

MLSA

COLLEGE OF LITERATURE, SCIENCE, AND THE ARTS
Spring 2013

chain
reactions





UPDATE

Complex Effects

What is that behemoth on the cover, you ask? We're excited to tell you all about our chain reactions.

CARTOONIST RUBE GOLDBERG drew over-engineered machines that performed simple tasks. Today, a “Rube Goldberg,” can be synonymous with confusion or complication, but the term has also evolved into a handy way of illustrating how pulling a string in one place can cause something else to happen in another. One small starting point — a press of a button or flick of the wrist — sets off a series of chain reactions so intertwined they can't be separated from one another.

Our Rube Goldberg machine, built on site here in LSA, is composed of materials representing the feature stories in this issue. Each article shows a way of getting from point A to point B, but with unexpected connections and reactions irrevocably altering the landscape as it's in motion.

The chain reaction begins with the launch of a replica of Richard Byrd's famous Ford Trimotor airplane, used in his historic Antarctic flight. Spoiler alert, we're going to tell you what our machine does next, so if you want to figure it out on your own, now is the time to study the cover before reading ahead.

Orange “Hadron Collider” particles explode when Byrd's plane (A) flies across the string releasing the globe (B) that tips over the water jug (C), which fills the backpack (D) and raises the tree branch (E). The branch releases the helicopter (F), which rotates as it lowers and simultaneously starts the golf ball (G) rolling on the track and causes the books (H) to fall in succession. The books trip two switches, one that turns on the red rope lights (I) and another that lights the Block M. Meanwhile, the ball falls from the track, unleashing an orange particle explosion (J).



VIEW VIDEO OF OUR SIMPLE MACHINE IN ACTION
www.lsa.umich.edu/rubegoldberg



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Left Behind

Objects discarded during border crossings in the Sonoran desert document the increasingly violent ends of people caught between two countries.

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As part of the famous Byrd expedition to Antarctica, Laurence McKinley Gould risked his life on frozen mountain ranges to bring the scientific method to the tip of the Earth.

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Lights Out

With the Large Hadron Collider shut down until 2015, LSA scientists who contributed to the Higgs hunt — some 130 over the last 14 years — are taking stock of the post-Higgs landscape.

by Mary Jean Babic

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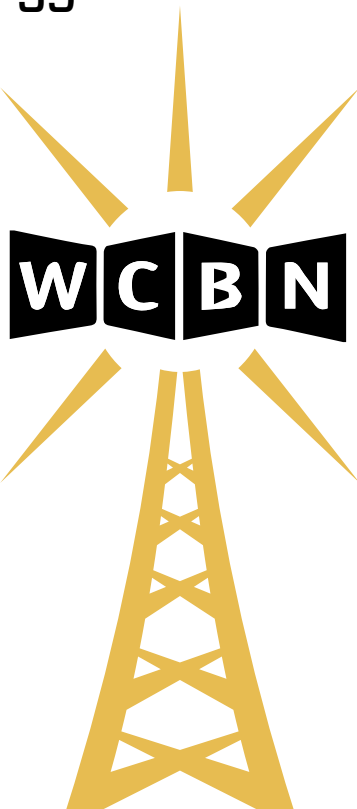
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Welcome Interim Dean Gelman

IN APRIL, the University of Michigan Board of Regents approved the appointment of Susan A. Gelman, the Heinz Werner Collegiate Professor of Psychology, as interim Dean of the College of Literature, Science, and the Arts, effective September 1, 2013. As she serves the College in this new capacity, this page of the magazine will be devoted to her words about leadership in this extraordinary place.

Professor Gelman is one of the most distinguished and highly visible scholars in the College. She has served in numerous administrative capacities at the University of Michigan, and is an outstanding educator, mentor, and researcher.

Gelman received her B.A. degree in psychology and classical Greek from Oberlin College in 1980 and her Ph.D. degree in psychology with a minor in linguistics from Stanford University in 1984. She joined LSA as an assistant professor of psychology in 1984, rising through the ranks to professor in 1991. From 1999–2012 she was the Frederick G. L. Huetwell Professor of Psychology.

She is the author of over 200 scholarly publications, including a prize-winning monograph, *The Essential Child* (Oxford University Press, 2003). Her research has been funded by the National Science Foundation, the National Institute of Child Health and Human Development, the National Academy of Education, and other sources. She is a fellow of the American Academy of Arts and Sciences, the Association for Psychological Science, the American Psychological Association, and the Cognitive Science Society. Her honors include a J. S. Guggenheim Fellowship, and the American Psychological Association Distinguished Scientific Award for Early Career Contribution to Psychology. In 2012, Professor Gelman was elected to the National Academy of Sciences. She has served as president of the Cognitive Development Society; as review panelist for NSF, NIH, and the Ford Foundation; and as board member of several scientific societies. She has also served in an editorial capacity for over a dozen scientific journals.

“She is a remarkable and distinguished scholar,” says current LSA Dean Terrence J. McDonald, who has served the College for the past decade. “Her role as both a faculty member and associate dean provides foundational knowledge and experience from which to build a successful deanship. I am confident that the College and the strength of the liberal arts will only continue to advance in this interim period.”

INSIDE LSA



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Wherever this symbol appears in the magazine, you can find expanded content on the LSA Today website.

TOWERING RESONANCE

Ring in a behind-the-scenes tour of the Charles Baird Carillon in the Burton Memorial Tower (p. 63), and meet the maestro who makes it sing.



GLOBETROTTERS GALORE

Sea views in Santorini, mountains in Chamonix: Flip through award-winning photos highlighting students' study-abroad experiences.



