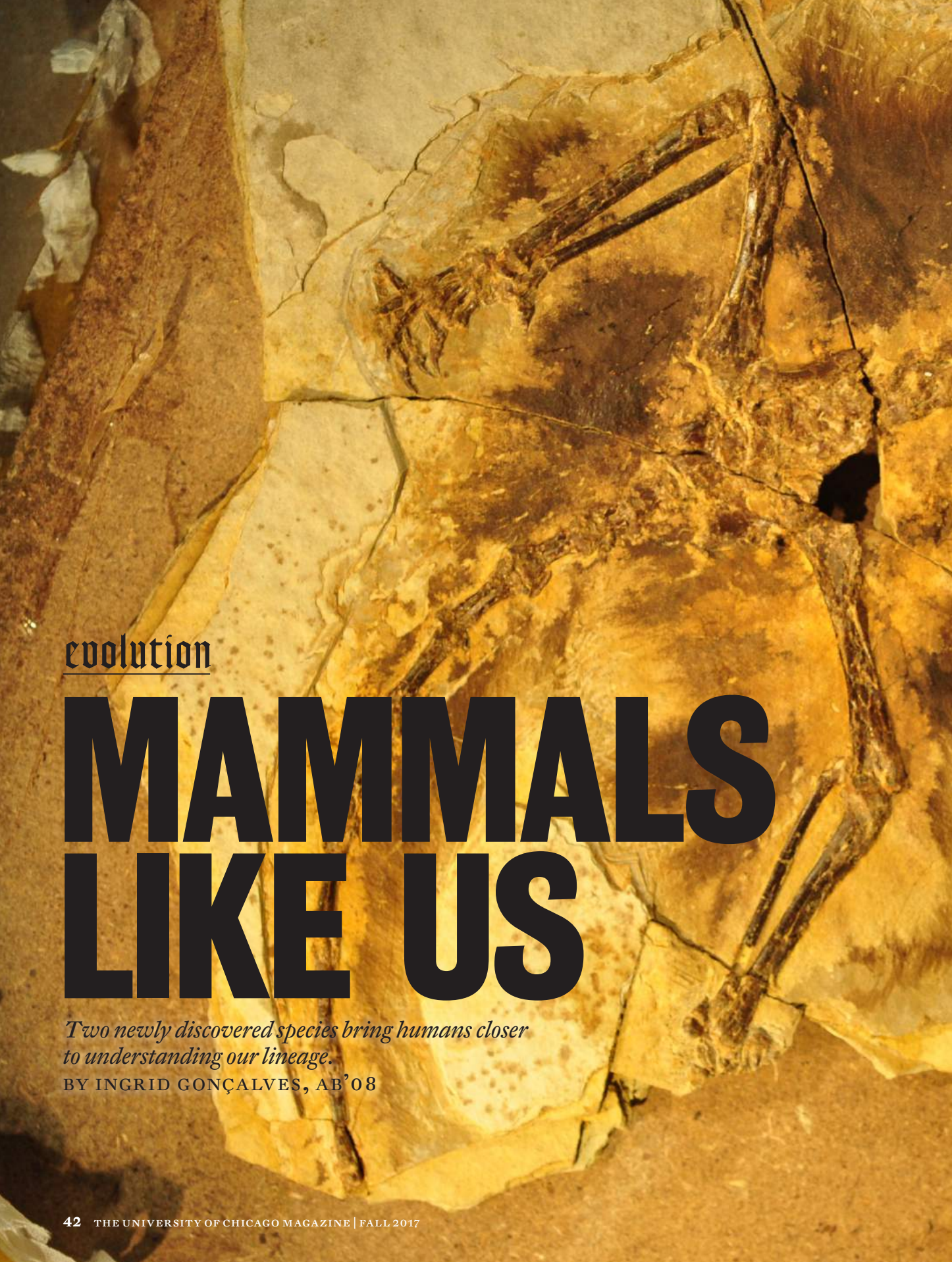


evolution

MAMMALS LIKE US

Two newly discovered species bring humans closer to understanding our lineage.

BY INGRID GONÇALVES, AB'08

No one bothered to clone mammals for *Jurassic Park*. Dinosaurs were the stars of the Mesozoic era, ruling uncontested until their mysterious, dramatic end. But two 160-million-year-old fossils unearthed in China reveal exciting action behind the scenes—suggesting that mammals hit their evolutionary stride much earlier than scientists previously realized.

The fossils, *Maiopatagium furculiferum* (see pages 42–43) and *Vilevolodon diplomylos*, are now the oldest winged mammals known to science, part of an extinct lineage called the haramiyidans. *Maiopatagium*—nine inches long, slightly larger than mouse-sized *Vilevolodon*—translates to "mother with skin membrane." These prehistoric critters resembled modern-day flying squirrels, with their furry coats, long fingers, and fleshy parachute-like membranes. But they took flight long before the ancestors of any living relatives, which followed different branches of the family tree and developed wings independently around 100 million years later.

"It's amazing that the aerial adaptations occurred so early in the history of mammals," says **David Grossnickle**, a graduate student in the Committee on Evolutionary Biology and a member of professor **Zhe-Xi Luo**'s lab. "Not only did these fossils show exquisite fossilization of gliding membranes, their limb, hand, and foot proportion also suggests a new gliding locomotion and behavior."

Mammals are far from the most biologically diverse class. They comprise an estimated 5,400 species, compared to 10,000 birds, 27,000 fish, and millions of insects. But mammals are rich in ecological diversity. From bats to manatees to giraffes, they have adapted to a much broader range of environments than other vertebrates.

"Our two new gliders are just a demonstration that this fundamental mammalian ecological diversity is actually a very interesting biological signature of our entire group, going from the very beginning of our entire history," says Luo, professor in the Department of Organismal Biology and Anatomy at the University of Chicago. The Luo Lab focuses on the evolution of early mammals, with the help of a custom-made X-ray computed tomography scanner affectionately known as PaleoCT (unlike similar medical equipment, these X-rays are powerful enough to see through rock).

Luo, who has studied mammals since he was an undergraduate at China's Nanjing University, coauthored two papers, both published in *Nature* this past August, on *Maiopatagium* and *Vilevolodon* with an international team of researchers from UChicago, the Beijing Museum of Natural History, and China's Hebei Geo University. These studies add to a growing body of evidence suggesting that mammals evolved not in the wake of dinosaurs but alongside them.

Maiopatagium and *Vilevolodon* lived in the trees, above the jaws and claws of their reptilian contemporaries. Gliding also helped them reach seeds, fruits, and other elevated food sources likely suited to their dental anatomy. Wings like theirs are one of many biological innovations that enabled mammalian species to thrive around the globe.

After the Cretaceous–Paleogene extinction—the one that took out most of the dinosaurs—mammals proliferated, resulting in one of the most extensive fossil records available. The *Maiopatagium* and *Vilevolodon* fossils were exceptionally well preserved for their age, still showing outlines of skin, hair, and other soft tissue. But the process of studying ancient fossils remains delicate and time consuming.

Luo's team used PaleoCT to build 3-D skeletal renderings of each glider fossil. Those renderings informed the illustrations and animations for *Maiopatagium* and *Vilevolodon* created by scientific illustrator and lab manager **April Neander**. "After CT scanning it takes thousands of hours to get a detailed morphology right," Luo says.

To fill in details not preserved in the fossil record, researchers drew from available information and parallels to living relatives. Primitive mammals had less developed hearing than their descendants. "As a reflection of that, I didn't make the external ear very big," says Neander.

Scholarly interest in fossils is on the rise, driven in part by the need for physical evidence to corroborate research conducted at the molecular level. Fifteen other labs on campus use the Luo Lab's equipment for their own research, from neurosurgeons to geophysicists.

In some ways human interest in other mammals is self-centered. (The fact that they're cute doesn't hurt. "You find fossils where they're snuggled up with each other," Neander says.) The origins of our distant-but-not-too-distant relatives may harbor clues about our own ancestry.

"Mammals are us," Luo says. "Many of the biological traits that we came to associate with ourselves, like parental care, nursing of babies, our hair, the way we talk, the way we hear, the way we feed … can be mapped in the evolutionary record—that's fossils—to give us an understanding of it."

Despite the differences in our anatomies and our experiences, mammals share one thing in common: the hustle. Even our earliest ancestors displayed a relentless drive to adapt—to our environments, our neighbors, and our evolving circumstances. On this level at least, we can all relate. ◆

ADAPTED FROM AN ILLUSTRATION BY APRIL I. NEANDER; PAGES 42–43: PHOTO COURTESY ZHE-XI LUO

MAROON MENAGERIE

Meet some of the fantastic beasts UChicago faculty helped introduce to the scientific record and the popular imagination.

BY KAITLYN AKIN, '19; CHRISTOPHER GOOD, '19; AND SUSIE ALLEN, AB'09

FROM LEFT: ADAPTED FROM ILLUSTRATION BY KALLIOPI MONOYIOS; ADAPTED FROM 3-D MODEL BY TYLER KEILLOR

Tiktaalik roseae

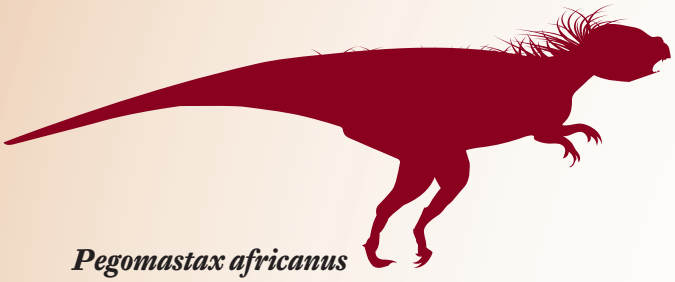
Tiktaalik roseae probably looked something like a flattened crocodile. However, the 375-million-year-old fossil, unearthed in 2004, is the key to understanding the evolutionary link between aquatic and land-dwelling animals. Although *Tiktaalik* had fins and lived mostly in shallow streams, scientists believe it spent short amounts of time on land—its skeleton reveals limb structures present in later land-dwelling mammals, including humans. This concrete connection between humans and prehistoric fish was the subject of a best-selling book and a PBS series, both titled *Your Inner Fish*.

SITE: Ellesmere Island, Nunavut, Canada
AGE OF SPECIMEN: 375 million years (Devonian)
DISCOVERED: 2004
UCHICAGO RESEARCHER: **Neil Shubin**, Robert R. Bensley Professor of Organismal Biology and Anatomy

Eodromaeus murphi

Eodromaeus murphi, a 3.9-foot-long carnivorous dinosaur weighing in at a meager 15 pounds, looks tame enough. But despite its small stature—"pint-sized," in Sereno's words—the "dawn runner" has had an outsized impact on our understanding of dinosaur evolution. The 230-million-year-old species dates so far back that archaeologists have dubbed it a basal dinosaur: they believe it forms the base of an entire family tree. Its upright gait, sharp teeth, and sharp claws suggest that it was an ancestor to *T. Rex*.

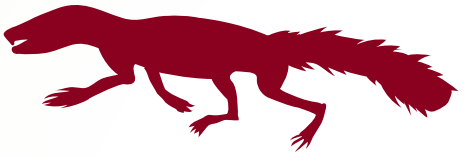
SITE: Northwestern Argentina
AGE OF SPECIMEN: 230 million years (Triassic)
DISCOVERED: 1996
UCHICAGO RESEARCHER: **Paul Sereno**, professor in organismal biology and anatomy



Pegomastax africanus

Rock fans, check your Dinosaur Jr. jokes at the door. Yes, *Pegomastax africanus* was tiny. The bizarre bipedal herbivore, whose name translates to "thick jaw from Africa," brandished a beak with a pair of vicious-looking canines and rows of self-sharpening teeth. But it was the bristly hide—found preserved under lake sediment and ash—that led Sereno to liken *Pegomastax* to a "nimble, two-legged porcupine." The *Pegomastax* fossil was discovered in a slab of rock in the early 1960s and tucked away in a Harvard University lab drawer, its significance not yet apparent. Sereno encountered it years later and, he told the *New York Times*, "my eyes popped, as it was clear this was a distinct species."

SITE: South Africa
AGE OF SPECIMEN: 200 million years (Jurassic)
DISCOVERED: 1960s
UCHICAGO RESEARCHER: **Paul Sereno**



Agilodocodon scansorius

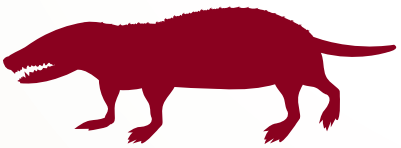
Shrew-like *Agilodocodon scansorius* dashed up tree trunks and skittered over branches, high above the ground 165 million years ago. The earliest known tree-dwelling mammal, *Agilodocodon* likely fed on sap, a first for mammals. Its front teeth were shaped like spades, allowing *Agilodocodon* to chomp through bark, though its sharp-edged molars suggest it may have been omnivorous. *Agilodocodon* had sturdy, flexible wrists, elbows, and ankles for climbing—structures present in modern climbing mammals.

SITE: Inner Mongolia, China
AGE OF SPECIMEN: 165 million years (Jurassic)
DISCOVERED: 2011
UCHICAGO RESEARCHER: **Zhe-Xi Luo**, professor of organismal biology and anatomy

Megaconus mammaliaformis

To be classified as mammals, animals must nurse their offspring. Another typically mammalian characteristic? Fur. But one fuzzy critter from 165 million years ago suggests that mammals may not always have had a monopoly on hair. Squirrel-like *Megaconus mammaliaformis* had mammalian fur and teeth—but also a spine, ankle bones, and ear structures that closely resembled other mammal-like reptiles. The discovery of the not-quite mammal, not-quite reptile *Megaconus* proves that many of the traits we associate with mammals today first emerged in other classes of creatures. Today's mammals are the "accidental survivors," Luo explains, of many mammaliaform lineages that weren't so lucky.

SITE: Inner Mongolia, China
AGE OF SPECIMEN: 165 million years (Jurassic)
FIRST DESCRIBED: 2013
UCHICAGO RESEARCHER: **Zhe-Xi Luo**

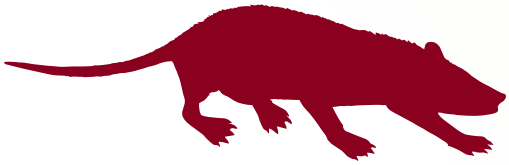


Docofossor brachydactylus

While *Agilodocodon scansorius* took to the branches, *Docofossor brachydactylus* was the first mammal to live underground. Similar to African golden moles, these mouse-sized mammals evolved shovel-like paws with short, wide fingers, perfect for digging—suggesting that the gene patterning in modern mammals that causes variation in skeletal development also operated in their long-ago ancestors. Scientists believe that *Docofossor* favored lakeside dwellings, where it snacked on worms and insects in the soil.

SITE: Hebei Province, China
AGE OF SPECIMEN: 160 million years (Jurassic)
DISCOVERED: 2012
UCHICAGO RESEARCHER: **Zhe-Xi Luo**

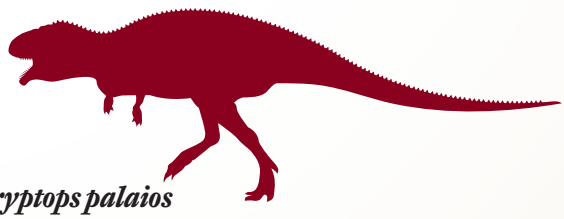
CLOCKWISE FROM TOP LEFT: ADAPTED FROM ILLUSTRATION BY TODD MARSHALL; ADAPTED FROM ILLUSTRATION BY APRIL I. NEANDER; ADAPTED FROM ILLUSTRATION BY APRIL I. NEANDER; ADAPTED FROM ILLUSTRATION BY APRIL I. NEANDER



Spinolestes xenarthrosus

Spinolestes xenarthrosus scurried on wetland floors around 125 million years ago. The "Cretaceous furball," as Luo describes it, was just under 10 inches long, about the size of a modern-day mouse or rat. (Researcher Thomas Martin of the University of Bonn dispensed with scientific objectivity and admitted to the BBC he found *Spinolestes* "very cute.") Despite the fossil's age, features including compound hair follicles, hedgehog-like spines, and soft tissue were preserved. Because of *Spinolestes*, researchers now know that these fundamental qualities of modern mammals had already emerged during the early Cretaceous period, some 60 million years earlier than previously thought.

SITE: Las Hoyas Quarry, Spain
AGE OF SPECIMEN: 125 million years (Cretaceous)
DISCOVERED: 2012
UCHICAGO RESEARCHER: **Zhe-Xi Luo**



Kryptops palaios

Kryptops palaios—literally, "old hidden face"—owes its name to the spiny shell that enveloped its skull. In practice, *Kryptops* wasn't one for hiding: with small, sharp teeth and a taste for carcasses, the 25-foot carnivore was compared to a two-legged hyena by its discoverers. Like *Eocarcharia dinops*, another fossil discovered on the same dig in the Saharan Desert, *Kryptops* was indigenous to the ancient supercontinent Gondwana, from which present-day South America, Africa, Arabia, Madagascar, India, Australia, and Antarctica were formed.

SITE: Saharan Desert, Niger
AGE OF SPECIMEN: 110 million years (Cretaceous)
DISCOVERED: 2000
UCHICAGO RESEARCHERS: **Paul Sereno** and **Stephen L. Brusatte**, SB'06

Eocarcharia dinops

Eocarcharia dinops—the "fierce-eyed dawn shark"—lived up to its name: standing 25 feet tall, it boasted a maw full of bladelike teeth and a swollen bony brow that wasn't just for looks: Sereno and Brusatte theorize that the creature used its head as a battering ram in fights over mates. *Eocarcharia* and its relatives were forerunners of *Carcharodontosaurus iguidensis*, a massive meat eater that dwarfed *T. Rex* in size.

SITE: Saharan Desert, Niger
AGE OF SPECIMEN: 110 million years (Cretaceous)
DISCOVERED: 2000
UCHICAGO RESEARCHERS: **Paul Sereno** and **Stephen L. Brusatte**, SB'06

Spinosaurus aegyptiacus

As Cretaceous carnivores go, *Spinosaurus aegyptiacus* is practically a household name. To archaeologists, it's a semiaquatic predator, with nostrils placed to help it breathe in water, dense bones for buoyancy control, and a dorsal spine that turned its back into a sail. To the rest of us, *Spinosaurus*'s claim to fame is its size—nine feet longer than its nearest *T. Rex* competitor, it's the largest known fossil of a carnivorous dinosaur. That distinction earned *Spinosaurus* a starring role in *Jurassic Park III*. Even the story of its discovery has a whiff of Hollywood about it. The first *Spinosaurus* fossil was unearthed by a German paleontologist in 1915, only to be destroyed in World War II. Nearly a century later, a new specimen was dug from the ground by a Moroccan fossil hunter and eventually made its way to Italy, where researchers worked to confirm its origin and authenticity.

SITE: Kem Kem Beds, Morocco
AGE OF SPECIMEN: 95 million years (Cretaceous)
DISCOVERED: 1915, 2013
UCHICAGO RESEARCHERS: **Paul Sereno** and former postdoctoral scholar Nizar Ibrahim

CLOCKWISE FROM TOP LEFT: ADAPTED FROM ILLUSTRATION BY DOROTHEA KRANTZ AND OSCAR SINTISDRO; ADAPTED FROM ILLUSTRATION BY TODD MARSHALL; ADAPTED FROM ILLUSTRATION BY DAVIDE BONADONNA; ADAPTED FROM ILLUSTRATION BY TODD MARSHALL

glimpses

FIRST PRINCIPLES

BY CARRIE GOLUS, AB'91, AM'93

Before law school, **Sonja R. West**, JD'98, spent a few years as a reporter in Illinois, Iowa, and Washington, DC. "I got to see some legal issues come up at newspapers where I worked, and I was always really fascinated by them," she says. "The idea formed in my head that rather than doing the reporting, I might like defending the reporters."

West is now the Otis Brumby Distinguished Professor in First Amendment Law at the University of Georgia, where she specializes in constitutional law, media law, and the US Supreme Court. In her academic work, she has argued for better protection for high school journalists and autobiographical writers, and for greater transparency at the Supreme Court. In addition to her publications in law journals, West writes regularly for *Slate* and the *Huffington Post*.

West spoke to the *Magazine* about the First Amendment and how it's being interpreted today. Her comments have been condensed and edited.

Hazelwood v. Kuhlmeier

I was a high school journalist at an interesting time. The Supreme Court decided a key student press case, *Hazelwood v. Kuhlmeier*, in 1988. I became editor in chief of my high school newspaper in 1989.

In *Hazelwood* the court said that school administrators or officials could censor student speech—and in particular that case was focused on a student newspaper—for what were very broadly described pedagogical reasons. I had to start having regular meetings with our administrators, where I told them what was going to be in the newspaper. What it meant to suddenly have to answer to a government official had a big impact on me. It put a tiny seed in my head of what the law could mean for journalists and why it was important.

Speech rights v. press rights

In my work I have tried to make one central point: the First Amendment of the Constitution not only protects our freedom of speech but also our freedom of the press.

What we've had from the Supreme Court is all this focus on speech. We have wonderfully robust speech rights and they apply to everyone. What the court has been reluctant to do, and has not done, is recognize unique press rights or protections as constitutional rights. My overall argument is that our press clause is not being given the power that I believe it should have, that the framers of the Constitution meant.

Student journalists v. principals

In "Student Press Exceptionalism" [*Education Law & Policy Review*, 2015] my argument is that when students are engaging in journalism—when they are exercising press rights, acting as the press, and fulfilling press functions—another layer of protection comes in.

Student journalism fills a hole that mainstream traditional media are not necessarily able to fill. They cover unique issues about their school, issues that affect students in particular. It's important work. We should recognize them not just as students exercising speech rights, but as student journalists exercising press rights.

Dicta v. law

In the '60s, '70s, and even into the '80s, there was a period when the Supreme Court loved the press. The justices

OUR PRESS CLAUSE IS NOT BEING GIVEN THE POWER THAT I BELIEVE IT SHOULD HAVE.

A journalist earlier in her career, West (second from right) went to law school because she wanted to be an advocate for the media. She then practiced media law before becoming a professor.

would speak frequently about how important the press was—they're the watchdogs of government, they inform the people, they fulfill this vital role in our democracy.

But they would say these things in what lawyers call dicta, statements that have nothing to do with the holding of the case. They don't have any real precedential value; they don't have any value as law.

Reporting v. legal writing

I miss having a daily deadline. It's a great relief to file a story and go home. In academic work there's no deadline. It's done when you decide it's done. Then you submit to the journals, and even then it's not really done, because you keep changing it in the edits.

I absolutely resist the idea that legal writing has to be boring and dry. If there is a colorful way to make a point, or an analogy I can make, I have no problem making that at all. When I'm working with students when they're trying to write a paper, often one of the first things I'll say to them is, "What's your lead?" You need to catch the reader's attention, give us the pithy explanation of where this paper is going. That's just good writing.

Supreme Court v. cameras

They don't have cameras in the Supreme Court, and you never get to see oral arguments. That's obviously an important issue, and they have shown absolutely no inclination to change.

The transparency issues go deeper than that. They only release the audio weekly. They do release transcripts daily, but audio is weekly. They don't release transcripts of bench statements [statements given from the bench when handing down an opinion], and the audio for those is released at the beginning of the next term, usually months later.

I got to clerk there [for Justice **John Paul Stevens**, LAB'37, AB'41, from 1999 to 2000] and it's an amazing institution. The more the public could see of it, the better.

Hard v. soft law

We are living in very interesting times. Much of our constitutional democracy is not based on what we call hard law. Often there is not a black-and-white written-down law or constitutional provision that is exactly on point.

The government functions through a great deal of soft law: norms and customs that have supported our constitutional structure and have been followed by presidents and the administration in general. What we are seeing from the Trump administration is the setting aside of customs and norms. He has not as yet used any hard law to go after journalists.

Obviously lots of other presidents have disliked the press—Nixon is a great example. But there was still this basic understanding that reporters were there to do a job. We've never had a president of the United States openly declare, in his words, a war on the media, or call them "the enemy of the American people." Those are very strong words. And these constant refrains of "fake news" are an attempt to undermine the legitimacy of the press as a whole.

As these norms and traditions are falling away, we're seeing more of a need for the Constitution to step in.

Freedom of speech v. confusion

My focus is on free speech and free press. But the First Amendment also protects our freedom of religion, freedom to assemble and petition our government, and a number of other things. There is a lot of confusion about what exactly these rights entail. People think we have more rights than we do.

First of all, only the government can violate our free speech rights or our free press rights. They have to do something that regulates and censors us. If a private person tries to do this to you, even if you feel very cornered, it's not a free speech issue.

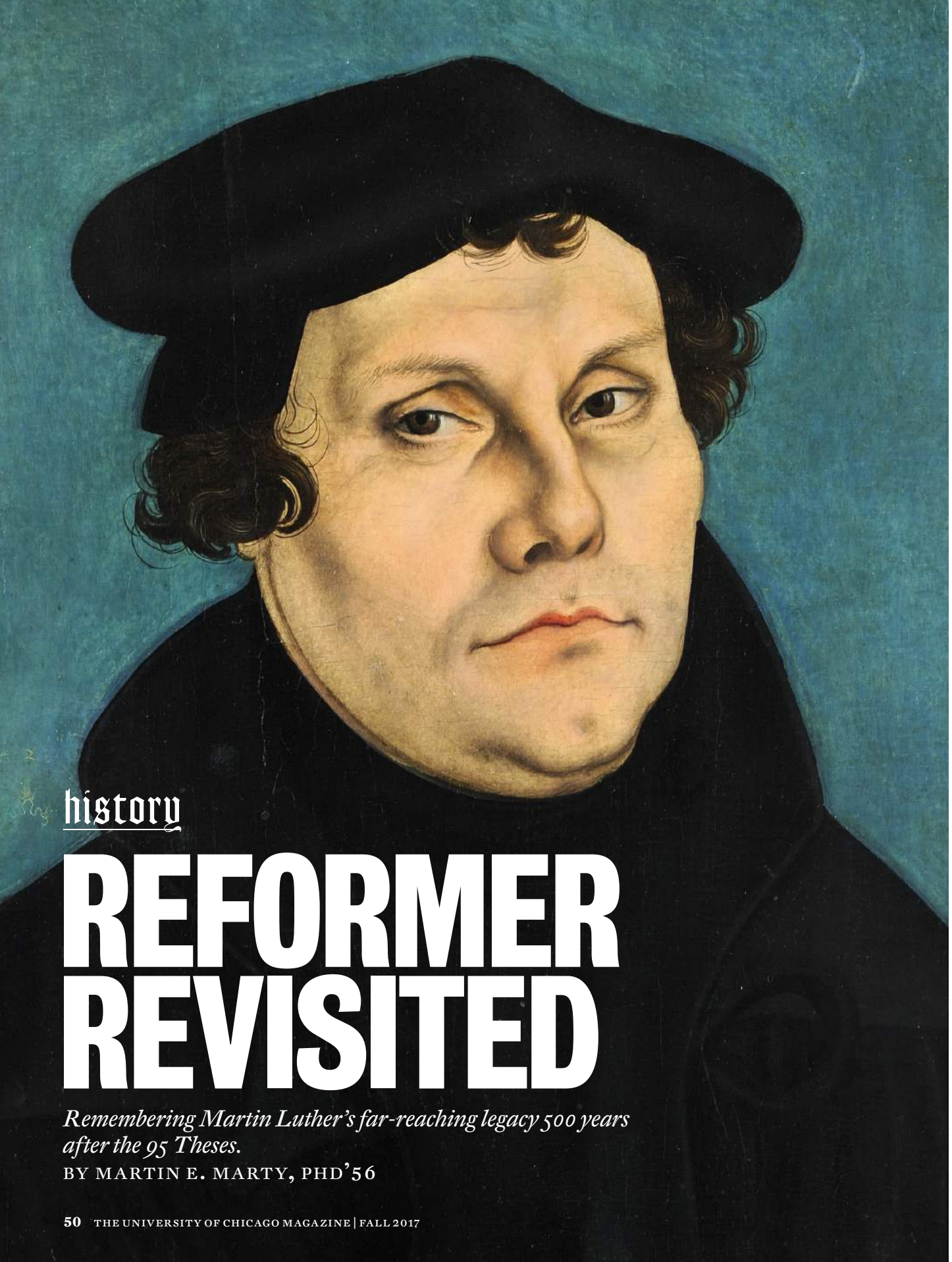
You have a right to speak in a lot of situations, but you don't have a right for there not to be consequences for that speech. When a business gets boycotted, that's not a freedom of speech issue. That is us having a debate.

Garrett v. Obama

I really loved the University of Chicago Law School. I was a big, big fan of professor Beth Garrett [later the first woman president of Cornell University; she died in 2016 at age 52]. I had her for civil procedure as a 1L, and I thought she was so fantastic that I took every class that I could take with her. I think I took tax from her. I mean, I'm not a tax person.

Obama was there—he was a state legislator—and I didn't take his class. It's one of my biggest regrets ever. I don't know what I took instead. What was I thinking? ◆

PHOTOGRAPHY BY IAN MCFARLANE/COURTESY UNIVERSITY OF GEORGIA SCHOOL OF LAW



history

REFORMER REVISITED

Remembering Martin Luther's far-reaching legacy 500 years after the 95 Theses.

BY MARTIN E. MARTY, PHD'56

Friar Martin Luther was naturally at home in monasteries, churches, and courts.

Surprisingly, this religious figure was, and is, almost equally at home in universities. His movement was born 500 years ago in an upstart German university at Wittenberg and is being commemorated and reappraised in higher academic institutions worldwide. Scores of colleges and universities are named after him, not only in northern Europe, where the movement that came to be called the Reformation was born, but also in global outposts, such as the young Martin Luther Christian University in Meghalaya, India. Up to 100 million Lutherans can be found around the globe, first in Germany and Sweden, then in Ethiopia and Tanzania, which come in third and fourth in Lutheran population surveys.

Universities are home to libraries, where writings of Luther abound in 120 large German-volume editions, while his bounty of books and pamphlets testify to the part the printing press, a recent invention, played in the Reform movements. Catalogers locate his writings, their analogues, and the writings of his colleagues on shelves in sections marked *history*, *arts*, *sciences*, and all the humanities, including, of course, *theology*. Psychologists probe records of Luther's often-tortured and revealing inner life. Economists talk about "the Protestant ethic," in many forms influenced by Luther.

Among the visual arts, Luther favored many, including paintings by German artists and woodcuts by Lucas Cranach, a witness at the ex-friar's wedding. It was through music produced or inspired by Luther that the Reformation took hold in parishes and homes. Luther and his colleagues helped move church music and musicians from remote choir stalls to the crowded benches of ordinary church people. His hymn "A Mighty Fortress Is Our God" came to be identified as "the Battle Hymn of the Reformation," with the metaphors and reality of wars all too relatable to Luther and other Reformers.

In quieter settings, he and his colleagues turned out hymns that were sung in schools and during congregational worship. A whole pop culture emerged from this, and the grand cantatas and masses composed by Johann Sebastian Bach and his near peers are its legacies in serious concert programs. Rare is a university chorus that does not prize and perform this heritage.

Luther, of course, was not solitary in his home life and work. Other monks and friars broke vows, affirmed marriage, and found mates. Luther helped "marry off" a group of young nuns as they fled their convents and himself married one who was left over in that domestic lottery. She was Katherine von Bora, a very gifted and loving manager of the Luther-Haus, which was always open to guests, especially students. Kate gave birth to six children, kept the books, tended to her husband in the turmoil of radical changes in church and university, hosted their live-in guests, served meals, brewed the beer, and came to be revered by women, who were becoming prominent in Protestantism.

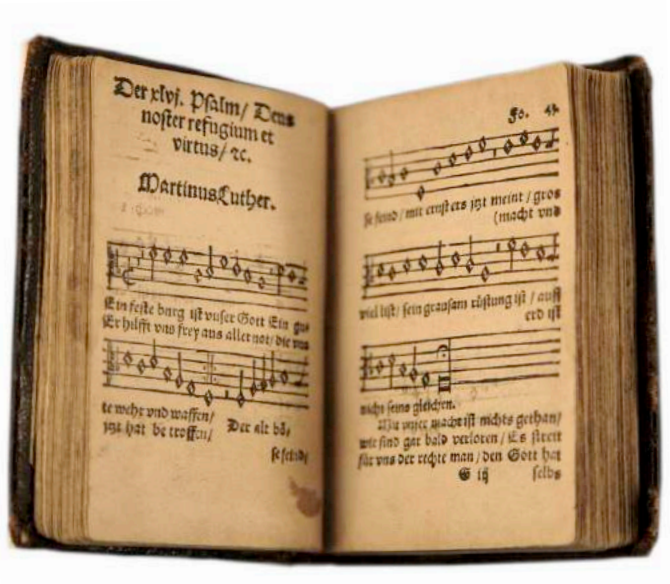
The Lutheran version was by no means the first reform movement to unsettle late-medieval Catholicism. A century before Luther, the Bohemian Jan Hus and other leaders had been articulate enough, in challenging Roman Catholic authorities, popes, and emperors, that they risked all, and Hus was burned at the stake as a heretic. In England, leaders in the restless wing of the Catholic Church made the Bible available in new translations and questioned many traditions, even as they began to move away spiritually from Rome. Through central Europe, early nationalist movements blended the Christian language of the cross, rooted in the church, and the language of the sword, symbolizing dealings with the state.

Some scholars like to describe a collection of many territories of the Holy Roman Empire as a tinderbox, ready to explode into fire, and they see Luther and other university teachers and preachers as strikers of the matches to ignite them. Of reform, Luther once said that while he and his friends in Wittenberg drank beer, God moved in and brought freedom and grace to the masses.

The most direct subject of the turmoil for a troubled and creative theologian had to be God. For Luther and his spiritual kin, "God" meant the God of Christian faith. An old book on my shelves since student days, Philip S. Watson's *Let God be God! An Interpretation of the Theology of Martin Luther* (Muhlenberg Press, 1947), elaborates. Luther and those associated with him were surrounded by a God-based culture, imposed on all by church and state, which were until then ordinarily linked. The Reformers claimed that the official church did not let God be God. In their eyes, the church

IT WAS THROUGH MUSIC PRODUCED OR INSPIRED BY LUTHER THAT THE REFORMATION TOOK HOLD IN PARISHES AND HOMES.

IMAGE COURTESY CRANACH DIGITAL ARCHIVE (LUCASCRANACH.ORG)



Early printings of Luther's hymn "A Mighty Fortress Is Our God" were few, and no first editions are known to survive. This rare second edition is in the Lutherhaus museum in Wittenberg, Germany.

leaders remade God to match their own interests, needs, and private revelations. In practice, God was cut down to cultural size and not left free to rule or to save humans.

To rule meant to govern personal and social life in terms provided in the divine commandments, as received in the Bible. They were usually propagated and administered through the church. Those who failed to keep God's law, as interpreted by the church, would suffer in this world and then eternally in a vividly imagined fiery scene to come. On the other side of the curtain of death there was promised a way of thriving with a gracious God in total fulfillment and happiness. Those Christians who kept the divine law would be rewarded with "salvation," the promised vision and experience of God. Along the way there developed a kind of halfway house called purgatory, where the sinners—everyone, that is—were to be painfully prepared for the benign realm, usually called Heaven, by being purged of the account of sins and doubts that afflicted all.

It is easy to see how that domain of total and fateful choice could be exploited, and it was. The condensed story says that the pope, wanting to build colossal St. Peter's church in Rome, needed funds. These were more abundant and less spoken for in German and neighboring lands. So, picking up on a few undeveloped clues in the tradition, enterprisers in German lands peddled indulgences, as if they were tickets redeemable to reduce the time spent in being purged. Luther and his fellow preachers took on the indulgence peddlers head-on, and things were never the same again. And the public rejoiced.