A PORTRAIT OF THE ARTIST

LSA History of Art Professor Matthew Biro discusses why Pablo Picasso's work remains so impactful today, 40 years after the painter's death.



PLAY BALL!

With baseball season in full swing, an alumna discusses her father Rick Ferrell's legacy as a Major League catcher and coach.



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Plus!



Read past issues of
LSA Magazine:

[www.lsa.umich.edu/
alumni/magazine](http://www.lsa.umich.edu/alumni/magazine)

The Versus Issue

The Fall 2012 issue is fantastic! From the meaningful cover to the articles on the history of Title IX, Raoul Wallenberg, 1960s activists, Greg Skrepenak — it kept me reading to the end. I enjoyed recognition of Dean McDonald and the history of all LSA Deans. The physics of the Cube and many other well-chosen photos of the campus made my years there more memorable. Congratulations!

Joyce Peck Plummer ('53, M.A. '57, M.L.S. '66)

How Do You Score?

While I believe these sample SAT problems are no more difficult than the hardest problems I remember, I do have a problem with your published answer to question 4. The most frequent number is 78. The average is 73.7. And the median—halfway between the largest and smallest values—is 72. Thus the correct answer is C, not A. I hope this example and the answer provided does not come from a real test.

Peter Boyce (Ph.D. '63)

Editor's note: The median in a string of numbers can be determined by sequentially ordering all the digits from lowest to highest and picking the middle one. (If there is an even amount of numbers, the median is the average of the two centermost digits.) In this case, the list of numbers is: 66, 69, 70, 75, 77, 78, 78. The middle number, or median, is 75.

Fight Club

I had the distinct experience of being both a female athlete on the varsity swim team while concurrently a member of the Michigan Marching Band. I did both of them back to back (band from 4–6 P.M. and swimming from 6–8 P.M.) in 1973 and 1974. For the Marching Band, I was in the second year of George Cavender allowing women in his military-styled ensemble. Here is where Title IX did not come in. We were given shapeless windbreakers, men's pants, told to buy men's shoes and men's white spats, and, to top it all off, all of us wore navy blue French berets, into which I had to somehow get my waist-length hair. Mr. Cavender wanted us to either all look like men, or at least androgynous, and he succeeded. You can't tell the men from the women in any of the photos that were ever taken.

Gail Greenstein Sewall ('76)

CORRECTIONS

Alumnus Greg Skrepenak was listed as having two children. He has three. The "Fight Club" Title IX article deck noted the milestone legislation was celebrating 30 years. It should have said 40. In the same article, the image on p. 35 showing the women's varsity field hockey team should have been credited to alumna Elizabeth Eagan ('75), and we left out a graduate degree for alumna Sheryl Szady: She received a Ph.D. in 1987. Finally, Jill Banfield, not Vincent Deneff, was pictured on p. 28.



I'm so happy to lurk that wurd's can mean whatever we want them to mean, and that we can spell them however we want. No need for English classes any longer, just let the stoo'dents txt away howeffe'r they want. Verse as a common verb? Sure, why not?

Tom Haynes ('68)

Sci-Fi Best-Sellers

Many readers answered our call and told us what was missing from our list of sci-fi books in the last issue. "A number of works from earlier days belong here if influence rather than just sales is what you're after," wrote **David Lovelace (M.A. '77)**, who cited several of Robert Heinlein's early works, including *The Man Who Sold the Moon* and *Methuselah's Children*. He also nominated Isaac Asimov for the *Foundation* trilogy, *The Caves of Steel*, *The Naked Sun*, and *I, Robot*. **Ruth Gustafson ('59)** added Mary Doria Russell's *Children of God* and

The Sparrow, and, along with **J. Medrano ('60)**, gave a shout-out to author Arthur C. Clarke. Medrano writes that Clarke's genius went beyond the written page: He "created the concepts of communication satellites but could not get a patent.[.] He was refused, since rockets were yet to be perfected and he could not provide a 'working model.' By the time he could, the concept had been accepted into something like 'public domain' and was now ineligible for patent." Thanks to everyone who weighed in!

Most popular letter-generating article:
"The Hitchhiker's Guide to the Genre" and its sidebar, "Sci-Fi Best-Sellers."

TALK TO US

We invite your feedback on LSA Magazine content or on topics related to the College. Letters for publication may be edited for style, length, and clarity.

Email: lsamagazine@umich.edu

Or write to:
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56

The number of sophomores who had U-M Provost **Phil Hanlon** as a professor this past fall in the lecture series “The Challenge of College Affordability: Financing the University.”



And the Award Goes To...

City of Promises: A History of the Jews of New York (NYU Press, 2012), won the Everett Family Foundation’s Jewish Book of the Year Award. It was edited by **Deborah Dash Moore**, an LSA professor of history and director of the Frankel Center for Judaic Studies.

\$1.3 Billion

The amount U-M spent in the last fiscal year to top the National Science Foundation’s annual list of leading public U.S. institutions in terms of research spending.

What’s That Smell?

Funky Focus? Malodorous Mustang? **Blaise Boles**, an LSA professor in the Department of Molecular, Cellular, and Developmental Biology, is among researchers working with Ford Motor Company to create a microbe-resistant substance for the interior of vehicles, which would make cars less “stinky.”



LSA students **Meryl Davis** and **Charlie White** took their fifth consecutive national title at this year’s U.S. Figure Skating Championships. LSA student **Evan Bates** and his partner **Madison Chock** took second, and LSA students **Alex** and **Maia Shibutani** finished third.

@stuartberlow

Read @umichLSA Magazine on the jet home from A2. I love my school, such an extraordinary place!

@steffisk8s

Professor **Charles Shipan**’s lecture on political myths was fantastic. #michigan-difference

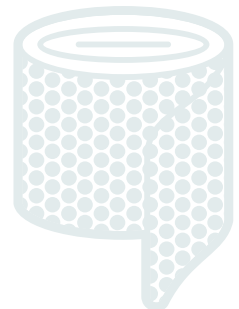


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4,000

The number of first-year students who received a reusable water bottle from **Planet Blue**, U-M’s sustainability initiative.



“Don’t Rush, Look Before You Flush”

THE SLOGAN FOR **JORDAN** (’12) AND **BRYAN SILVERMAN**’S ANN ARBOR-BASED START-UP FIRM, **STAR TOILET PAPER**, WHICH SELLS ADS AND COUPONS PRINTED ON SHEETS OF TOILET PAPER.

WELCOME TO THE "D."

Belle Isle to 8 Mile: An Insider's Guide to Detroit is a new book by siblings Andy Linn ('06), Emily Linn ('00), and Robert Linn ('09, M.U.P. '11), which highlights more than 1,000 attractions, sites, events, restaurants, bars, and shops in the city of Detroit.



rube goldberg!



CARTOONIST, LSA MUSE
(1883–1970)

New Hardware

The Angell Hall computing center, commonly known as the "Fishbowl," will get a makeover beginning this summer—the first significant upgrade since its opening in 1988.

DAYS OF YORE

As a precursor to its bicentennial in 2017, U-M has launched heritage.umich.edu. The site features compelling photography and outstanding storytelling, which bring to life the people and places that have shaped U-M's history.

FIVE MILLION PAGES

The volume of content now available as part of the reimagined online site, Animal Diversity Web, a multimedia encyclopedia of animal natural history. The site was originally developed in 1995 by LSA Professor of Zoology **Philip Myers** and U-M collaborators. It is one of the oldest animal diversity websites in existence, and now regularly receives more than a half million users worldwide per month.

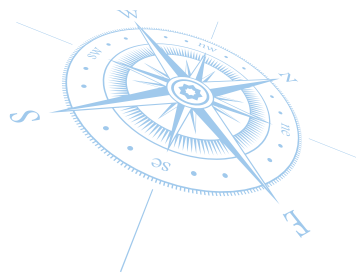


“Let me guess: You see a couple of Army guys and you think we’re the enemy or something. Am I right?”

LIAM HEMSWORTH IN *LOVE AND HONOR*. THE FILM WAS DIRECTED BY **DANNY MOONEY** ('08), PRODUCED BY **EDDIE RUBIN** ('09) AND **PATRICK OLSON** ('84), AND CO-WRITTEN BY **JIM BURNSTEIN** ('72, M.A. '74), LECTURER IN THE DEPARTMENT OF SCREEN ARTS AND CULTURES.

SW1A 0PW

Part of the address for the House of Lords, where more than 200 British alumni convened for an LSA event hosted by **Lord Mark Malloch-Brown** ('76). The grads across the pond heard speakers that included LSA Dean **Terrence J. McDonald** and Professor of Economics **Jim Adams**, and were treated to a tour of the Houses of Parliament.



LOCATION, LOCATION, LOCATION

The origins of several stories in this issue and online:

Germany	Minnesota
Cuba	Washington, D.C.
Mexico	Arizona
Antarctica	England
New Jersey	London



Steadfast.

YOU CAN HELP.

Jasmine Leon was only ten years old when her mother was diagnosed with Graves' disease, diabetes, and a host of other illnesses. As the medical bills piled up, her family struggled financially, but still she dreamed of attending the University of Michigan. Thanks to the generosity of alumni through the LSA Fund, Jasmine's lifelong dream became a reality.

CONSIDER THE FUTURE.

Today, Jasmine is an LSA senior who is active in her sorority as well as many volunteer organizations on campus. She plans to attend graduate school, and even hopes to create her own need-based scholarship to pay forward her extraordinary gift of education.

TAKE ACTION.

Give a gift today to help Jasmine and countless U-M students like her make the Michigan Difference.

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UN
EXPECTED

CONNECTIONS

HUMAN BEINGS LIVE THEIR LIVES TRYING TO CONNECT THE DOTS— finding patterns, unlocking secrets, building frameworks. We're problem solvers, navigating and shaping an increasingly complex world—sometimes made so, ironically enough, by our own solutions.