That telling oversimplifies a complex story, but other versions reinforced its main theme that humans are condemned and need redemption, which meant being brought back to God. And here was a dramatic, fresh pitch of Luther and the Reformers. Instead of winning eternal life by buying it, making pilgrimages, or following other rites, people simply had to hear and believe the word of God, channeled through the Bible and the preached word. All words of divine grace, they taught, center in God's loving action in Jesus Christ, faith in whom these Reformers shared, though often in conflicting interpretations. Luther and company insisted that they were not rejecting the message of the Church after 15 centuries, but were listening to it without the clutter of law and superstition. They were "letting God be God."

That project gathered the energies of movements including the Reformed in Switzerland and the Netherlands, and the Anglicans and others in England and Scotland. Some of these were quite different from Luther's version, many finding the Lutheran way too compromised, calculating, and cautious. There developed what is often thought of as "the left wing of the Reformation," which preached radical separation from the Catholic way. In the patterns of that time, people were compelled to go along religiously with their rulers, whether Catholic or Protestant, conservative or radical. All professed in their creeds that they believed the Church to be "one," but the Lutheran and multiple other reform movements led to the appearance of many churches.

In our ecumenical age, Luther is revered by Lutherans and many other Protestants (and Catholics). He and his themes are studied and often approved in ways little anticipated. His heirs today do not disguise or hide his faults. In his later years he turned notoriously anti-Judaic—or, in today's terms, grossly anti-Semitic—when Jews, with whom Lutherans shared the ancient covenant with God, did not accept Jesus Christ and the salvation Christians believed he brought. In our time, the 100-plus Lutheran church bodies around the world unanimously have united in repenting, which means affirming a change of heart with respect to Jews. They acknowledge that, for all their efforts, they have a long way to go. But today very many observances unite Lutherans, Catholics, and others in prayer and common action.

In this 500th year, the calendar points to countless Lutheran and Protestant activities: conferences, publications, festivals, hymn sings, and more. Many who participate in them, whether on university campuses, in classrooms, summer camps, Bible studies, advanced seminars, or local congregations, will find vast changes in the world separate them from much in Luther's world. But in the whole range of these bodies' participations and observations, one goal is nurtured broadly and deeply: to realize and affirm fresh ways of "letting God be God." ◆

Martin E. Marty, PhD'56, is the Fairfax M. Cone Distinguished Service Professor Emeritus at the University of Chicago, where he taught for 35 years. He is the namesake of the Divinity School's Martin Marty Center, focused on religion in public life, and author of *Martin Luther* (2004), from the Penguin Lives series, and *October 31, 1517: Martin Luther and the Day that Changed the World* (Paraclete Press, 2016).

PHOTOGRAPHY BY PAUL T. MCCAIN

NEWS FROM THE UNIVERSITY OF CHICAGO PHYSICAL SCIENCES DIVISION

2017

INQUIRY

NOTE FROM THE DEAN

Critical inquiry

In December 1942 a group of physicists led by Enrico Fermi, operating in what was code-named the Metallurgical Laboratory, built the first nuclear reactor—Chicago Pile-1—underneath the old Stagg Field. There they achieved the first controlled, self-sustaining nuclear reaction, giving rise to the atomic age. (See "Manhattan's Critical Moment," page 56.)

Afterward, for safety reasons, the Met Lab moved out of Chicago to a spot near Palos Hills, Illinois, and was renamed Argonne after the surrounding forest. It was formally chartered as Argonne National Laboratory in 1946, signaling the beginning of "big science"—large-scale scientific research often supported by federal governments. Physics had entered the public domain.

Fermi's experiment led to the formation of three institutes at UChicago: the Institute for Nuclear Studies, which became the Enrico Fermi Institute; the Institute for Metals, which evolved into the James Franck Institute; and the discontinued Institute of Radiobiology and Biophysics. The EFI, now famous for astrophysics and particle physics research, and the JFI, at the intersection of materials science, condensed matter physics, physical chemistry, and atomic, molecular, and optical physics, are cornerstones of the Division of the Physical Sciences.

From the first nuclear weapons to nuclear energy to radiation cancer therapy, the University has been on the forefront of atomic age breakthroughs. We've also been the first to warn of the destruction that came to pass, dangers with us now, and threats to our future born of nuclear research. UChicago scientists founded the Bulletin of the Atomic Scientists after the atomic bombs were detonated in Japan. It still operates today to acknowledge, address, and take responsibility for nuclear science and how it's used.

The University is commemorating the 75th anniversary of CP-1 by considering our history and our role in shaping the world. Events have been held throughout the fall quarter and will culminate in a two-day symposium on December 1 and 2. Physicists, chemists, historians, public policy leaders, and the community will join in free inquiry and expression and will engage the world in understanding what happened here, where it led, and what's to come. For information, see mag.uchicago.edu/cp1-events.

I hope you will consider joining us,

Rocky Kolb

Edward W. "Rocky" Kolb
Dean of the Physical Sciences Division

STATISTICS

Sharpened focus

A mixture of theory and practice helps statistician Rina Foygel Barber, SM'09, PhD'12, optimize her results.

For assistant professor **Rina Foygel Barber**, SM'09, PhD'12, statistics is "one of the fantastic places that you can get a real intersection between theory and application—not just in the same PhD program but in the same project."

Take her research on image formation in computed tomography (CT) scans. In collaboration with **Emil Sidky**, SM'91, PhD'93, a research associate professor in radiology at UChicago, and Taly Gilat-Schmidt, a biomedical engineer at Marquette University, Barber used optimization theory to help develop the mirrored convex/concave (MOCCA) algorithm, which helps CT scanners make better, clearer three-dimensional CT images in less time.

A CT scan assembles a series of X-rays taken from different angles into one three-dimensional image, providing doctors with a more thorough picture of a patient than they'd see in a two-dimensional image. An algorithm controls the process of taking and assembling these images; the more efficient it is, the quicker the scanning process. A shorter CT scan not only saves time and money and reduces patients' radiation exposure but also improves the scan itself—the longer patients have to lie still, the more likely they are to twitch or fidget, blurring the resulting image.

"We are working with real data and answering real questions," says Barber, "but at the same time we're learning about optimization theory and figuring things out that are much more general than just that specific problem."

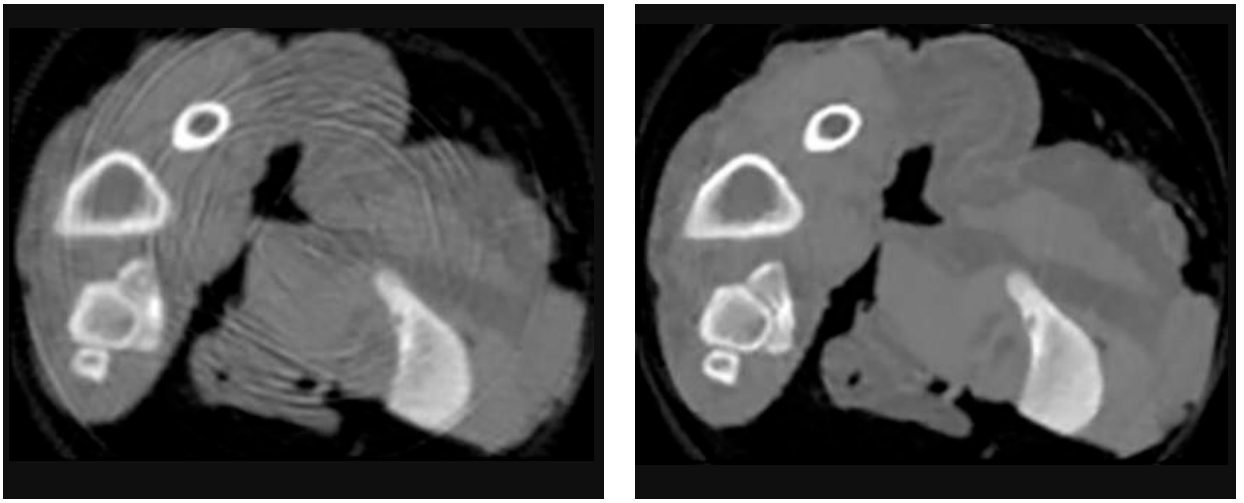
Optimization theory in statistics involves finding the equation that best answers the problem at hand. The trick is to avoid choosing a local optimum, which is the best option within a small neighborhood of possible solutions, instead of a global optimum, which is the best option period. Regarding convex and nonconvex (concave and linear) algorithms, convex means that an optimal solution is guaranteed to be the best global solution.

Because they avoid the trap of the local optimum, "almost all of the main theory and really beautiful theory" has been for convex optimizations, which Barber notes are also easier to work with. But CT scans and other medical imaging involve an element of randomness, as X-ray beams can behave unpredictably. This randomness, Barber and her team found, is better captured and accounted for with a nonconvex equation.

As they worked together on the MOCCA project, Sidky noted that unlike many theorists, who contribute one central idea to a collaboration and then leave the rest to the experimentalists, Barber "listens to all aspects of it: the experimental part of it and some of the issues I had for implementing on a large scale. She has ideas on all of those things."

Barber attributes her involvement in the project—and to

PAGE 53 ILLUSTRATION BY ANTHONY FREDA; PHOTOGRAPHY BY JASON SMITH



Previously, the "noise" created by the data during a CT scan created rings (left) making them hard to read. Barber's MOCCA algorithm helped create clearer scans (right) in less time.

some extent, her career in statistics—to happenstance. After earning her undergraduate degree from Brown in 2005, she taught math at the Park School in Baltimore. Although she loved teaching, she says, "I just needed a bit more math in my life." At the beginning of her second year in UChicago's doctoral program in mathematics, she took a statistics course for fun and was hooked.

Her introduction to Sidky came in 2014, her first year on the faculty at UChicago. Some of Sidky's students took Barber's course on compressed sensing, another statistical area with medical imaging applications having to do with the minimum number of images required to produce, for example, a CT scan. Hearing about the course from his students, Sidky and other members of the radiology department met with Barber, and their work in CT image reconstruction quickly shifted from compressed sensing to nonconvex optimization.

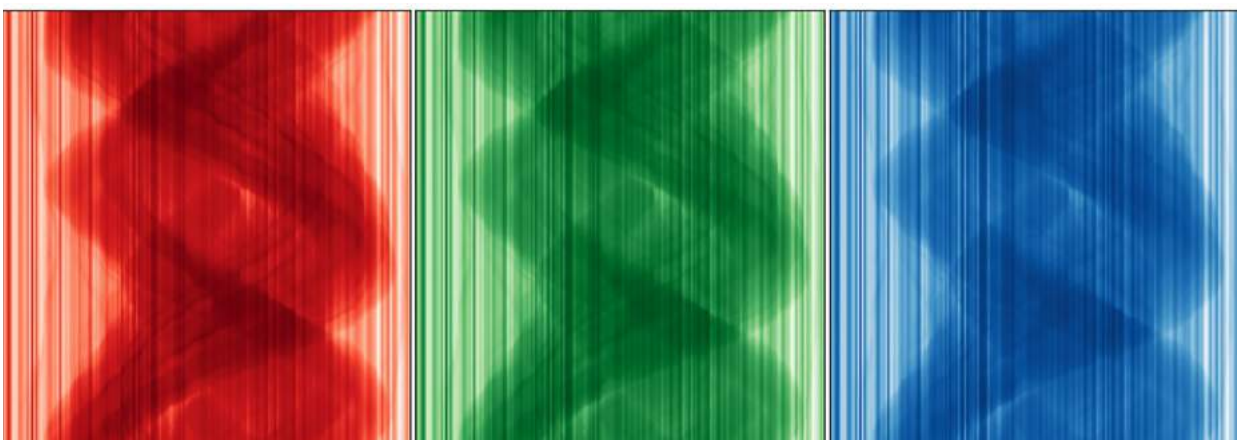
Barber hopes that her work with Sidky and Gilat-Schmidt can not only find applications with other types of imaging but also "inspire completely different problems from the stat and math side."

She is already making her mark in other subfields. In March she received the Institute of Mathematical Statistics Tweedie New Researcher Award for "groundbreaking contributions" in her work with her postdoctoral adviser, Stanford's Emmanuel Candès, on what statisticians call a *knockoff filter*, which helps eliminate variables in a data set.

She also works on high-dimensional inference and estimation methods, which apply classical statistical techniques to data representing a much larger sample size than a traditional statistical sample.

Because high-dimensional statistics and large-scale optimization are relatively new subfields of statistics and thus, says Barber, "tend to skew younger," she finds women to be well represented among her peers. At UChicago specifically, she notices strides in terms of gender diversity in math and science. "It's been a great place to be from the start," she says.

In fact, Barber's graduate experience—along with the University's collaborative research climate and proximity to her family—was a significant draw to come back as faculty.
—*Jeanie Chung*



IMAGES COURTESY TALY GILAT-SCHMIDT

Barber's work can be illustrated with these scans of a chicken wing. This image is the raw data collected by the CT sensors.

Manhattan's critical moment

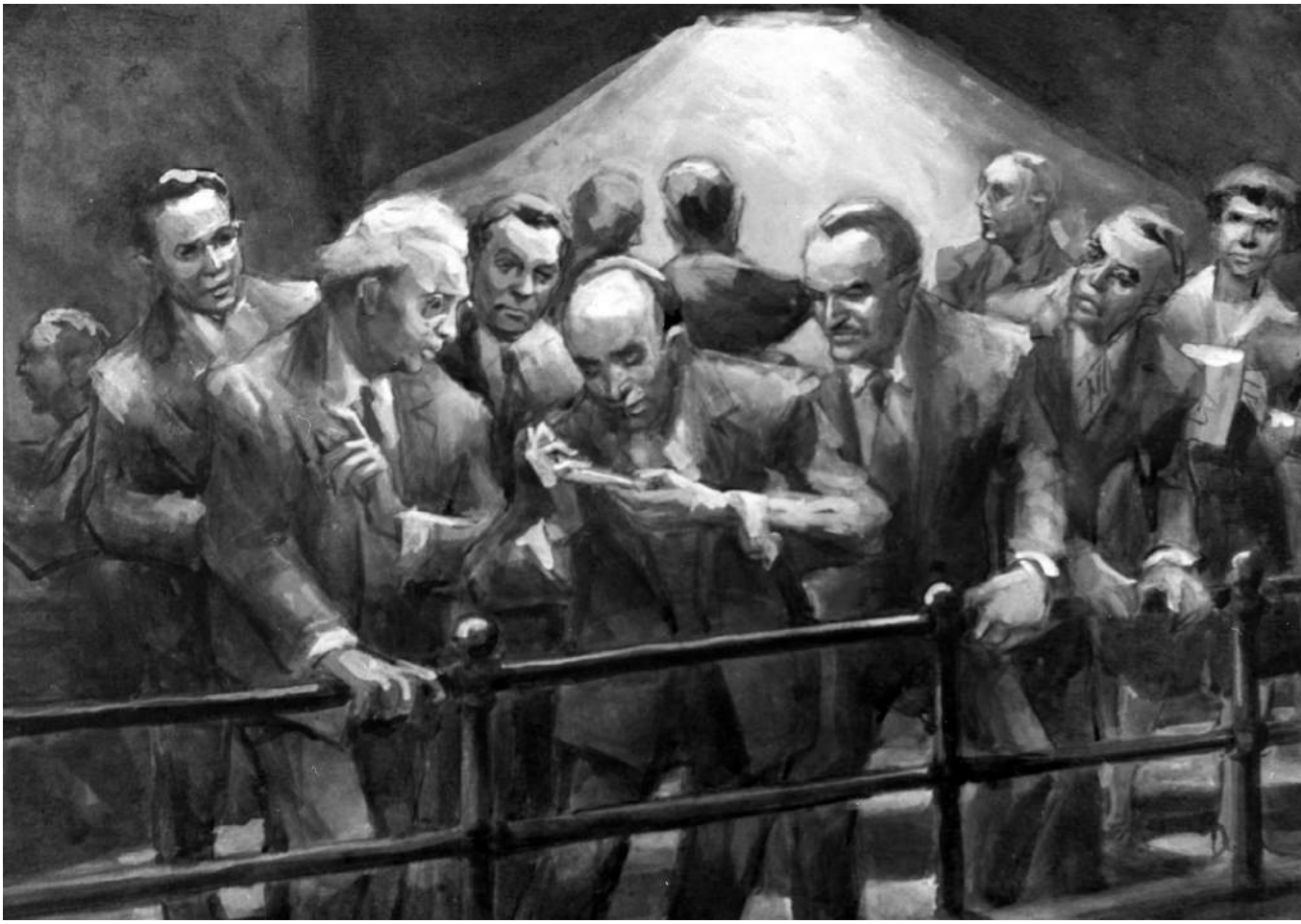
The University marks the 75th anniversary of Chicago Pile-1, the world's first controlled, self-sustaining nuclear reaction.

On December 2, 1942, in an abandoned squash court underneath the former Stagg Field, where Mansueto Library and Henry Moore's *Nuclear Energy* sculpture now stand, a team of 49 scientists and workers gathered on a balcony intended for spectators and stared at a 20-foot pile of bricks below.

Chicago Pile-1, or CP-1 for short, weighed more than 400 tons and consisted of layers of solid graphite bricks alternating with bricks embedded with uranium metal and uranium oxide, braced by a wooden frame—nearly $39 million worth of materials in today's dollars. Within the pile, these components were reacting in ways invisible to the naked eye. As the radioactive uranium naturally decayed, it released fast neutrons through spontaneous nuclear fission. The graphite served as a moderator, slowing the released neutrons enough to be captured by other uranium nuclei, which normally would induce more fission in a chain reaction.

But the physicists had prevented such a chain reaction by inserting cadmium rods into the side of the pile to absorb the slowed neutrons. The rods, arranged in three redundant safety systems, were stopping—and controlling—a nuclear chain reaction. The main system, which included 10 rods—any one of which would stop the reaction—was manually inserted and retracted. A second system included two electronically operated fail-safe rods, programmed to automatically deploy if neutron intensity rose above a set safety point. And the last system was an emergency rod attached to a rope, to be cut in the event of a crisis. What

IMAGE COURTESY ARGONNE NATIONAL LABORATORY



No photography was permitted at the top-secret experiment to achieve the first nuclear reaction. John Cadel's painting recreates the moment when Enrico Fermi (center) determined the reaction had become self-sustaining.