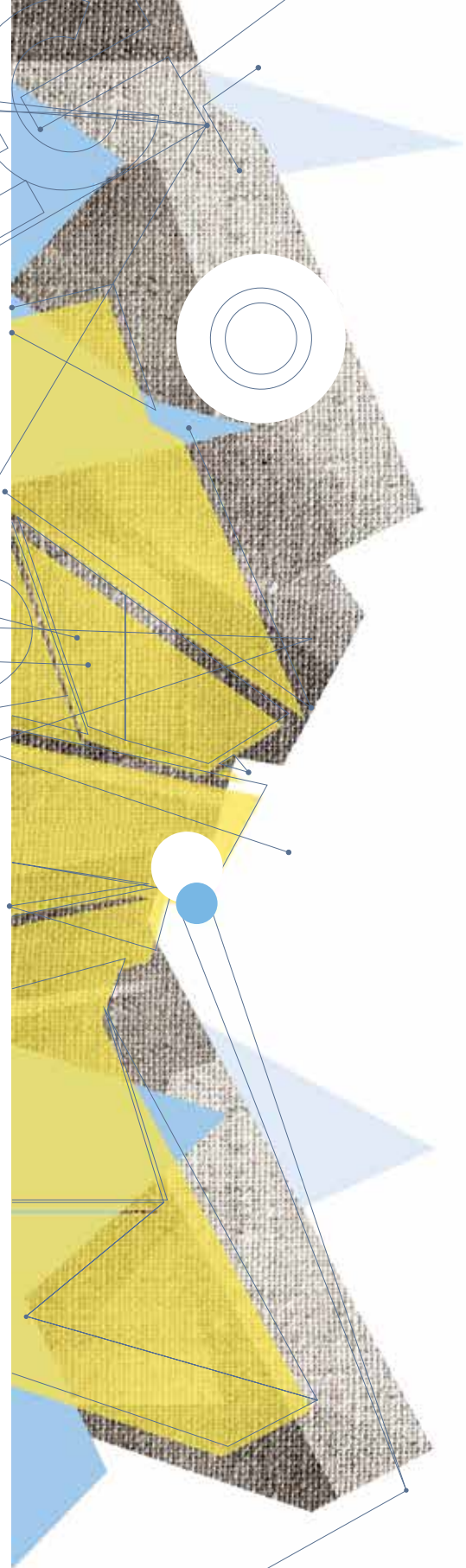
Connecting the dots is what LSA students, faculty, and alumni do best, thereby making the academy a hub for inspired moments of discovery. These are the insights that can change the world, and they're only found by those willing to pursue unlikely leads or follow uncommon paths.

This issue is replete with stories of Wolverines exercising that impulse for inquiry to great effect, finding unexpected connections that remake our understanding of everything.


A professor and his students sharpen the complex picture of illegal immigration by picking through trash strewn about the desert. Admiral Byrd reaps accolades for his famous flight in 1929, all while an alumnus-turned-professor on his team assembles the geological puzzle pieces that uncover a stupendous mountain system. And the Large Hadron Collider powers down, giving LSA physicists a chance to reveal what's on the horizon as they continue unlocking the secrets of the universe.

Of course, it's not unusual in fairly lean times for people to question the value of theoretical physics, expeditions, and the liberal arts. Why should society spend so much time, money, and energy on work with aims that are often ambiguous?

The simple answer is that we can only evolve—individually and collectively—when we connect the dots.







Illegal border traffic into the United States has slowed, but migrant deaths are on the rise, especially in the Sonoran desert in the Southwest. One professor studies the objects discarded during border crossings to bring this clandestine process to light, and to document the increasingly violent ends of people caught between two countries.

left behind

by **Lara Zielin**

in

this part of Arizona's Sonoran desert, the terrain is uneven, rocky. It's a jagged, mountainous expanse where the 110-degree temperatures can kill you by day, and armed bandits can kill you by night. ¶ The deadliness of this place is precisely why migrants use it to cross illegally into the United States. It's hard for Border Patrol to find anyone out here among the hills and shadows and scrub. It's also hard for anyone to save you if you get into trouble during a crossing — and many do. ¶ Hundreds perish here annually. Often their bodies are never found. They are dubbed *los desaparecidos*, or “the disappeared,” a term once reserved for the victims of brutal Latin American regimes — innocents who were carted off in the middle of the night, and never heard from again. ¶ It's not just the bodies that go missing, but also the stories. What happened on the journey? What went wrong? Who was this person? There are clues, however. LSA Professor of Anthropology Jason De León has spent long hours in the Sonoran environs, cataloging the items migrants leave behind as they attempt to cross into the United States. Water jugs. Shoes. Small kids' toys. And scores of backpacks to carry it all. It looks like trash, but these objects, collected through his Undocumented Migration Project (UMP), become data to help construct a record of people who are largely unknown, whose journeys rarely come to light.

It's a polarizing investigation to be sure. More than half of Americans — 61 percent — believe that there would be less poverty in the United States if immigration laws were better enforced, according to the Federation for American Immigration Reform. An even higher percentage of U.S. voters — 67 percent — say that military troops should be deployed to the Mexican border to prevent illegal immigration.

But De León says his work is about much more than studying people who break the law. “[Illegal immigration] doesn't happen in a vacuum,” he says of the social and economic motivations that prompt migrants to cross into the United States, and the complex economic structures that allow millions in profit from the illegal journeys. “There are processes in play here that people don't like to talk about, whether it's trade relationships with Mexico, or the companies that migrants work for when they come to the United States, or global industries that make money by hanging them out to dry. The narrative of this kind of migration is usually, ‘here is a sad tale,’ but if you look at the objects, they can tell you how much more is going on.”¹

| beyond trash |

SINCE THE START OF UMP IN 2009, De León and his team of undergraduate and graduate students have hiked the dusty, gravelly trails of Sonora to find and document migrant stations. These

locations — sometimes no more than a copse of scraggly bushes or a dried gully — are where migrants rest, clean up, change clothes, and leave items behind before meeting their U.S.-side contacts and being shuttled out of the elements.

Migrant stations are strewn with detritus, but De León has approached them with archaeological precision. “People who say it's trash fail to recognize the historical, political, and global economic forces that have shaped this process and given it an archaeological footprint.”

De León and his team begin to make sense of the stuff by mapping the site systematically. “We take a GPS with us so we can see [the artifacts] on a regional scale,” explains Ashley Schubert, a Ph.D. candidate in anthropology, who helps De León train undergraduate students in field methodologies. Members of the crew then “complete an inventory form noting things like the number of jeans found, whether they belonged to an adult or child, male or female,” as well as other relevant details. After the documentation process, items for further study are bagged along with the site number, location, artifact description, and name of the person collecting it, and brought back to De León's lab in West Hall at U-M.

¹For that reason, in part, this story uses the terms “migrant” or “undocumented migrant” versus “illegal” or “illegal immigrant.”

“The word ‘illegal’ overshadows the social processes inherent in a border crossing,” explains De León. “We're not just talking about the law, but a person going through a process or moving across a landscape. We're trying to say they're having other experiences here that are just as important.”

Undergraduates who participate in this hands-on field school “get to see the whole archeological process,” says Schubert, “from having preliminary questions to collecting data, to analyzing it.”

But what does any of this stuff *say*? What meaning is there to be derived from discarded shoes and backpacks?

One insight is how companies have engaged in sophisticated market evolution to exploit the so-called needs of the migrants in the desert. One example is the black water bottle.

“In 2009, I saw a black water bottle for the first time,” recalls De León. “It was a horizon marker,” he adds, using the archaeological term for when something very specific to a time period shows up in the historical record.

Prior to 2009, migrants would paint their water bottles black or cover them in black plastic, believing that this made them less visible during a crossing. But in 2009, De León says he saw the first instance of a black water bottle specifically designed and distributed by a company.

“The shape, the color, even the patron saint on the label are all playing into migrant beliefs about what happens during a crossing,” De León says. The key here, however, is the word *beliefs*, because the black water bottles aren’t actually aiding migrants at all. In fact, according to De León, they’re liabilities.

Border Patrol agents largely use sensors, aerial drones, and thermal imaging in the field. So the idea that the opaque plastic reduces visibility against this technology is what De León calls “folk logic.” What’s more, he and colleagues conducted tests on the daily temperature of the black water bottles, comparing them to the daily temperatures of the water inside clear plastic bottles, and found a 15-degree difference. The black water bottles eventually heated to 126.3 degrees Fahrenheit, which is 6.3 degrees higher than the recommended temperature setting for a domestic water heater.

Thus, in an inhospitable location where exposure and exothermic reactions (overheating) are the leading causes of death, drinking hot water accelerates the dangers. Black-bottle manufacturers perpetuate myths about the bottles’ effectiveness and, by doing so, they increase the personal risks for those who use their products.

In addition, De León and his team have found scads of cheap knock-off tennis shoes. Migrants buy them because they’re affordable, and they believe the footwear will help them fit in once they reach the United States. Or they’ve been told by Mexican vendors that a particular brand leaves no footprints or makes

(PREVIOUS PAGE) **After treacherous desert journeys**, undocumented migrants rest, change clothes, and leave objects behind before crossing into the United States. These migrant station sites are studied as part of LSA Professor Jason De León’s Undocumented Migrant Project. Here, the objects are laid out, ready to be inventoried and for relevant objects to be taken back to Haven Hall for further study.

(THIS PAGE) **A carving in a tree** in the Sonoran desert.





less noise in the desert at night. The reality is that these poorly made shoes disintegrate during treacherous crossings. De León has uncovered bloody socks, gauze, and worn-out shoes — one desperately tied back together with the strap of a bra.

“We find these items over and over at the migrant stations,” De León says. “They’re deceptively simple objects, but they show a complex industry that’s grown out of border crossings.”

What’s also apparent is the suffering that is associated with the collected pieces. “A close inspection of the objects shows how each betrays their user in different ways,” De León writes in *American Anthropologist*. “As an archaeological assemblage, a pattern of use wear emerges that is indicative of routinized and intense physical suffering.”

The suffering was all too apparent for Schubert, who was part of a research group last summer that stumbled upon a deceased migrant. “It was a woman,” Schubert recalls. “It was one of those situations you know you might encounter, but hope never happens.”

In spite of the potentially gruesome nature of the fieldwork, Schubert wants to return to the desert next summer to investigate crossing artifacts specifically associated with the U.S. Border Patrol. It’s another side to the story that emerges among the objects: that the migrants aren’t the only ones leaving things behind (see sidebar, p. 15).

“There are plastic restraints, fast-food items, tires, batteries — a lot of things that aren’t good for the environment,” Schubert says. The objects say a lot about how and where migrants are apprehended, for example, but Schubert wants to look deeper into the environmental impact of migration policies and practices.

In the meantime, the items that have already been pulled from the desert are stored in De León’s lab in white boxes, stacked ceiling-high, with neatly printed labels on the outside.

Students like Melissa Needham, a junior majoring in anthropology, help organize and catalog the items for further study — and in one case for display. This past spring, Needham helped ready objects for LSA’s Institute for the Humanities exhibit titled *State of Exception*. It was the first major curation of De León’s work since UMP began, and included a combination of objects, installation, and video shot by photographer Richard Barnes along the U.S./Mexico border. Among the items in the showing was a piece of the blanket used to cover the deceased migrant found by Schubert and other team members.

“A lot of people don’t see undocumented migration from this view,” Needham says. “It’s eye opening.”

Needham also documented visitors’ reactions to the exhibit for a project affiliated with the Undergraduate Research

LSA junior Melissa Needham in Jason De León’s Haven Hall lab, where she helps organize and catalog objects discarded by undocumented migrants. Some of the items were used this past spring for an Institute for the Humanities exhibit titled *State of Exception*.

Opportunity Program (UROP). Through a comment book at the exhibit, visitors were encouraged to write down their thoughts and feelings about the backpacks, shoes, bottles, personal effects, and other items on display. *Makes me uncomfortable*, wrote one visitor. *Are you documenting their struggle or yours?*

“There’s been no shortage of verbiage,” Needham says. “Whether good or bad, it doesn’t really matter. I think it’s great that people are just having some sort of reaction.”