A COLLEAGUE ASKED FERMI WHAT HE WOULD DO IF ANYTHING WENT WRONG. HE REPLIED, "I WILL WALK AWAY—LEISURELY."

would happen once the physicists removed the cadmium rods? Would the reaction peter out, or never even start? Would the pile explode?

Enrico Fermi, the Nobel Prize–winning physicist who led the experiment and would later join the UChicago faculty, was confident in his calculations. He assured fellow Nobelist Arthur Holly Compton, the UChicago physicist who directed the Metallurgical Laboratory, which conducted the experiment and later became Argonne National Laboratory, that the pile would produce no more energy than could power a lightbulb. Before the experiment, a colleague asked Fermi what he would do if anything went wrong. He replied, "I will walk away—leisurely."

On the morning of the experiment, Fermi ordered all rods removed, save for one of the manually operated rods. The emergency rod was hoisted on its rope, monitored by Norman Hilberry, Compton's right-hand man. On the squash court floor, physicist George Weil operated the remaining main rod that served as a starter, accelerator, and brake. Weil slowly removed it over several hours as Fermi monitored the clicking neutron counter.

At 11:35 a.m. there was a loud clap. One of the automatic safety rods had slammed into the pile; the safety point had been set too low, triggering the mechanism (and a lunch break).

At 2:30 p.m. the experiment resumed. Weil again pulled out the remaining main rod in a series of measured increments, and the neutron intensity rose at a steadily increasing rate. Fermi ran calculations on his slide rule before announcing, "The reaction is self-sustaining. The curve is exponential." The rods were replaced at 3:53 p.m. to end the reaction. Quiet applause rippled through the audience.

The experiment succeeded: CP-1 became the first reactor to go critical, or maintain a controlled, self-sustaining nuclear reaction, producing half a watt of power. This "birth of the atomic age" formed the basis for decades of technological innovation that would change the course of human history.

CP-1 has a complicated legacy. The experiment was a cornerstone of the Manhattan Project, the Allied effort to develop nuclear weapons during World War II. The Germans "were advancing everywhere, they were conquering everywhere, and they were working on an atomic bomb," said **Roger Hildebrand**, the Samuel K. Allison Distinguished Service Professor Emeritus in Physics, in a 2012 interview. "The consequence of losing a nuclear race was the preoccupation of everyone who knew that a nuclear bomb might be possible."

Less than three years after CP-1 went critical, the United States dropped atomic bombs on the Japanese cities of Hiroshima and Nagasaki, killing at least 129,000 people—mostly civilians. The war, which had already claimed 50 million lives, was over within a month.

The development and use of nuclear weapons, as well as the potential for both beneficial and destructive technologies based on CP-1's success, were not taken lightly. In June 1945, two months before Hiroshima and Nagasaki, a group of Manhattan Project scientists, led by UChicago physical chemistry professor and Nobelist James Franck, released *The Franck Report*, warning of an impending nuclear armaments race and unsuccessfully advocating for a demonstration of power by dropping an atomic bomb on an uninhabited area.

The same month the war ended, September 1945, another group of Manhattan Project scientists and UChicago professors, who "could not remain aloof to the consequences of their work," established the Bulletin of the Atomic Scientists. Its early years, according to the Bulletin's mission statement, chronicled the "dawn of the nuclear age and the birth of the scientists' movement, as told by the men and women who built the atomic bomb and then lobbied with both technical and humanist arguments for its abolition."

Still active today, the Bulletin informs science leaders, policy makers, and the public about nuclear weapons and disarmament, the changing energy landscape, climate change, and emerging technologies. The Bulletin of Atomic Scientists is the organization behind the annually reevaluated Doomsday Clock, set in 2017 at 2.5 minutes to midnight—the apocalypse. The clock symbolizes the world's vulnerability to nuclear technologies, measured by the scientists who develop them.

To mark the 75th anniversary of Chicago Pile-1 and to address its far-reaching influence, UChicago will hold lectures, seminars, workshops, multimedia presentations, music performances, and exhibitions throughout the fall quarter. The series of public events, titled Nuclear Reactions—1942: A Historic Breakthrough, an Uncertain Future, began in September and will culminate in a two-day program on campus December 1 and 2. Visit mag.uchicago.edu/cp1-events.

—Ingrid Gonçalves, AB'08, and Maureen Searcy

knowledge

Uncharted

From dark matter to gravitational waves to a balloon-born telescope, scientists discuss how they handle setbacks.

BY MAUREEN SEARCY AND SEAN CARR, AB'90

ILLUSTRATION BY ANTHONY FREDA

Scientific progress follows a winding path, filled with detours and wrong turns—a natural result of exploring the unknown. Science makes headway by challenging itself, identifying mistakes, self-correcting, and persevering. That's how alchemy becomes chemistry, astrology becomes astronomy, and belief in the four humors leads to medicine.

UChicago scientists have seen their share of scientific wandering. One describes searching for something that no one is sure even exists, and how not finding it is in fact a discovery. Another explains how skepticism—of historical discoveries as well as his own team's data—leads to more reliable methods, sensitive instruments, and credible results. And one story is a study in resilience in the face of repeated misfortune, and in how catastrophe can give rise to creativity and improvisation.

Science is not a "lockstep march toward progress," says **Edward "Rocky" Kolb**, dean of the Physical Sciences Division. He compares the process to Brownian motion, with ideas bouncing around erratically but with a general direction toward deeper understanding and more correct results. "How do we know what the right direction is? We bump into a wall and say, 'Oops, that's the wrong way.'"

HIGH HOPES

ANGELA OLINTO IMPROVISES WHEN HER EXPERIMENT CRASHES.

On April 25, astrophysicist **Angela Olinto** let go of her balloon.

Launched from Wanaka, New Zealand, it rose more than 20 miles into the sky—a stadium-sized super pressure helium balloon, carrying a one-ton UV telescope and Olinto's hopes to discover the secrets of ultra-high-energy cosmic rays. "I find the most energetic particles exciting," says Olinto, the Albert A. Michelson Distinguished Service Professor of Astronomy and Astrophysics, "because they challenge our theories on how they became so energized."

The extremely rare charged particles strike Earth at a rate of one particle per square kilometer per century. When they collide with the atmosphere, they produce a cascade of secondary particles, including neutrinos. If astrophysicists can observe those particle showers, they can look backward and search for their origin.

The balloon's payload, an instrument called the Extreme Universe Space Observatory (EUSO), was designed to measure the UV light produced when nitrogen molecules in the atmosphere are energized by the cascade and then return to ground state. The balloon was scheduled to carry the fluorescence detector for 100 days, testing the equipment but "mostly collecting data," says Olinto.

Three days into the flight, the balloon sprang a leak. By day 12, it was at the bottom of the South Pacific Ocean. NASA planned for this possibility and sank the balloon, using a remote termination command to prevent a dangerous descent. NASA's 30-year-old balloon program had conducted an environmental analysis of an open-ocean landing and designed the payload to act as an anchor, pulling the entire balloon quickly to the ocean floor to protect marine life.

Olinto had no say over if or when the balloon should come down. "We are responsible for the payload," she says. "The balloon and the flight—that's all under NASA's control." Despite her disappointment, Olinto stays positive. "This was not my worst nightmare. That would have been completing the 100-day flight and finding our equipment doesn't work well."

The 13-country EUSO collaboration was able to collect some data, in part because after the leak the researchers changed their strategy to optimize what time they had left. "We had to improvise," says Olinto.

Normally they would collect data on moonless nights, when the particle shower lights are best observed, and download data when the moon is bright. When the leak was confirmed, they downloaded no matter the moon's state. Luckily their launch window opened during the new moon, and they collected about 60 gigabytes of data.

The balloon's leak is one of many setbacks the EUSO project has faced. A version of EUSO was originally designed for the International Space Station (ISS) in the early 2000s, but after the 2003 Space Shuttle *Columbia* disaster, NASA halted space shuttle missions for more than two years pending the investigation. The shuttle program was then phased out in 2011.

In 2012, when the detector was reconfigured for the Japanese Experiment Module of the ISS and became JEM-EUSO, Olinto was invited to lead the US branch of the 13-country collaboration. But several factors, compounded by the 2011 Fukushima meltdown, made the future of that project uncertain. So JEM-EUSO was broken into several projects, one of which was EUSO-SPB, aboard the super pressure balloon, whose launch was then delayed a month by weather concerns.

"I have been in many situations where it looked like the whole effort was about to dissolve into dust," says Olinto. Yet she finds those situations filled with creative energy, which she funnels into formulating new approaches. "The goals in research are flexible," she says, "so the alternate path and the final destination are redefined when challenges are overwhelming."

Olinto's new plan is to build another telescope and add a neutrino detector. The project's second generation, EUSO-SPB2, received a NASA award in September. "No one has seen ultra-high-energy neutrinos before," she says. The second flight will allow EUSO to collect more data and test the neutrino instrument's capabilities. "It will be easier to predict and prepare for what can go wrong, learning from the first flight, where lots of things went wrong."

HOW DO WE KNOW WHAT THE RIGHT DIRECTION IS? WE BUMP INTO A WALL AND SAY, 'OOPS, THAT'S THE WRONG WAY.

SECOND TIME'S THE CHARM. AND THE FOURTH. AND THE FIFTH.

DANIEL HOLZ, SM'94, PHD'98, EXPLAINS FAKE GRAVITATIONAL WAVES.

On Monday, September 14, 2015, at 4:51 a.m. CDT, the twin Laser Interferometer Gravitational-wave Observatory (LIGO) detectors—in Hanford, Washington, and Livingston, Louisiana—picked up the signal of gravitational waves.

Produced by the collision and merging of two massive black holes, it was the first observation of the ripples in space-time that Albert Einstein had predicted a century earlier.

Five months after the detection—once scientists, including UChicago associate professor of physics **Daniel Holz**, SM'94, PhD'98, had checked, rechecked, and triple-checked the data—they announced their results to the world.

This wasn't the first time LIGO had been through this drill; it was just the first time that it turned out *not to be a drill*.

Five years earlier, before Holz joined the collaboration, a less sensitive previous incarnation of LIGO had picked up what appeared to be gravitational waves. The collaboration had gone through all the usual steps with the detected event: "It was studied, taken apart, everything, hundreds and hundreds of people involved" over several months, says Holz. A paper was drafted; the decision was made to submit it for publication. "We're talking about people arguing about the title of the paper," Holz says—it was that close to done.

There was just one problem: there had been no event.

The initial signal had been a "blind injection," a test designed by a sworn-to-secrecy team within LIGO to see if the equipment—and most important, the scientists interpreting the data—could distinguish between a false positive and an actual event.

"The answer," Holz says, "was, 'No, this isn't real. We're not publishing this. We haven't just detected gravitational waves, and no one's getting a Nobel Prize.'" (Flash-forward to October 2017: LIGO leaders Barry Barish, Kip Thorne, and Rainer Weiss get the nod from Stockholm.)

It might seem like "a complete waste of time," Holz says of the negated months of work, but it's "actually useful. It makes you go through the whole process" and ask, what went wrong, what *did* they get right, and how could everything be improved? It keeps the scientists on their toes.

Such tests are standard in the field of gravitational waves research, and an understandable precaution when you're working to confirm a key part of the general theory of relativity. The abundance of caution is part of the legacy of the first scientist to claim to have detected gravitational waves, Joe Weber of the University of Maryland—the "father of the field," Holz says, and "an absolutely brilliant experimenter." In 1969 Weber published a paper in *Physical Review Letters* that described what he had detected.

But the signal he had found was "at least five orders of magnitude too loud," Holz explains. Others "could not think of any way from the theory side that there really could be waves that were that loud." No one else was able to reproduce Weber's results. Nonetheless, he remained convinced and continued to make more "detections" throughout his life.

Weber's example "set a particular tone" to the gravitational waves search, and so the goal for LIGO was "to have our detection, especially our first detection, be so clear, so impressive, that no one could possibly doubt what we've done."

After the false alarm of the blind injection, which came during the era of "initial" LIGO, improvements in the detectors made them far more sensitive. By September 2015 "advanced" LIGO was ready—or almost. In fact, at that point the new equipment was not officially online. "We were still fiddling with the machine," Holz says. "We were going to turn it on very soon."

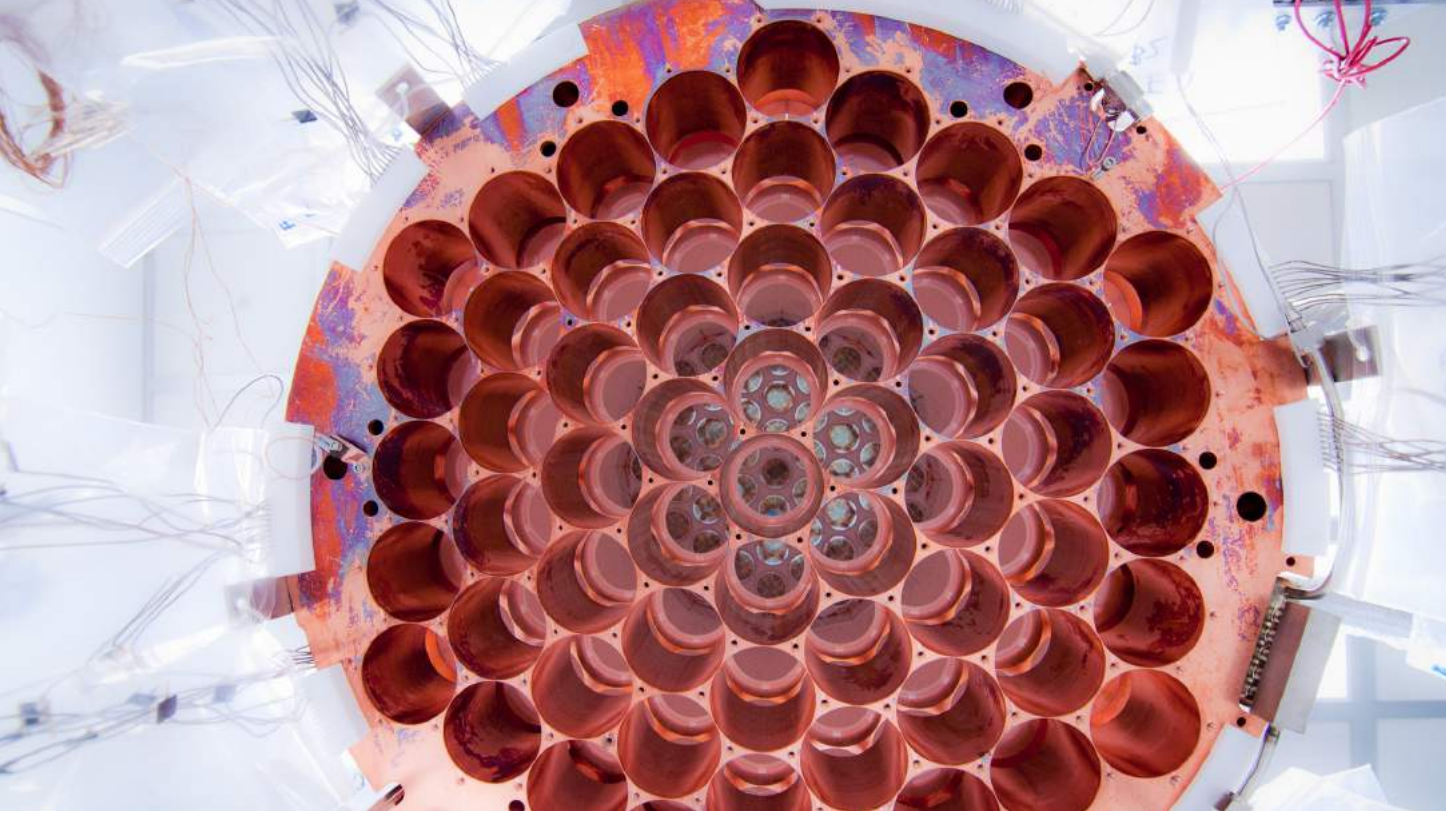
So when the detection came through, everyone assumed it had to be an injection. That's when they received word from the top: the blind injection system was not yet up and running. And if such a "perfect event" wasn't an injection, it could be only one thing.

"We still ripped it apart," says Holz. Without the blind injection system up and running, it was even more important to make sure they weren't fooling themselves. "It was five months of a thousand people doing their very best to figure out how this might not be real." But it was real. "We couldn't make the event go away."

More gravitational waves have followed—confirmed detections in December 2015 and January 2017. Conservatism, however, still rules: an October 2015 detection is classified only as a "candidate" gravitational wave because it wasn't loud enough for the collaboration to be confident.

To this day, however, LIGO has yet to switch on its blind injection system. "Because we've seen real events, we know it's working," Holz says. So the last thing they need is fake signals to analyze. "At this point it's becoming difficult to keep up with the real events that keep showing up."

IT MAKES YOU GO THROUGH THE WHOLE PROCESS AND ASK, WHAT WENT WRONG, WHAT DID THEY GET RIGHT, AND HOW COULD EVERYTHING BE IMPROVED?



At Sanford Underground Research Facility, a mile beneath the Black Hills of South Dakota in a former gold mine, the Large Underground Xenon dark matter detector continues to search for WIMPs.

PHOTOGRAPHY BY C. H. FAHAM

PROCESS OF ELIMINATION

ROCKY KOLB SEARCHES FOR THE MYSTERIOUS PARTICLE.

Astrophysicists theorize that about 85 percent of the universe's mass is dark matter, which can be detected only through its gravitational effects. Galaxies and galaxy clusters spin so quickly that they should have torn themselves apart based on their observable matter. Something is holding them together, but no one knows what.

Scientists know much about what dark matter is not: It is not the visible stuff of stars and planets. It is not dark clouds of baryonic (ordinary atomic) matter, which can be observed absorbing radiation passing through them. And it's not antimatter, which would produce gamma rays when it annihilates with matter. So what is it?

One hypothetical candidate is WIMPs—weakly interacting massive particles that don't interact much with ordinary matter, proposed more than 30 years ago. As a graduate student at the University of Texas, Austin, in the 1970s, Rocky Kolb, now the Arthur Holly Compton Distinguished Service Professor of Astronomy and Astrophysics at UChicago, helped lay the foundations for WIMPs by exploring the limits to weak interaction.