The project underscores how no object can provide meaning entirely on its own, and De León’s team will continue to connect the found items in the lab to ethnographic work conducted in the field, including conversations with migrants in Nogales, Mexico. “We can only make sense of this using face-to-face interviews,” De León says.

| if the dead could speak |

ALL THIS WORK ADDS TO A LARGER UNDERSTANDING of the new migration landscape. After all, these aren’t the crossings of 15 years ago, when migrants snuck in at checkpoints or dashed into traffic to cross highways dissecting Mexico and the United States. Migration has changed thanks to recent legislation by the Obama administration, the addition of thousands of border patrol agents throughout California, Texas, and Arizona, not to mention growing numbers of bandits and drug cartels that prowl the desert.

In 2011, 62 percent fewer migrants attempted to cross the border illegally than in 2007; however, the proportion of border crossing fatalities continues to rise, according to U.S. Border Patrol numbers. From 2001 to 2011, more than 2,100 immigrants died in Sonora, 249 in 2010 alone.

Moving forward, De León, who is the grandson of an illegal immigrant, wants to look more closely at what, exactly, happens to the bodies in the desert.

Many go unclaimed. “There are more than 700 unidentified human remains in Tucson,” he says. “It’s another, though more morbid, type of artifact.”

It all shines light on what happens behind the scenes — as politicians debate and policies are rejected and passed, thousands of migrants walk into the desert. Some never walk out. Their stories are lost.

“This process is shrouded in mythology and rhetoric. I’m saying, here’s a social phenomenon that no one’s trying to understand, let’s look at it.” De León picks up a boot on his desk, which he found 60 miles from the border. Whoever it once belonged to had walked a long way — likely lost.

“I want to document what’s really happening. Not what people think is occurring, not what they want to believe, but what’s actually taking place.”

Lara Zielin is the Editor of *LSA Magazine*.



Trash Talk

Numerous environmental groups are concerned about the volume of trash that migrants leave behind in the desert, but there’s an increasing focus on what Border Patrol agents are dumping as well.

“I’ve seen discarded radios, batteries, goggles, and enormous tires that Border Patrol agents drag across the sand so they can see footprints and track people,” says Ashley Schubert, a Ph.D. candidate in LSA, who studied the Border Patrol trash firsthand in her field research with LSA Professor Jason De León.

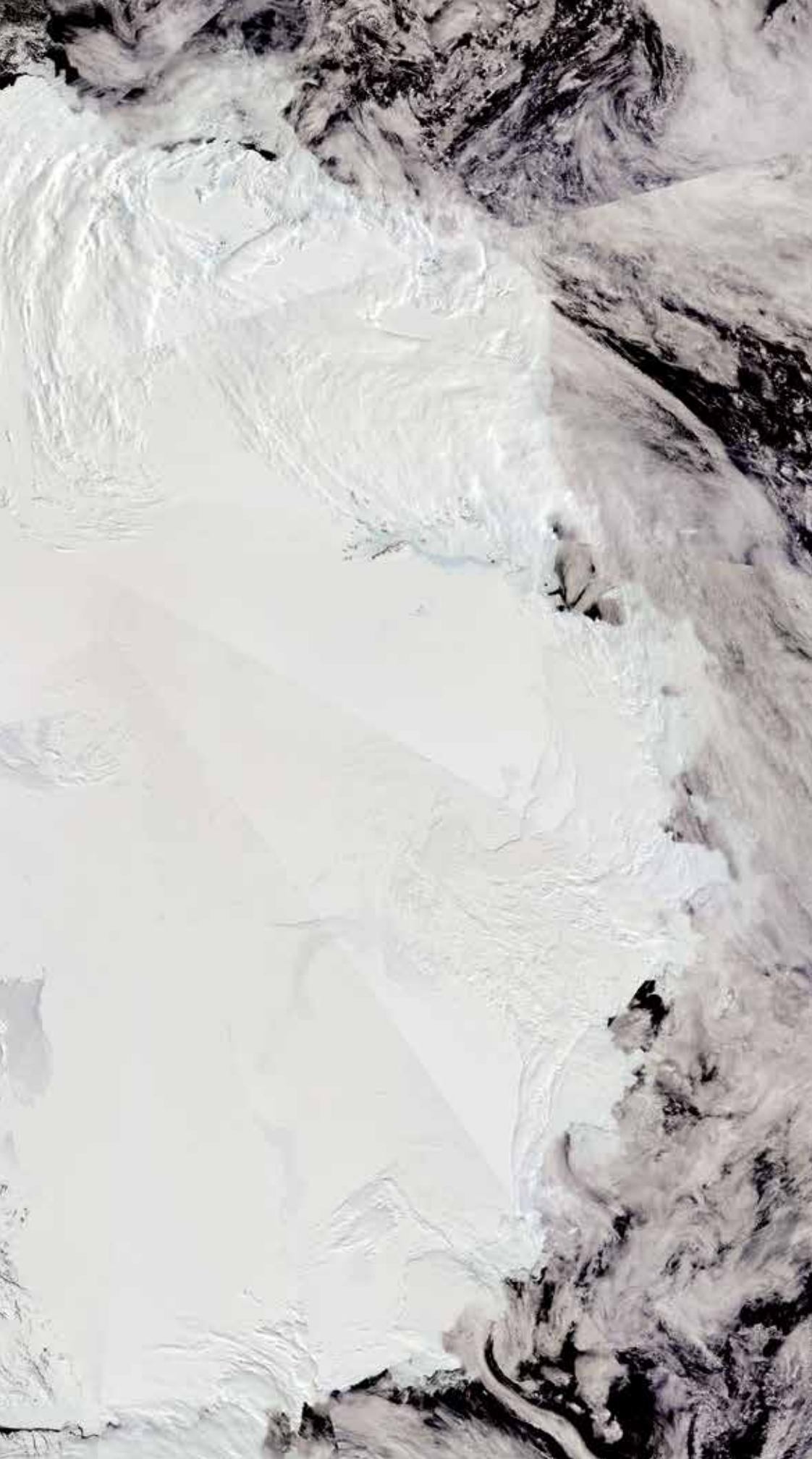
These objects, Schubert says, while less numerous than some of the backpacks and water bottles commonly associated with migrant trash, actually have a greater environmental footprint. “A battery in the desert will do much more damage than a T-shirt or a pair of shoes. These technologically advanced items are profoundly harmful.”