WIMPs may be part of the concept of supersymmetry, which fills gaps in astrophysicists' understanding of known particles and forces. The idea says that each fundamental particle has an as-yet-undiscovered superpartner. When scientists use the properties of the lightest supersymmetric particles—WIMPs—and calculate how many would still exist after the big bang, that number matches the amount of dark matter seen (or inferred) today.

But so far no detectors or colliders have been able to shed light on WIMPs. So does Kolb still think they're the answer? "I think we'll be surprised, that the answer will come out of left field," he says.

What's advantageous about the WIMP hypothesis says Kolb, is that it's falsifiable. British philosopher Karl Popper's concept of falsifiability states that theories are scientific only if it is possible, in principle, to prove them false, and that empirical science is never confirmed, only incrementally corroborated through absence of disconfirming evidence.

Another dark matter candidate—ordinary matter in the form of black holes, neutron stars, or brown dwarfs called MAssive Compact Halo Objects, or MACHOs—was falsified in 2004 through the discovery of a galaxy cluster that doesn't behave in accordance with the hypothesis.

"Maybe we're on the verge of falsifying WIMPs," says Kolb, which would be a form of discovery.

He cites the famous failed experiment of Albert Michelson, founder of UChicago's physics department, and Edward Morley to establish the existence of "ether," the medium they believed filled space and was required to transmit light. In the process of failing, they established the speed of light as a fundamental constant, and their work eventually led to the theory of relativity.

So discovering that WIMPs aren't the explanation for dark matter would point astrophysicists in other directions. But scientists "should completely exhaust the possibilities," Kolb says, before making that call. ◆

profile

A wider scope

Nancy Grace Roman, PhD'49, didn't get tenure. She changed the course of astronomy instead.

BY MAUREEN SEARCY

"I have no soft spot for the University of Chicago," says **Nancy Grace Roman**, *PhD'49. While her graduate work was educationally and scientifically fruitful, her faculty years afterward were marred by discrimination. The unfair treatment she received as a woman academic is a key element in Roman's story, one that led her to a fledgling six-month-old NASA as its first chief of astronomy, where she arguably changed the face of space exploration.*

"How did you get interested in astronomy?" ask countless interviewers, curious why she gravitated to a field women were actively discouraged from pursuing when she was growing up in the 1930s and '40s. Roman, age 92, responds that she has no idea. Born in Nashville, Tennessee, her family moved frequently. One early memory was of living in Nevada and organizing an astronomy club between fifth and sixth grades for her friends to study constellations in Reno's pitch-black night skies, implying a previously sparked interest.

When Roman was a girl, her mother, Georgia, took her to see the Northern Lights and constellations. Later, when they lived together before Georgia's death in 1992, Roman wondered aloud whether those outings inspired her enthusiasm for space. "My mother was sort of shocked, because she had no science interest at all," says Roman during an interview at her home in Chevy Chase, Maryland, in March. Georgia had been a music teacher. And—as she reminded Roman during that talk—had also shown her trees and flowers and birds. "Those didn't stick," says Roman.

She credits her geophysicist father, Irwin, with early exposure to science at home. "He taught me mental arithmetic by playing games with me," she says. He also introduced her to scientific concepts and skills such as woodworking and household mechanics. "He said that I could not leave for college without knowing how to rewire a lamp."

During the Great Depression, Irwin worked where he could—for an oil company, a university, and eventually the civil service—requiring the family to move frequently. By seventh grade Roman had relocated to Baltimore. After reading every astronomy book in the Baltimore library, she made up her mind to become an astronomer, knowing it would take another 12 years of school. She figured if she couldn't "cut it," she could teach math or physics.

Roman attended Swarthmore for three reasons: it had

PHOTO COURTESY NASA

Nancy Grace Roman holds a model of the Orbiting Solar Observatory in 1962.

a good astronomy department, it was close to Baltimore, and it was coed. Goucher College was a women's school at the time, and Johns Hopkins admitted women only to their night classes. (Although she wanted a change, Roman's attendance at an all-female high school may have contributed to her later success. "Studies show that a statistically significant number of female leaders, regardless of arena, often come from women's schools," says physics department chair **Young-Kee Kim**, "because they can exercise their leadership skills." See "Strength in Numbers," page 66.)

Many coed universities from the late 1800s through about 1960 had a dean of women, an administrator in charge of female student affairs, who oversaw women students' lives, from their academic choices to their social behavior. (Two universities are commonly cited as the first to employ deans of women—Swarthmore and the University of Chicago.)

According to Roman, Swarthmore's dean of women during her undergraduate years encouraged women to pursue what she deemed female-appropriate fields. "If you insisted on majoring in science or engineering, she wouldn't have anything more to do with you," says Roman. "So she sent me to [the head of the astronomy department] Peter van de Kamp."

He too was less than encouraging, though Roman doesn't know if the treatment was gender based, as few men were starting college during World War II. Van de Kamp, who studied astrometry—the precise measurement of positions, motions, and magnitudes of stars—told Roman that he was using material collected by his predecessors 50 years ago and collecting material to be used by his successors 50 years in the future. "He was trying to discourage me, trying to tell me this is a slow study, that you're not going to see the results," she says. But Roman didn't realize his intent until many years later, and so she persevered.

Joining the University of Chicago and Yerkes Observatory in 1946 for her doctorate, Roman finally felt accepted and a part of the student body—treated like everybody else. She told a NASA historian in 2000 that there were always at least two women students, one of whom arrived almost the same day she did and with whom she remained great friends.

She had difficulties with her thesis adviser, who would go six months without speaking to her, but it wasn't because she was a woman, says Roman. "He was just moody." She found adviser-level support from visiting professors, who helped her research continue forward.

Roman's thesis project centered on the Ursa Major cluster—the central part of the Big Dipper, itself part of Ursa Major, the great bear. Star clusters are formed in relatively compact areas of dense gas and dust clouds, and as clusters age, the stars have different velocities, Roman explains. "They tend to expand. Like water evaporates into air, stars evaporate into space." So stars born of the same cluster can be found all over the sky. Her project involved looking for stars that were born with the stars in the Big Dipper, using information in existing catalogs.

IT WAS THE BEGINNING OF AN ERA OF UNDERSTANDING THE STRUCTURE OF THE MILKY WAY.

"I could tell how stars were moving now and could reverse that motion, taking them back to the Dipper at about the right time," says Roman. She found more than 200 stars that had been born in the Ursa Major cluster.

After earning her doctorate, Roman stayed on as a postdoc, instructor, and then assistant professor—the first woman on UChicago's astronomy faculty. She taught formally and informally while conducting research. During this period she studied differences in stars bright enough to see with the naked eye. She discovered that the compositions varied and that the variance correlated with differences in the stars' velocities, directions, and, to some extent, location in the galaxy. Roman is especially proud of that work because it was the beginning of an era of understanding the structure of the Milky Way.

The problem, she says, was that she was making such a low salary that her parents had to help her financially. When she left UChicago and joined the government, she was hired as a freshly graduated PhD despite having six years of experience and an international reputation. "My salary was so low," she says, "that they didn't recognize it as professional experience."

Roman estimates she was making no more than 60 percent of what her male colleagues earned, based on salaries offered for comparable positions at peer institutions, invariably filled by men. The only woman faculty member in the Department of Astronomy and Astrophysics at that time, Roman had no other women's salaries to compare with her own.

When she brought her concerns to the department chair, Subrahmanyan Chandrasekhar, the Indian-born astrophysicist who went on to win a Nobel Prize, he told her, "We don't discriminate against women. We can just get them for less."

IT WAS LIKE LEARNING TO SWIM BY JUMPING INTO DEEP WATER.

"I would have thought he'd understand discrimination," says Roman.

Peter Vandervoort, AB'54, SB'55, SM'56, PhD'60, astronomy and astrophysics professor emeritus, de facto departmental historian, and Chandrasekhar mentee, confirms that Chandra, as many called him, did in fact experience his fair share of discrimination.

After joining the Department of Astronomy and Astrophysics and Yerkes Observatory (where the department resided) in 1937, Chandra was invited by University physicists to give a colloquium on campus. Physics department chair Henry Gale refused. "He did not want this black scientist from India to lecture in his department," wrote Chandra's wife, Lalitha, after his death. University president Robert Maynard Hutchins drafted a one-sentence response: "Mr. Chandrasekhar shall give his lectures."

"Hutchins said his appointment was a move toward diversity," says Vandervoort. Yet gender diversity, when Roman arrived more than a decade later, was still lacking.

In addition to the salary discrepancy, Roman felt certain that she would never earn tenure at the University of Chicago. She knew of no women in the Physical Sciences Division with tenure. She was aware of Maria Goeppert-Mayer's work in the physics department, who had been subject to the University's antinepotism rule, common among universities at the time, which precluded family members from working in the same department. These rules often led to discrimination against married professional women, as the husband's appointment was nearly always given priority. Goeppert-Mayer's husband had a tenured appointment, so the University found creative ways to offer her other types of resources and standing. She conducted her Nobel Prize–winning research at UChicago—as a volunteer.

Much has changed at the University since then. In 2015 an outside consultant was hired to analyze gender pay inequality for faculty, says dean of the Physical Sciences Division **Edward "Rocky" Kolb**. He notes that in the analysis, "comparisons were difficult, but I was pleased that there was no disparity" in the PSD, which now employs 13 percent tenured or tenure-track women faculty—a number he thinks is still far too low. "I can't solve society's problems because society won't listen to me," jokes Kolb. "But one thing I can do is work as hard as I can to increase representation of women on the tenure-track faculty."

Vandervoort, who met Roman at Yerkes when he was an undergraduate, can't say whether she would have eventually received tenure. But he's certain she should have, citing an "impressive list of publications" and the respect she earned in the international astronomy community. One of Roman's publications from 1950 is a key paper "in building up the standard model of the dynamical and chemical evolution of the Milky Way," says Vandervoort.

Her work, then and now, has been recognized as groundbreaking—the beginning of what surely would have been an influential career in academia. But while she made pivotal discoveries at UChicago, Vandervoort says that she strikes him as not the type to wait around. She is, he says, "a person who can recognize opportunities."

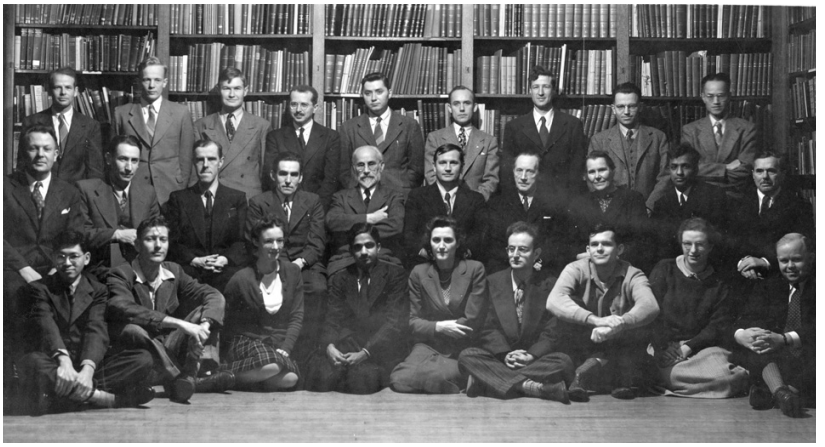
Sure enough, when an astronomer in the department—Gerard Kuiper, for whom the Kuiper belt is named—told Roman about a position at the Naval Research Laboratory (NRL) in Washington, DC, she took it. "I believed that Kuiper's suggestion was also confirmation that a tenure position at Yerkes was unlikely," says Roman. The move meant changing her specialization from optical astronomy to radio astronomy, which at the time was a new field for the United States and has since blossomed into a major area of study.

Radio telescopy, just like optical, measures electromagnetic radiation but focusing on different parts of the light spectrum. Radio waves are much longer than visible light waves and can travel through many obstacles that block our vision. So radio telescopes allow astronomers to observe stars in the middle of dense clouds of gas and dust where they're forming, providing more information about star births than light-based telescopes can.

Because the field was new and NRL's group of engineers was small, Roman was expected to build her own equipment. "Radio astronomers today are shocked at that," she says, "because no one builds their own now." In addition to gaining experience working in different wavelengths, she also gained an engineer's eye, with an understanding of instrumentation.

Much of NASA's science originated at NRL, so Roman benefited from being in the right place at the right time. It was a quick and logical jump to NASA to set up and lead its astronomy program.

"It was like learning to swim by jumping into deep water," Roman says of her switch to management. In a 1980 interview with the American Institute of Physics, she describes taking a couple of courses for women in management, which she found less than helpful. "The speakers were people who were used to talking to men in management and, as far as I



Roman (bottom row, second from right) sits with fellow PhD students, UChicago astronomy and astrophysics faculty members, and visiting Soviet astronomers at Yerkes Observatory in 1946.

UCHICAGO PHOTOGRAPHIC ARCHIVE, APF6-00495, UNIVERSITY OF CHICAGO LIBRARY

could tell, gave us essentially the same things, except they sort of 'feminized' it without understanding the real problems that women in management face," she said. "They tried to add things like 'dress design.'"

Nevertheless, she has no regrets about trading research for management. She encountered opposition at times, but it didn't seem to be based on her gender. Rather, she believes academics were wary of her federal affiliation, citing a mistrust of government entities.

Roman, widely regarded as the "mother of Hubble," finds the moniker "slightly embarrassing," but it grew from good intentions. Physicist and astronomer Lyman Spitzer Jr. is considered the "father of Hubble," but Roman—chief of astronomy and NASA's first woman to hold an executive position—was equally responsible for bringing the Hubble Space Telescope to fruition. At a meeting shortly after its April 1990 launch, Edward J. Weiler, a former student of Spitzer's and Hubble chief scientist at the time, bestowed the name on Roman.

Hubble, the world's first large space-based optical telescope, is named after Edwin P. Hubble, SB 1910, PhD 1917. At launch it carried five instruments, including cameras, spectrographs, and fine guidance sensors, and it has been visited five times for repairs and new instrument installations. (Five-time space shuttle astronaut **John Grunsfeld**, SM'84, PhD'88, conducted three of these repairs.)

Hubble has beamed back to Earth hundreds of thousands of images, though the earliest ones were blurry. The telescope's primary mirror had a flaw: the outer edge was ground down too flat by about 1/50 the thickness of a human hair. During the first repair mission in December 1993, NASA installed the Corrective Optics Space Telescope Axial Replacement (COSTAR). In other words, they fitted Hubble with eyeglasses.

Since then, Hubble has helped determine the age of the universe, the identity of quasars, and the existence of dark energy. It remains one of NASA's most successful and enduring missions.

The telescope wasn't her idea, insists Roman. It was an idea shared by almost all astronomers, "certainly all observational astronomers." She did, however, advocate for the project, writing congressional testimony and selling the government on the notion that the $1.5 billion price tag (not including ongoing operating costs) was a worthwhile expenditure.

Roman also gathered a group of astronomers from various specialties across the country and sat them down with NASA engineers to determine what was wanted versus what was feasible. At that time, all observatories were ground based. A telescope put into orbit would have a major advantage, because even the most powerful Earth-bound telescopes capture blurry and distorted images since starlight refracts through Earth's atmosphere.

The astronomers decided a three-meter telescope would be ideal, but convincing Congress would be a challenge, so they reduced the scope and decreased mirror size to 2.4 meters. One main goal for the Hubble Telescope was to determine the "Hubble constant," Roman explained in a NASA oral history, measuring the ratio between the velocity of a galaxy's recession and its distance to determine the universe's expansion rate—and, in turn, the age of the universe.

This measurement must come from far-off galaxies because nearby galaxies all belong to the same gravitationally interacting group. The closest group that could be used was the Virgo cluster, and a mirror any smaller than 2.4 meters wouldn't be powerful enough. (The constant was published in 2001 by a team led by **Wendy Freedman**, now the John and Marion Sullivan University Professor of Astronomy and Astrophysics at UChicago, when she was at Carnegie Observatories—the first woman on its permanent staff and later the director.)

Starting in the late 1960s through the early '80s, the team designed the space telescope, sold the concept to Congress for funding, built the equipment, and readied for launch. The *Challenger* shuttle disaster waylaid the mission, but finally the Hubble Space Telescope launched aboard *Discovery* in 1990—44 years after its earliest conception by Spitzer in 1946.

Roman thought Hubble would be phased out with the 2018 deployment of its successor, the James Webb Space Telescope, whose major missions will be to study extrasolar planets and to learn more about the beginnings of the observable universe. But earlier this year, she heard that Hubble may operate for many years to come. She planned to discuss its future with administrators at Goddard Flight Center.

Retiring in 1979, she's not really in the know at NASA anymore. "I made a distinct effort not to get involved with head-

quarters," says Roman, "because I didn't think it was fair to my successor to meddle." (She handpicked Weiler as her successor, who called himself, in *NASA at 50: Interviews with NASA's Senior Leadership*, NASA's first male chief of astronomy.)

While Roman is proud of the work she did to get Hubble off the ground, so to speak, it's another space telescope that she has a real affection for, "one that nobody's ever heard of," she says: the International Ultraviolet Explorer. The 18-inch telescope took UV spectra, which was unusual when it launched in 1978.

"There was opposition to it from the X-ray astronomy community, who felt it was usurping money from their projects." The UV community wasn't as politically powerful as the X-ray astronomers, and Roman went to bat for it.

The IUE was open to anyone who wanted to use it and was always available because of its synchronous orbit, meaning its orbit was equal to one Earth day. "Hubble also took UV spectra, but it was in high demand for faint sources and particularly for imaging," says Roman. With its UV exclusivity, the IUE was used by half the observational astronomers in the world, Roman was told. It was shut down after 18 years because of cost, far surpassing its three-year life expectancy.

She believes that, unlike Hubble, the IUE truly would not have existed without her, but "mother of the International Ultraviolet Explorer" doesn't have the same ring to it.

STRENGTH IN NUMBERS

Physics offers an example of how the division can support women in science.

The challenges women scientists faced in **Nancy Grace Roman**'s (PhD'49) time arose in part from being the first or only woman in their sphere. Today low representation is still an obstacle for women scientists.

Studies suggest "there's a tipping point where women feel their voices are heard," says Physical Sciences Division dean **Edward "Rocky" Kolb**. When a board, faculty, or classroom reaches between 20 to 30 percent female, women cease being tokens and become community members. The division isn't there yet, he says, but "we need to get there as soon as possible, first by hiring tenure-track women."

To increase gender parity, the PSD develops and implements strategies to increase representation and advancement of women at all levels across the division. This effort includes strengthening a culture that honors diversity, developing targeted mentoring, and expanding opportunities for women to participate in division governance.

Many professors, both men and women, work to incorporate these ideals into their own departments and research groups. **Young-Kee Kim**, the Louis Block Distinguished Service Professor and physics department chair, is particularly active in this pursuit, tackling sexism at both personal and institutional levels.

In May 2017 Kim organized the dedication of a lecture room and an accompanying exhibit for Nobelist Maria Goeppert-Mayer, who conducted research as a volunteer at UChicago from 1946 to 1959—antinepotism rules precluded her from earning a salary where her husband was employed. (Universities started phasing out such rules in the 1960s, when the

PHOTOGRAPHY BY JEAN LACHAT

When MIT News deputy editor Maia Weinstock designed a Women of NASA Lego set, she included a minifigure of astronomer Nancy Grace Roman. "She typifies the type of person who has been underappreciated for her life's work," says Weinstock, "and surely deserves to be celebrated."

PHOTOGRAPHY BY MAIA WEINSTOCK

After Roman retired early from NASA, she wasn't quite ready to stop working, she explains in a 2013 autobiographical essay. She needed to learn modern computers and digital detectors if she was to return to research, so she audited a community college course in the programming language FORTRAN. But by the end of the class, she decided that after 20 years in management, she couldn't return to research, so she pursued consultant work with government contractors. Eventually, needing a new challenge, she joined Goddard's Astronomical Data Center in 1981—revisiting her early astronomy catalog experience—and in 1995 became the center's director.

In 1997 she retired again, and again she continued to work. This time it was service and volunteer oriented, such as joining Reading for the Blind and Dyslexic (now called Learning Ally) and Journey to the Universe, a program that sent scientists and engineers to schools in underserved areas of the United States. Many of her activities involved working with schoolchildren. Roman also gives public talks in senior centers, universities, and churches. In 2016 she gave 13 talks on topics such as the big bang, space discoveries, and the night sky.

She hopes to be a good role model. "I like to talk to children about the advantages of going into science and particularly to tell the girls, by showing them my life, that they can be scientists and succeed," she says. She gets emails from girls who, after learning about Roman's life and work, have decided to go into science.

To women already in STEM (science, technology, engineering, and math) who are still experiencing sexism, she says: "Persevere. Things are better than they used to be. Women now can and do get professorships; women are heads of observatories and departments." But the number of women in senior academic positions is not commensurate with the number of women in the field, she says, and advises they prepare for inevitable problems.

When the 25th anniversary of Hubble rolled around in 2015, astronomers and astrophiles alike celebrated, and Twitter paid tribute to Nancy Grace Roman (who started using her middle name again not too long ago, returning to her Southern-born traditions).

One user wrote: "Nancy Roman took chief astronomer job at NASA because *women couldn't get tenure*, opted to reshape history of astronomy instead #planB."

Roman doesn't have a Twitter account, but hearing it aloud and reflecting on her career, she chuckles. "Appears so." ◆

American Association of University Women protested their unfairness.)

The dedication accomplishes two goals: honoring Goeppert-Mayer for her groundbreaking work in nuclear shell structure and counteracting the social conditioning to imagine all scientists as men. "Students see that picture a thousand times," says Kim. Perhaps they will internalize that women have had vital roles throughout scientific history. Kim wants students to learn that science can be done by anyone, irrespective of gender, race, or ethnicity.

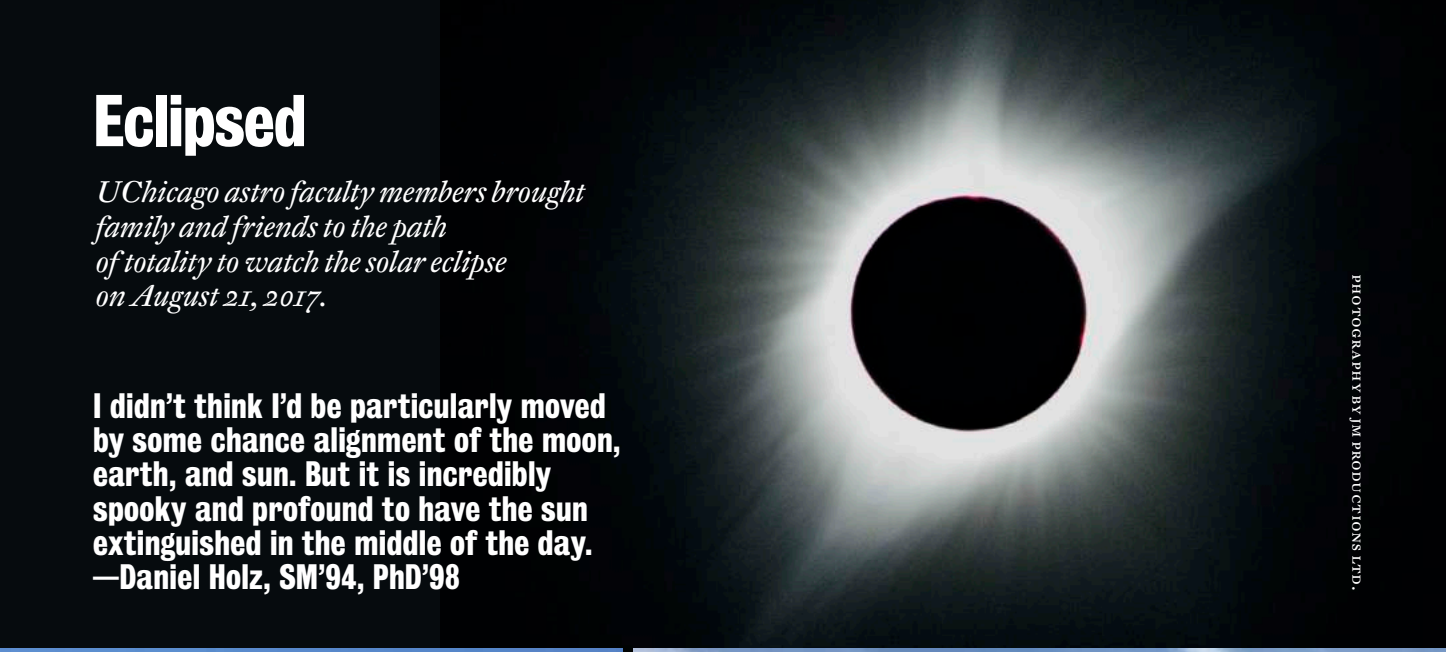
Beyond passive exposure, Kim actively works to recruit and retain women physicists. During admissions, she ensures that unconscious bias is recognized and discussed while ranking prospective students. When women and minority students receive offers, she sets up one-on-one Skype sessions with them. Current women grad students and faculty members play an active role during open houses.

The physics department currently has eight women faculty and 11 female graduate students who joined the program this fall, a growing community that strengthens the support structure for current and prospective female physicists, says Kim.

Fostering that community beyond UChicago, she chaired the 2014 Midwest Conference for Undergraduate Women in Physics, which united more than 200 young scientists from across the country. She has also initiated a regional conference for graduate student and postdoctoral minorities in physics, "creating not only opportunities for empowerment and network building," she says, "but also actively changing the culture of physics today." As Kim puts it, "It's important to have a strong cohort." ◆

Eclipsed

UChicago astro faculty members brought family and friends to the path of totality to watch the solar eclipse on August 21, 2017.



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I didn't think I'd be particularly moved by some chance alignment of the moon, earth, and sun. But it is incredibly spooky and profound to have the sun extinguished in the middle of the day. —Daniel Holz, SM'94, PhD'98

Left: Rocky Kolb and PSD Dean's Council member Rick Black in Wyoming. Right: Daniel Holz and family in Missouri.

To learn more about the Physical Sciences Division's academic and research priorities—and how you can help—contact the associate dean and director of development **Bill Lynerd** at **773.702.3751**, **blynerd@uchicago.edu,** or **William Eckhardt Research Center, 5640 South Ellis Avenue, Suite 319, Chicago, IL 60637**. Email *Inquiry* at: **psd-inquiry@uchicago.edu** Editor: **Maureen Searcy** Editorial Director: **Amy Braverman Puma** Design: **Guido Mendez, Michael Vendiola**

peer review

President Hutchins may have disbanded the football team in 1939, but University of Chicago students still celebrated Homecoming. For the 1940 festivities, Margery Brooks, EX'42; Faith "Punky" Johnson, EX'43; and Marian McCarthy, SB'43, perform in a skit, "Victory Vanities."

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Elizabeth Wallace, the King, and I

BY IVAN P. KANE, AB'78, JD'81

Near the end of his life, the old man was a bundle of contradictions. He had long craved attention, adopting a colorful pen name and striking manner of dress. He still loved to perform in public and hold private court with his many admirers, who affectionately called him "the King." But in later years he was also intensely lonely and subject to dark spells. His circle of friends was predominantly male, but his household was made up exclusively of women. His oldest daughter and wife had already passed away, and he was soon to lose his remaining daughters, one to a tragic accident and the other to marriage.

In light of this, it was not surprising that the old man would seek out a friendship with a younger woman who was his peer in intellectual accomplishments and who possessed great sympathy and discretion. She said of him: "I never knew him to say a clever thing at the sacrifice of a kind thing, nor a witty thing divorced from truth. I don't mean mere vulgar facts, but truth, truth about human nature—he was always true to that."

University of Chicago professor Elizabeth Wallace (1865–1960) met Mark Twain in 1908 while vacationing in Bermuda. Betsy (as Twain called her) and the King became fast friends. They were intellectual soul mates—not lovers. Twain regularly invited Betsy to join his party at meals and on walks and carriage rides about the island. He summoned her to join the after-dinner card games in his room. He read to her his favorite Kipling poems and from his unpublished writings.

The relationship continued until Twain's death two years later, with regular correspondence, exchanges of favorite books, and a Thanksgiving visit to Twain's home.

I am a 1978 graduate of the College, where I majored in English. I wish I could say that I discovered Elizabeth Wallace during my studies at the University, but I learned of her decades later. However, the seeds of this discovery were planted during my undergraduate studies. I had a wonderful exposure to Twain with James E. Miller Jr., AM'47, PhD'49, and Robert Streeter, well-known American literature scholars. (In one class I wrote a paper titled "The Unity and Coherence of *Huckleberry Finn*." The title was a poke at the Chicago school Aristotelians and New Critics, but I was convinced that I had discovered a textual organizing principle that explained Twain's intentions for the structure of *Huckleberry Finn*, which most critics believe falls apart with its burlesque ending.)

I never knew him to say a clever thing at the sacrifice of a kind thing, nor a witty thing divorced from truth.

My undergraduate experience triggered a lifelong passion for all things Mark Twain. I became a Twain-iac! I collect Twain books, ephemera, and whatever else crosses my path, and I read as much scholarship as time permits. Lately scholars have been particularly interested in Twain's last years, which produced *Letters from the Earth* (Harper and Row, 1962) and other reflections on the state of man that were considered too controversial to be published during his lifetime. Recent biographies that focus on this period mention Twain's friendship with Wallace. My reaction was, "Why didn't I know about this before?"

The relationship was not a secret. Just a few years after Twain's death, Wallace published a memoir of their friendship, *Mark Twain and the Happy Island* (McClurg, 1913). I wish I could give the book an unqualified recommendation, but it shows signs of the influence of Twain's late-life travel companion and literary executor, Albert Bigelow Paine, who closely guarded Twain's reputation. He suppressed the darker writings and insisted that acquaintances portray Twain in a sunny light. Paine requested many changes in Wallace's manuscript and approved the final result. Wallace's deep affection for Twain is evident in her writings, so she also may have wished to burnish his legacy. As a result, *Happy Island* is a popular treatment in a breezy, occasionally sentimental style. It portrays Twain as a fun and caring friend but only hints at weightier matters.

PHOTO COURTESY MINNESOTA HISTORICAL SOCIETY

Twain and Wallace were photographed together in 1909, the year after they met and the year before his death.

Twain's correspondence with Wallace tells a different story. He shares intimacies about his family and personal situation. He rejoices in his daughter Clara's wedding but discloses that her betrothed broke off two prior engagements. He rages against his personal secretary and her fiancé, who he believes are conspiring to defraud him. He shares his sorrow concerning the deaths of his daughter Jean and his dear friend Henry H. Rogers. And he shares details of his declining health, most centering around whether his doctors will or will not allow him to indulge his cigar habit.

The Twain-Wallace relationship gave me a fascinating window on the mind and character of America's greatest writer—and learning more about Elizabeth Wallace gave me equal delight and satisfaction. She was a remarkable woman whose accomplishments were felt on three continents.

Born in 1865 in Bogotá, Colombia, Wallace was a child of Presbyterian missionaries. She was speaking English and Spanish by age four. Among her childhood playmates was the famous South American poet José Asunción Silva. When Wallace was 8 or 9, her mother and her siblings moved to the United States for the children to continue their educations. She eventually graduated from Wellesley College and acquired French, Italian, and German fluency and considerable Latin skills along the way.

Wallace did graduate work under future UChicago president Henry Pratt Judson at the University of Minnesota. When William Rainey Harper called on Judson to recruit him for the not-yet-opened University, Judson summoned Wallace to his home to meet Harper and, after accepting Harper's offer, encouraged her to apply for a UChicago graduate fellowship. She was surprised to learn that John D. Rockefeller's gift establishing the fellowships specifically gave women "equal privileges to men," and even more surprised to be accepted. Wallace joined the 1892 entering class as a fellow in history.

Her choice to study Latin American history puzzled the head of the history department, German scholar Hermann von Holst. He responded (as she described it): "I know notings von tose countries. For me tey do not exist . ... You read and study all you vant about dem, den you come und tell me und I will gif you a degree."

Harper was more enthusiastic, as (said Wallace) "he liked nothing better than to find an unexplored field." He funded an appropriation for Latin American source books and asked Wallace to give a course in Latin American history and institutions so that UChicago "should be the first institution in the country to initiate such studies." It is no exaggeration to say that Wallace invented the field we now call Latin American studies.

Early in her academic career, Wallace secured postgraduate fellowships at l'École des Hautes Etudes in Paris and at the International Institute in Madrid. During her first extended stay in France, in 1896, she formed friendships with that country's best-known writers and thinkers, and kept the company of French intellectuals for the rest of her life. When she visited the country in 1949, at age 84, she told of meeting "vociferous existentialists, both male and female, with disheveled hair, fantastic beards and stockingless feet." The dame of French letters was also a woman of action. In 1946 Wallace was inducted into the French Legion of Honor for her relief work for France in both World Wars.

After her first sojourn in France, Wallace returned to the University of Chicago as a French instructor. Apart from travel for fellowships, she would remain there for the rest of her academic career. She left her mark on the University in many ways, including as a dean in the College, head of one of the first dormitories for women, and a teacher of French and Spanish literature in the Department of Romance Languages, where her class on Molière was especially popular.

Her name stands in the knowledge of alumni with Harper, Judson, Burton, and others of our Hall of Fame.

In 1923 Wallace and two others became the first women to attain the rank of full professor at the University of Chicago. The next year she joined with the other two female professors to write a remarkable letter addressed to the president and trustees. The letter detailed the many ways in which women were then second-class citizens at the University: there were no women on the board of trustees and very few on important faculty committees. Only four women spoke at the first 134 convocations. Women accounted for only 20 percent of graduate fellowships despite comprising 40 percent of the graduate students. Women received instructorships while men of similar achievement were awarded professorships. And women had only restricted privileges at the Quadrangle Club.

The letter called on the University to furnish opportunities to both sexes on equal terms. It was reported that some trustees wanted to fire Wallace and her coauthors, but a special commission found that all of the letter's claims were not only true but understated. In the next announcement of promotions, the ranks of female full professors were doubled.

Upon Wallace's retirement in 1927, Harold H. Swift, PhB 1907, chairman of the trustees, wrote, "her name stands in the knowledge of alumni with Harper, Judson, Burton, and others of our Hall of Fame." The pronouncement was especially generous and gratifying coming from one of the addressees of Wallace's letter on women's issues. Today, though the memory of her has largely faded, she is still present on campus as the name-

No, revelation—of a valuable sort—does not come through sorrow when one is old. Before 70 the whole satire and swindle of life has ben revealed.

sake of Wallace House in the Max Palevsky Residential Commons and as the model for the figure "the City" in the *Masque of Youth* mural on the third floor of Ida Noyes Hall.

After her University of Chicago career ended, Wallace stayed active until her death in 1960—as a scholar, attending academic conferences all over the world, and as the Zelig-like figure she'd long been, crossing paths with a colorful cast of writers and intellectuals. Among those she encountered (both during and after her UChicago career) were Henri Bergson, Marc Chagall, Arthur Conan Doyle, Henry James, Émile Zola, Diego Rivera, Leon Trotsky, and Edith Wharton.

In one episode Wallace joined UChicago hosts and a special guest as a plus-one at the opera. The production was not to the guest's liking, so he and Wallace whiled away the time composing risqué limericks on their programs at the back of the box. Only after the event did she learn her companion was H. G. Wells.

Her closer friends included Stephen Vincent Benét, Archibald MacLeish, Gaston Paris, Ida Tarbell, and Thornton Wilder. She was a trusted adviser to University presidents in both school and personal matters. Harper sought her help to "rescue" a "striking blonde" student from an imprudent affair with an older man, and later Wallace gave Robert Maynard Hutchins advice concerning how the University could help a nation at war. Caltech president (and former UChicago physicist) Robert A. Millikan sought her help with his autobiography. So Mark Twain was just one of many eminences to make her a confidant.

For me the most striking parts of the Twain-Wallace correspondence are certain reflections Twain shared with her in the face of death. These letters show the intimacy of their relationship, as well as Twain's trust in Wallace's discretion. She never revealed the more controversial parts of the letters, either in *Happy Island* or in her autobiography, *The Unending Journey* (University of Minnesota Press, 1952).

In the last six months of his life, Twain's letters to Wallace grew longer. He tells Wallace he is writing *Letters from the Earth*—a blasphemous repudiation of Christianity with frank passages about human sexuality—and wishes he could read it to her, while at the same time admitting that perhaps he had better omit certain passages. "This book will never be published," he tells her—"in fact it couldn't be because it would be felony to soil the mails with it." He adds that "Paine enjoys it, but Paine is going to be damned one of these days I suppose." In fact Paine and, after his death in 1937, Twain's daughter Clara suppressed publication until 1962.

Twain's next lengthy letter came shortly after the death of his daughter Jean. He wrote from Bermuda, where he had fled hoping that the better climate would improve his declining health. He opened with both barrels, echoing the ideas about religion he was writing for *Letters from the Earth*:

No, revelation—of a valuable sort—does not come through sorrow when one is old. Before 70 the whole satire and swindle of life has been revealed—to all except the willfully or constitutionally dull. What a silly invention human life is! And how like a glove its silliest religion fits it! And how perfectly our principal God and His Family harmonise with the outfit! Do I "know more" than I knew before? Oh, hell no! There was nothing to learn (about hereafters and other-such undesirables), there never has been anything to learn and know about these insulting mysteries. I am happy—few are so happy—but I got none of this happiness from "knowing more" of the unknowables than I knew before.

In a reply that is lost to us, Wallace, the daughter of missionaries, tried to comfort Twain by speaking of "worlds still unexplained." The next letter brings Twain's exasperated response: "You 'know there are worlds still unexplained'? Do you? Very well then—you don't. Why do you want to talk like that and wither a person's hopes? Isn't this life enough for you? Do you wish to continue the foolishness somewhere else? Damnation, you depress me!"

Perhaps not wanting to offend his friend with his bitterness, Twain then shifts the tone of the letter to chatty news about acquaintances and the delights of Bermuda. He closes by giving his friend an affirming portrait of his life on the island, where "the joy of it never stales":

There are no newspapers, no telegrams, no mobiles, no trolleys, no trains, no tramps, no railways, no theatres, no noise, no lectures, no riots, no murders, no fires, no burglaries, no politics, no offences of any kind, no follies but church and I don't go there. I think I could live here always and be contented.

You go to heaven if you want to—I'd druther stay here.

As ever affectionately

S. L. C.

Twain died April 21, 1910, not six weeks after his last letter to his "Dear Betsy." Wallace followed him from this world 50 years later, on April 9, 1960, the same year that Twain's daughter Clara finally authorized publication of *Letters from the Earth*. ◆

Ivan P. Kane, AB'78, JD'81, recently retired after 35 years of practicing law. He is recovering and settling into his next life, which includes service on the University of Chicago Humanities Council and as a board member and chair of the Program Committee at the American Writers Museum.

NOTES

ORCHESTRATING CHANGE
Curtis Long, AB'85, who created a program that brought the Alabama Symphony Orchestra (ASO) to venues including a record store, brewery, and art museum, is the new president and CEO of the Rochester Philharmonic Orchestra. Long was selected to head the financially struggling orchestra after leading a turnaround of the ASO, where ticket revenues rose by more than 70 percent in nine years. Long said it's "not enough" for orchestras to focus on traditional audiences in traditional venues: "Orchestras everywhere need to be thinking outside the box."

SPIRITUAL LEADER

Rev. **Teresa Hord Owens**, MDiv'03, became the first woman of color to lead a mainline Protestant denomination when she was elected general minister and president of the Christian Church (Disciples of Christ) in the United States and Canada on July 9. She is the second woman and first African American to head the Indianapolis-based denomination of 600,000. Until her election, Owens was dean of students at the University of Chicago Divinity School and pastor of First Christian Church of Downers Grove, Illinois.

SOCIOLOGY ON THE SMALL SCREEN

AMC will develop **Sudhir Venkatesh**'s (AM'92, PhD'97) 2008 best seller, *Gang Leader for a Day: A Rogue Sociologist Takes to the Streets* (Penguin Books), into a TV series, the network announced in July. The book details Venkatesh's years studying—and at times participating in—gang life on Chicago's South Side as research for his sociology dissertation, "American Project: An Historical-Ethnography of Chicago's Robert Taylor Homes." Executive producers include *Hand of God* creator Ben Watkins and actor and filmmaker Ed Burns, who will also costar.

JUDICIAL NOMINEES

On June 7 President Donald J. Trump nominated two alumni for federal judgeships. **Allison H. Eid**, JD'91, is a Colorado Supreme Court judge, and **Stephen S. Schwartz**, JD'08, is a partner at Schaerr Duncan LLP in Washington, DC. If confirmed, Eid will serve on the US Court of Appeals for the 10th Circuit and Shwartz will serve on the US Court of Federal Claims.

JUDICIAL RETIREMENT

After 37 years on the federal bench, US district judge **Milton Shadur**, SB'43, JD'49, announced plans to step down on September 1. Since his nomination by President Jimmy Carter in 1980, Shadur, now 93, has authored more than 11,000 court opinions. He graduated from UChicago at 18 and received his JD after serving in the Navy during World War II. He presided over a landmark Chicago school desegregation case and a lawsuit contesting overcrowding at Cook County Jail, among many other notable proceedings.

AN ACTIVIST'S IMPACT

Political organizer **Heather Tobis Booth**, AB'67, AM'70, is the subject of a documentary by filmmaker Lilly Rivlin, *Heather Booth: Changing the World*, released in April. As a UChicago student, Booth participated in the Freedom Summer in Mississippi and formed Jane Underground, an organization that helped women safely secure abortions before *Roe v. Wade*. She worked for Harold Washington's successful mayoral campaign in 1983 and helped Senator Elizabeth Warren to build public support for the Consumer Financial Protection Bureau.

DOC TO DEAN

Anita Blanchard, MD'90, has been named associate dean for graduate medical education at the Pritzker School of Medicine. Her appointment takes effect January 1, 2018. Blanchard, who joined the UChicago faculty in 1994 after completing her residency in obstetrics and gynecology, served as Pritzker's program director in obstetrics and gynecology from 2004 to 2017.

SCIENTIFIC ADVANCEMENT

Astrophysicist **David John Ruffolo**, PhD'91, was this year's recipient of Thailand's outstanding scientist award, given by the king of Thailand's Foundation for the Promotion of Science and Technology. Ruffolo is a professor at Mahidol University, where he studies cosmic rays and solar storms. A Thai national since 2012, Ruffolo came to the country in 1991 to teach high school physics and decided to remain with the ambition of promoting better science education.

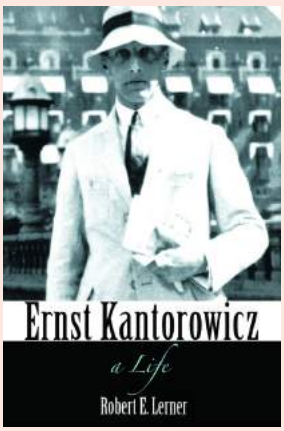
HONORS FOR EBERT

Roger Ebert, EX'70, was inducted into the Chicago Literary Hall of Fame at the American Writers Museum in downtown Chicago on August 19. The Pulitzer Prize–winning film critic wrote for the *Chicago Sun-Times* for 46 years and authored 17 books, including the 2011 memoir *Life Itself*. Ebert taught film courses at the Graham School for 37 years, sometimes bringing directors to class to discuss their work. Ebert's widow, Chaz, accepted the award on her late husband's behalf.—*Susie Allen, AB'09*

PHOTO COURTESY ROCHESTER PHILHARMONIC ORCHESTRA

RELEASES

The Magazine *lists a selection of general interest books, films, and albums by alumni. For additional alumni releases, use the link to the* Magazine*'s Goodreads bookshelf at mag.uchicago.edu/alumni-books.*



ERNST KANTOROWICZ: A LIFE

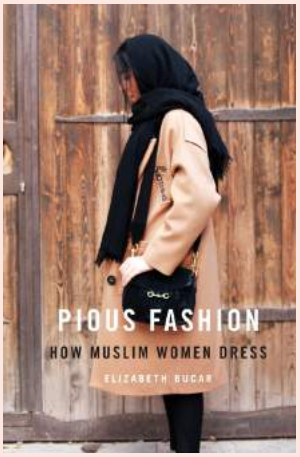
By Robert E. Lerner, AB'60; Princeton University Press, 2017

The German-Jewish historian Ernst Kantorowicz is best known for his classic study of medieval political theology, *The King's Two Bodies* (1957). His own life was shaped by the tumult of history and politics: once an avowed German nationalist who fought in World War I, Kantorowicz became a vocal critic of the Nazis and fled Germany after *Kristallnacht*. At the University of California, Berkeley, Kantorowicz was fired when he refused to sign an anticommunist loyalty oath; he spent the rest of his career at the Institute for Advanced Study in Princeton, New Jersey. In a new biography, Northwestern University medieval historian **Robert E. Lerner** chronicles the life and thought of this singular scholar and historical figure.

CRIMES AGAINST A BOOK CLUB

By Kathy Cooperman, AB'93; Lake Union Publishing, 2017

In search of quick cash to support their families, best friends Annie and Sarah cook up a devious plan to sell a "miracle" antiaging skin cream to the wealthy women in Annie's book club. But a seemingly harmless plan takes a risky turn when she adds a secret—and illegal—ingredient to the formula.



PIOUS FASHION: HOW MUSLIM WOMEN DRESS

By Elizabeth Bucar, AM'01, PhD'06; Harvard University Press, 2017

How do Muslim women decide what to wear? Religious ethicist **Elizabeth Bucar** challenges the perception of head scarves and other traditional dress as oppressive, arguing that many Muslim women find aesthetic pleasure and opportunities for self-expression in their clothing choices. *Pious Fashion* examines the experiences of women in Iran, Indonesia, and Turkey, as well as the burgeoning global market for fashion aimed at *hijabis*.

WHIPLASH: HOW TO SURVIVE OUR FASTER FUTURE

By Joi Ito, EX'90, and Jeff Howe; Grand Central Publishing, 2016

The future has arrived, and it's moving faster than our ability to understand it, write Joi Ito, director of the MIT Media Lab, and *Wired* contributing editor Jeff Howe. In *Whiplash* they offer nine organizing principles to help individuals and organizations navigate our digital world's new "operating system," such as embracing risk and maintaining a "culture of creative disobedience."

PASSION PROJECTS FOR SMART PEOPLE: TURN YOUR INTELLECTUAL PURSUITS INTO FUN, PROFIT, AND RECOGNITION

By Michael R. Wing, AB'85; Quill Driver Books, 2017

A guidebook for the overeducated and underemployed, *Passion Projects for Smart People* provides strategies for nurturing your side projects and translating them into book deals, museum exhibitions, and teaching opportunities. **Michael Wing**, a high school science teacher who's done field work all over the world, explains how to apply for grants, get published, partner with museums and other institutions, and more.

ELECTRIC ARCHES

By Eve L. Ewing, AB'08; Haymarket Books, 2017

In her debut collection of poetry, prose, and illustration, **Eve Ewing** celebrates and reimagines the lives of African American luminaries including LeBron James, Prince, and blues legend Koko Taylor. "The Arrival," a poem riffing on Assata Shakur's assertion that "black revolutionaries do not drop from the moon," describes the sudden arrival of extraterrestrial liberators bringing "the promised light, descended to us at last." Suffused with magical realism, *Electric Arches* explores race, life in Chicago, and the complex path from girlhood to womanhood.

TRY NEVER

By Anthony Madrid, PhD'12; Canarium Books, 2017

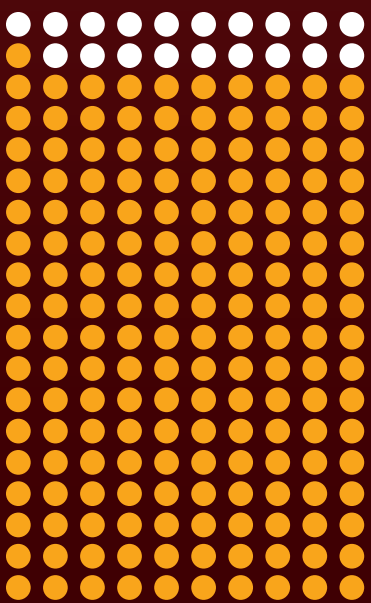
The 17 poems in *Try Never* are based on englyn, a rhyming Welsh poetic form dating back to the 14th century. Full of humor and surprise, **Anthony Madrid**'s updated englyns offer riddle-like wisdom, as in "Cold Spring," which concludes, "Redbud puts out a violet petal. / What settles disputes revives them."

— Susie Allen, AB'09

We've raised the bar

The Phoenix Society has raised its membership goal from 1,800 to 1,900, which will add more than 1,000 new members from the start of the **University of Chicago Campaign: Inquiry and Impact** to its close in 2019.

GOAL
1,900 members



CURRENT PROGRESS
1,710 members
AS OF SEPTEMBER 2017

When you plan a gift from your will or living trust, or name UChicago as a beneficiary of your retirement plan or life insurance policy, you become a Phoenix Society member for life.

Help us reach our goal by simply notifying us that you've included a gift to the University in your estate plan.

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Chuck D, of Public Enemy, performing at Mandel Hall in 1989.

DEATHS

FACULTY AND STAFF

Elizabeth Serson Johnson of Chicago died July 19. She was 95. A onetime journalist for the *Ottawa Journal*, Johnson was an editor of Cambridge University Press's *Collected Writings of John Maynard Keynes* (1978). Her first husband, economist Harry Gordon Johnson, was on the UChicago faculty for more than two decades. After he suffered a stroke in 1973, Johnson devoted herself to his care until his death four years later. She then worked at the University of Chicago Press as an economics editor until 1983, marrying UChicago physicist John A. Simpson in 1980. Simpson died in 2000. Johnson is survived by a daughter, a son, and two grandsons.

Elizabeth "Rose" Waltz, a nurse at the University of Chicago Medicine for more than 30 years, died May 8 in Hyde Park. She was 80. In retirement Waltz volunteered as a nurse at the Interlochen Arts Camp. She is survived by three daughters, one son, and eight grandchildren.

1920s

Florence Petzel, LAB'27, PhB'31, AM'34, died August 16 in Anderson, SC. She was 106. Petzel became an assistant professor of textiles at Ohio State University in 1938 and later held professorships at the University of Alabama, Oregon State University, the University of Texas, and Texas Tech University. She was the author of *Textiles of Ancient Mesopotamia, Persia, and Egypt* (1967) and several scholarly articles on the properties and history of fabrics. She is survived by two nephews.

1930s

John G. Morris, LAB'33, AB'37, died July 28 in Paris. He was 100. A celebrated photo editor, Morris oversaw the publication of some of the 20th century's most iconic images. During World War II he edited Robert Capa's photos of D-Day for *Life* magazine and later embedded himself with American troops in Normandy. At the *New York Times*, he urged the publication of Nick Ut's photo of a girl running from a napalm bombing during the Vietnam War; the photo later won a Pulitzer Prize. He received the French Legion of Honor in 2009 and the International Center of Photography's Infinity Award in 2010. Morris is survived by his partner, Patricia Trocmé; four sons; and four grandchildren.

Arthur O. Kane, AB'37, JD'39, died October 6, 2016, in Chicago. He was 98. In 1965, after working at his father's law practice for more than a decade, Kane founded a firm specializing in workers' compensation and occupational disease issues. He later served as president of the Illinois Workers' Compensation Lawyers Association and chair of the Chicago Bar Association's committee on workers' compensation. Philanthropic support from Kane and his wife, Esther, established the Law School's Arthur Kane Center for Clinical Legal Education and endowed faculty positions in constitutional and administrative law. Kane's wife, Esther, died on June 27, 2017. He is survived by a daughter; son **James Allan Steinback**, MBA'70; four grandsons; and six great-grandchildren.

1940s

William Henry Grede, AB'42, of Palos Park, IL, died July 29. He was 96. Grede was awarded a Purple Heart for his service as a bombardier and navigator in World War II. He owned a floral delivery business before becoming a high school teacher and then dean of instructional television at Chicago's Public Broadcasting Service affiliate WTTW, where he was a pioneer of offering college accredited course broadcasts. Grede served on the school board in Palos Park and developed a scholarship for police cadets interested in studying criminal justice. He is survived by a son, a granddaughter, and a great-granddaughter.

Minnie H. Steinberg, SB'44, PhD'50, died June 13 in Evanston, IL. She was 97. As a graduate student in anatomy, Steinberg studied the effects of radiation exposure on lab animals. Impressed by her diligence, one of her professors recommended her for a Manhattan Project team conducting related research. After World War II she worked alongside her physician husband assisting with minor surgeries and serving as his receptionist. Steinberg is survived by two sons, 13 grandchildren, and 38 great-grandchildren.

Roslyne Sterne (née Gross), EX'44, died June 23 in Palo Alto, CA. She was 91. During a long and varied career, she worked in advertising and as a model and singer. Publisher of *Dance Magazine* from 1985 to 1997, Stern was also a founding member of the political organization Emily's List. She is survived by her husband, Robert; a daughter; and one granddaughter.

Nina Kreloff Kans, AB'46, died March 7 in Rockville, MD. She was 89. Kans taught piano at the American Conservatory of Music in Chicago. Her husband, Nels F. Kans, EX'53, died in 2006. She is survived by two sons, **Jonathan A. Kans**, AB'79, SM'81, PhD'86, and **Joshua S. Kans**, AB'85; a brother; and a grandson.

Alex Booth, PhB'46, died August 17 in Stuart, FL. He was 93. He completed his UChicago degree in one year before returning home to Kenova, WV, to run his family's coal business. Within five years, the Booth Coal Company had become a multimillion-dollar corporation. Alongside his work there and at the Wise County Coal Corporation, he founded the Booth Scholars Program, which provides scholarships, computers, and travel opportunities to young people in Kenova, and the Booth Leadership Initiative, in support of theological education for pastors in sub-Saharan Africa. He also served as a trustee of the Huntington (WV) Museum of Art. Booth is survived by his wife, Katherine, and two stepdaughters.

Priscilla Utne, PhB'46, died March 26 in West Chester, PA. She was 92. A classroom and special education teacher and administrator at a New Jersey public school for 24 years, Utne was committed to social justice, the environment, and education. During the summers she taught art at children's camps. Utne is survived by a daughter; a son; a granddaughter; a grandson; and a great-grandson.

Emilie Elaine Cooper Boguchwal, AB'47, died August 8 in Ridgecrest, CA. She was 92. After the outbreak of World War II, she moved to Washington, DC, where she worked in the War Department. Boguchwal was a writer and editor at the Naval Ordinance Test Station in China Lake, CA, for nearly 50 years. In retirement she volunteered at the Ridgecrest City Information Desk and the Ridgecrest Senior Center. She is survived by two daughters, a son, and three grandchildren.

Robert Thomas Hennemeyer, PhB'47, AM'50, died August 21 in Washington, DC. He was 91. Hennemeyer received the French Legion of Honor for his military service during World War II. In 1952 he joined the US Department of State as a foreign service officer. Over his 35-year career, Hennemeyer served in England, Norway, Tanzania, and Germany, where he was twice consul general. From 1984 to 1986, he was the ambassador to Gambia. In retirement Hennemeyer worked to advance social justice through his efforts with the US Catholic Bishops Conference, the Woodstock Theological Center, and the Catholic Diocese of Venice, Florida. He is survived by his wife, Joan; one daughter; two sons; a sister; and four grandchildren.

1950s

Robert Ginsburg, SM'50, PhD'53, of Miami, died July 9. He was 92. During his 60-year career as a geologist—beginning and ending at the University of Miami, with a 16-year interlude at Shell Development and then Johns Hopkins—he studied sea-floor deposits off the coast of Florida, identifying a coral reef nearly three million years old and discovering a mile-deep underwater trench. Ginsburg also started initiatives to collect better baseline data on coral reefs, allowing more accurate measures of the oceans' health. He is survived by his partner, Leonore Bernard.

Leroy Ecklund, AB'51, died July 23 in Madison, WI. He was 87. A graduate of Northwestern Medical School, Ecklund served as a captain in the Air Force and a staff psychiatrist at an Air Force hospital in Elmendorf, AK. He later worked as the director of the Mendota Mental Health Institute in Madi-

son, where he created a program for deaf individuals with mental health issues. He is survived by his longtime partner, Gary Gill; three daughters; one son; two granddaughters; and two grandsons.

Keith Conners, AB'53, died July 5 in Durham, NC. A Rhodes Scholar who then trained as a clinical psychologist, in the 1960s he developed a 39-item questionnaire, the Conners Rating Scale, that became the standard tool to diagnose what is now called attention deficit hyperactivity disorder (ADHD) in children. Later studies by Conners prompted the widespread replacement of tranquilizers with stimulants such as Ritalin and Dexedrine as the standard treatment for ADHD. He is survived by his wife, Carolyn; a sister; four daughters; two sons; four grandchildren; and two great-grandchildren.

Jack Nadler, AM'54, of Montclair, NJ, died December 16, 2014. He was 85. Nadler worked in military research at Bell Labs and as a corporate researcher for AT&T before becoming a stockbroker. He is survived by his wife, **Rita K. Nadler**, JD'55; a daughter; two sons; and six grandchildren.

Frank Wellington Lehn, EX'54, died July 2 in Louisville, KY. He was 85. Lehn estimated that he treated 780,000 patients during more than 40 years practicing internal medicine with a focus on rheumatology. Honored as a Kentucky Colonel—the state's highest title of honor—he enjoyed camping, skiing, foxhunting, and steeplechase racing. Lehn is survived by his wife, Valla; three daughters; two sons; a brother; a stepdaughter; nine grandchildren; and 11 great-grandchildren.

James Wesley Haritage, AM'56, died August 2 in Dakota Dunes, SD. He was 92. A veteran of World War II, Haritage served as the head of social services at the Mental Health Institute in Cherokee, IA, until his retirement in 1992. He is survived by two daughters, a granddaughter, and a grandson.

Romeyn Taylor, AM'56, PhD'60, of Minneapolis, died June 4. He was 91. During World War II he served in the American Field Service as an ambulance driver with the British Army. Taylor was a professor of Chinese history at the University of Minnesota for 34 years. He was politically active and volunteered with homeless families in Minneapolis. He is survived by three daughters; two sons; a sister; five granddaughters; and three grandsons.

Philip Szanto, SB'57, AB'57, died May 26 in North Chicago, IL. He was 81. Szanto served as a US Army pathologist before practicing at Munster (IN) Community Hospital from 1973 until 1981, when he became a professor of pathology at Chicago Medical School of Rosalind Franklin University. Coauthor of a widely used textbook, *BRS Pathology* (1993), he retired in 2011. Szanto is survived by his wife, Anna; a daughter, **Judith Szanto Kutin**, SM'01; a son, **Michael Szanto**, SM'01; a brother; and three grandchildren.

James S. Chase, LAB'47, AM'57, PhD'62, died July 31 in Fayetteville, AR. He was 85. A US Army veteran who served in the Korean War, Chase began his career as a scholar of American political history at the University of Texas at Austin. In 1968 he moved to the University of Arkansas, where he remained until his retirement more than 30 years later. Chase wrote *The Emergence of the Presidential Nominating Convention, 1789–1832* (1973) and founded the *Ozark Historical Review*. He is survived by his sister and brother.

Robert Zaas, MD'57, of Cleveland, died August 5. He was 86. A former Naval doctor, Zaas served aboard the USS *Yorktown* from 1958 to 1961. After returning to his hometown of Cleveland, he established a private practice as an orthopedic surgeon. An accomplished flutist and lover of classical music, he enjoyed attending concerts, hiking, and rooting for Cleveland sports teams. He is survived by his daughter and three grandchildren.

Herma Hill Kay, JD'59, died June 10 in San Francisco. She was 82. The second woman on the faculty and the first woman dean of the law school at the University of California, Berkeley, Kay was an expert on sex-based discrimination and an advocate for gender equality. She helped write California's no-fault divorce law in 1969 and the Uniform Marriage and Divorce Act, a template no-fault divorce law for states to adopt. Kay is survived by three sons; four grandchildren; and two step-grandchildren.

1960s

Charles F. Lanman Jr., AB'60, died May 10 in Wauwatosa, WI. He was 78. Lanman was a public information officer in the US Bureau of Mines for 25 years; after earning a computer science degree in 1990, he worked for a number of software development firms, becoming a programmer for several tech companies supporting national security and civil defense needs, and retired in 2007. Lanman is survived by his wife, Nancy; a daughter; a son; and six grandchildren.

Bernard Pomerance, AB'62, died August 26 in Galisteo, NM. He was 76. Pomerance won the 1979 Tony Award for best play for *The Elephant Man*. Since its original two-year run on Broadway, the play has received several revivals, most recently in 2014 with actor Bradley Cooper in the starring role. Pomerance's other plays include *Quantrill in Lawrence* (1981) and *Melons* (1985). He was a cofounder of London's Foco Novo Theatre Company. He is survived by a daughter, a son, a brother, and two grandchildren.

Robert G. Faris, MBA'64, of Westfield, NJ, died August 21. He was 79. Faris's career in business included posts at Inland Steel, Standard Oil of Indiana, and McKinsey & Company. In 1971 he became president and senior partner of the venture capital firm Alan Patricof Associates (now Apax Partners). Faris was a cofounder of the Polish-American Freedom Foundation and received two major honors from the president of Poland for his work promoting economic cooperation between Poland and the United States. He is survived by his wife, a daughter, a son, a sister, two brothers, and five grandchildren.

Jonathan D. Lewis, AB'65, died June 5 in Chicago. He was 73. A psychiatrist who specialized in post-traumatic stress disorder, Lewis treated hundreds of refugees from conflicts all over the world, including many survivors of the Vietnam War and the Bosnian War. Later in life he published an edited volume of essays and a children's book. Lewis is survived by his wife, Betty de Visé; a stepson; and two grandchildren.

Katharine Hull, AM'65, died June 25 in Calabasas, CA. She was 87. Hull studied in the Graduate Library School and later worked in library services at Rye Country Day School and for the publisher Harcourt Brace Jovanovich. She enjoyed reading, writing, volunteering, the arts, and travel. Hull is survived by her sister, three sons, and nine grandchildren.

Robert Halonen, MBA'66, died August 13 in Cincinnati. He was 77. A onetime professor of economics, finance, and health care administration at the University of Arizona and Virginia Commonwealth University, Halonen later worked in health care, managing the financial operations of Trihealth, the Bethesda Foundation, Georgetown University Medical Center, and Charleston (WV) Area Medical Center. Halonen served on the boards of Lighthouse Youth Services and Hospice of Cincinnati, among other organizations. He is survived by his wife, Susan; one daughter; three sons; and three grandchildren.

Sigmund Dragastin, PhD'68, of Sunny Isles Beach, FL, died March 2. He was 84. Dragastin served as a Catholic priest before completing his sociology doctorate. The author of *Adolescence in the Life Cycle* (1975), he spent 22 years as an administrator at the National Institutes of Health.

George R. Yates Jr., AB'69, SM'84, of Chicago, died June 4. He was 73. An Air Force veteran, Yates worked as a computer programmer and systems architect for institutions including UChicago and Northwestern University. He returned to the University midcareer to study mathematics and neurobiology. Yates is survived by his wife, **Kathy Yates**, AM'74, and one son, **George Yates III**, LAB'08.

1970s

Donald Paton, MBA'71, died April 30 in Warwick, RI. He was 75. Paton earned an engineering degree from Cambridge University before emigrating to the United States, where he worked for General Electric. Following a long career in the planning, purchasing, and management of power plants, in retirement he enjoyed refurbishing his antique car, playing golf, sailing, and traveling. He is survived by his wife, **Stephanie Paton**, AM'71; a daughter; a son; and two grandsons.

Richard Beinecke, AM'73, died of a heart attack June 19 in Boston. He was 68. A manager for community health centers who contributed to mental health legislation for the Department of Health and Human Services, he later researched and taught on mental and public health at Suffolk University's Sawyer Business School in Boston. An avid kayaker and fisherman, Beinecke wrote a guidebook to the Mystic River. He is survived by his longtime partner, Carol Philipps; two daughters; two sisters; and a brother.

Lloyd C. Engelbrecht, PhD'73, died December 31, 2016, in Cincinnati. He was 89. An antiwar activist and World War II veteran, Engelbrecht was proud he never fired a shot during his military career. He studied the history of culture at UChicago and became a professor of art history at the University of Cincinnati, publishing books on the Bauhaus movement and the architect Henry Trost. He is survived by two sisters; two daughters; one granddaughter; and three grandsons.

Eugene Gaer, EX'73, of New York City, died July 7 in New York. His 39 years as a litigator were preceded by a stint teaching history at West Liberty University and Roosevelt University in the 1960s and '70s. He joined Rosenman Colin Freund Lewis & Cohen in 1978 after graduating from Columbia Law School. Gaer became general counsel at FOJP Service Corporation in 1987 and opened his own practice in the 1990s. He is survived by his brother.

Benjamin Gerald McArthur, AM'74, PhD'79, of Collegedale, TN, died April 10. He was 66. After earning his PhD, McArthur joined Southern Adventist University in Collegedale, teaching history there until 2017, save a stint from 2009 to 2012 as vice president for academics at Southwestern Adventist University in Keene, TX. McArthur is survived by his wife, Caroline; a daughter; a son, UChicago doctoral student **Robert McArthur**, AM'17; two sisters; three brothers; and two grandchildren.

Hollie Mottus Bendewald, AB'75, died April 2, 2016, of cancer. She was 63. Bendewald received an MBA from the University of Virginia Darden School of Business and served as an executive at banks including Citi and Chemical. She also worked as a consultant at Ernst & Young. She is survived by her sister and brother.

Gina Sosinsky, AB'76, died September 4, 2015, from complications related to a bone marrow transplant. She was 60. Sosinsky received her PhD in biophysics from the University of California, Berkeley, and joined the faculty of the University of California, San Diego, in 1995. A scholar of microscopic imaging, she served as assistant director of the National Center for Microscopy and Imaging Research at UC San Diego and taught courses on light and electron microscopy. She is survived by her husband, John Badger, and three sons.

John Yoder, MBA'76, of Harpers Ferry, WV, died June 9. He was 66. A district court judge in his native Kansas from 1976 to 1980, Yoder was appointed director of the Justice Department's asset forfeiture office by President Ronald Reagan. He was elected to West Virginia's state senate in 1992 and again in 2004. In 2008 he launched his successful campaign for a seat on the 23rd Judicial Circuit, where he served until his death. He is survived by two sisters and two brothers.

Lala Rukh, MFA'76, died July 7 in Lahore, Pakistan. She was 69. An artist known for her minimalist drawings and installation pieces, Rukh also taught at Punjab University and the National College of Arts. Her last exhibited work, the visual and sound installation piece *Rupak*, was shown at the art exhibition *Documenta 14* in Athens this year. Rukh was a cofounder of the Women's Action Forum, a group advocating for the rights of women in Pakistan, and remained active in the WAF throughout her life.

David Herrup, AB'77, died June 18 in Cambridge, MA. He was 62. Herrup was a research physicist at Fermilab before working as a medical physicist in the radiation oncology department at Massachusetts General Hospital and a lecturer at Harvard University. He is survived by his wife, Nicole Jordan; a daughter, **Rachel Ming Herrup**, AB'17; his mother; and two brothers, **Paul Max Herrup**, AB'74, and **Mark Herrup**, AB'80.

Ralph Hoffman, AB'78, died May 24 in Chicago. He was 68. Hoffman was a senior vice president and financial adviser at Merrill Lynch for 38 years. An expert bridge player, he reached the rank of Gold Life Master and was twice named Chicago Bridge Player of the Year. He is survived by his wife, Barbara Ames, and two daughters.

1980s

Wendy Lynne de Monchaux, MBA'86, died September 22 from complications following a seizure. She was 57. At Bear Stearns, de Monchaux rose through the ranks to become a senior managing director in trading and derivatives and in 1996 became the only woman on the firm's board of directors. She left Bear Stearns in 2008 to become a stay-at-home parent to her three children. She is survived by her husband, David MacWilliams; two daughters; one son; her mother; and a sister.

Peter Chines, AB'89, of Silver Spring, MD, died July 10. He was 50. Chines worked for two decades at the National Human Genome Research Institute at the National Institutes of Health, where his work designing complex databases helped advance research on type 2 diabetes and other genetic disorders. He is survived by his wife, Sujata Roy; his parents; a sister; and a brother.

Dennis Michael Black, JD'89, died July 1 in Santa Fe, NM, after a brief illness. He was 53. Black clerked for US Court of Appeals judge and senior lecturer in law Richard Posner before joining the Washington, DC, law firm Williams & Connolly. He became a partner in 1998, leaving in 2015 to do pro bono work with an LGBTQ youth organization and to cofound a clothes manufacturing company and retail store, among other projects. He is survived by his partner, R. Scott Wallis; his mother; and a brother.

Benjamin Mark Portis, MFA'89, died July 20 in Toronto following a car accident. He was 56. Portis worked as a curator for the Art Gallery of Ontario and the MacLaren Art Centre in Barrie, Ontario, and wrote about visual art and dance for numerous Canadian publications. He is survived by his mother, a sister, and a brother.

1990s

Robert R. Walsh, AM'90, died February 8 in Richmond, VA. He was 73. Walsh studied at the Graduate Library School and worked on library accommodation planning at Harvard University, Queens College in New York, and the Library of Virginia. He lectured widely on library space use and development. He is survived by three sisters and two brothers.

2000s

Terrell "Terry" Iandiorio, JD'05, died August 16 in Nantucket of accidental drowning. He was 46. Before enrolling at the Law School, Iandiaro taught at a school near Johannesburg, South Africa. An attorney at the Boston-based firm Ropes & Gray, he represented clients in the medical device, pharmaceutical, and defense industries. Iandiario received the Denis Maguire Pro Bono Award from the Boston Bar Association for his work with organizations including DotHouse Health. He is survived by his wife, Ann Ward; his father; a daughter; a son; a sister; and two brothers.

Justin Thomas Anderson, AM'09, died June 27. He was 34. As a high school student, Anderson was a finalist for the Morton Gould Young Composers Award and went on to study Italian and vocal performance at the University of Minnesota. He worked at the Italian consulate in Chicago. Outside of work, Anderson enjoyed gymnastics and played flute in a musical ensemble. He is survived by his parents and a brother.

2010s

Hannah Frank, PhD'16, died August 28 of suspected meningitis. She was 33. A professor of film studies at the University of North Carolina, Wilmington, Frank studied special effects, the history of animation, and Russian and Soviet cinema. She also made experimental animated films. At the time of her death, she was at work on a book about American animated cartoons of the 20th century. She is survived by her husband, **Jacob Blecher**, AM'08.

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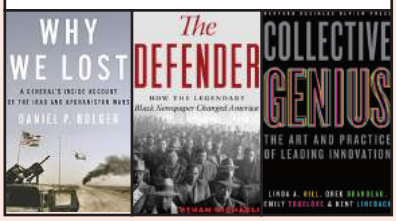

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In *ShirlyWhirl, M.D.*, a comic drawn by fourth-year Pritzker student **Shirlene Obuobi**, an autobiographical doctor in training navigates the pressures of medical school, universal ones and those that especially affect traditionally underrepresented students. "I was pretty intentional about making the main character a woman and black," Obuobi says. She hopes her work is "relatable if you're from my background, but might open your eyes if you're not." The comics address serious issues with unflagging levity and have a following of medical students around the country. "The most fun," she says, is "when people tag their friends and say 'that's me.'" Read a Q&A with Obuobi at mag.uchicago.edu/shirly.

—Laura Demanski, AM'94

See more comics and follow ShirlyWhirl on Instagram: @shirlywhirlmd.

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