In 2011, the U.S. Fish and Wildlife Service published a report linking environmental damage in the Sonoran area to Border Patrol operations. The Sierra Club said recently that Border Patrol vehicle tracks are damaging wilderness areas in Arizona’s Organ Pipe Cactus National Monument and Cabeza Prieta National Wildlife Refuge, where motorized traffic is prohibited by law.

Schubert will conduct additional fieldwork on border patrol trash this coming summer, while lawmakers debate how Border Patrol can effectively do its job without harming the environment.

In 2006, an agreement providing for cooperation on border security and environmental protection was signed by multiple government agencies. Senator John McCain (R-Arizona) is fighting that proposal, while another proposal by Representative Rob Bishop (R-Utah) would waive 16 environmental laws on federal lands within 100 miles of the Mexican and Canadian borders, according to the Sierra Club.

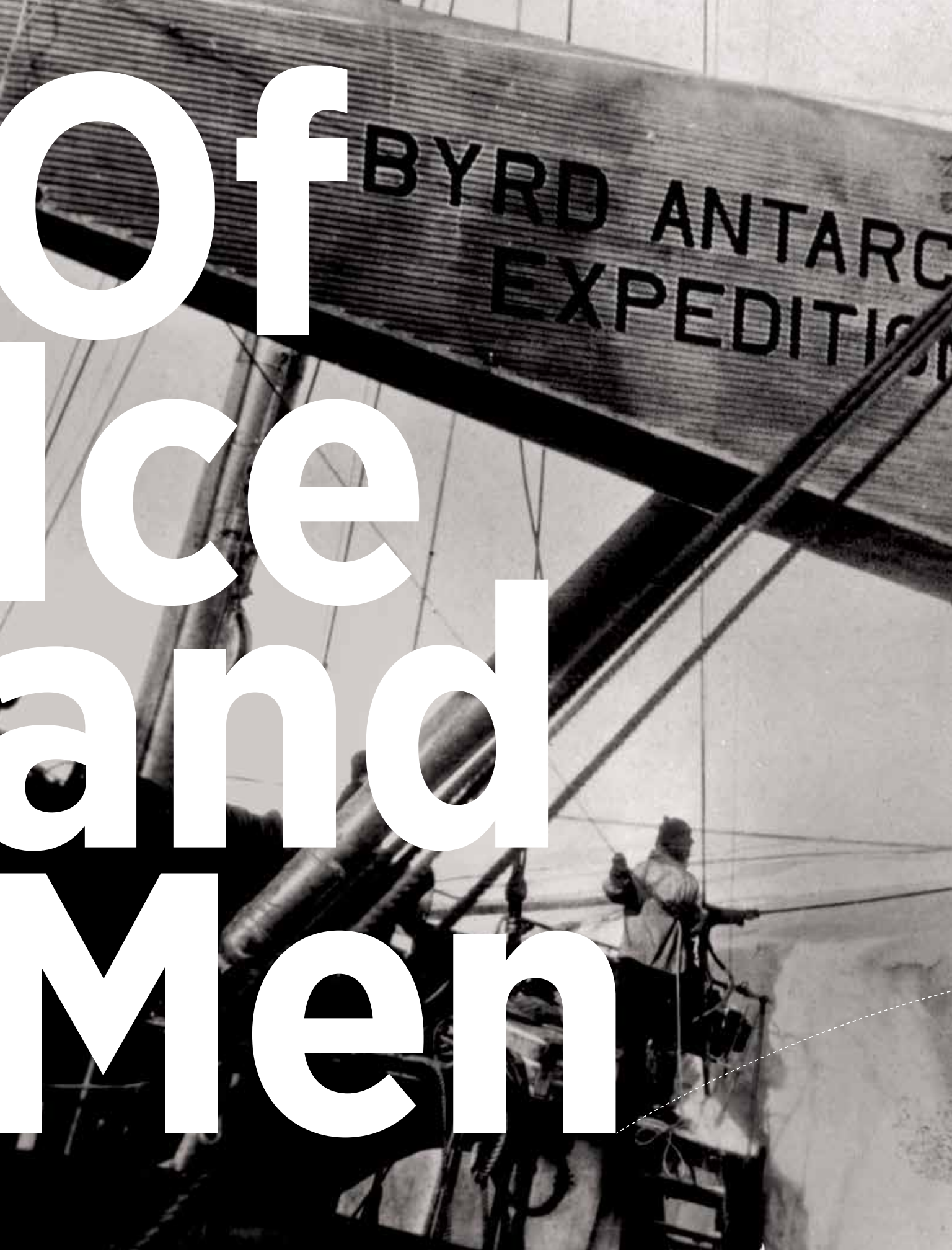


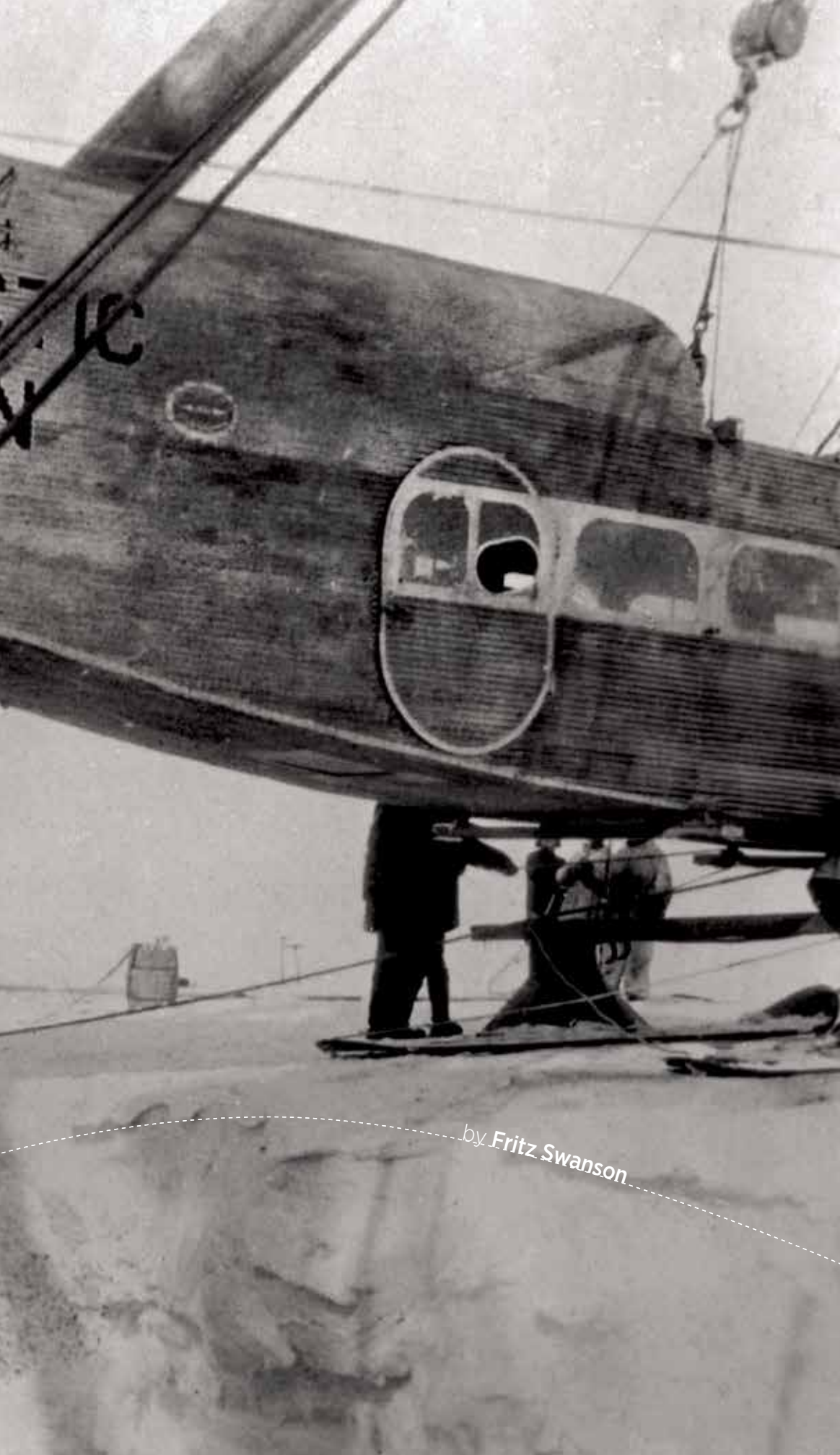


C I C N

Of Ice and Men

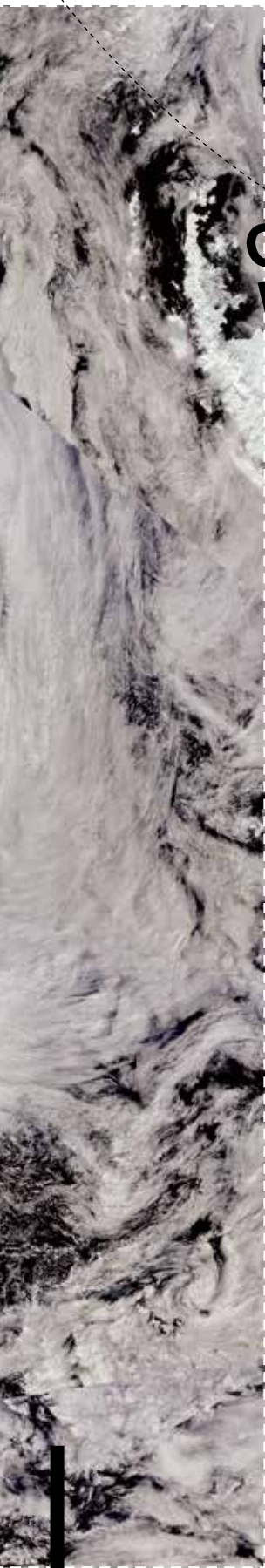
BYRD ANTARCTIC
EXPEDITION





AS THE ANT-
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BRINGING THE
SCIENTIFIC
METHOD TO
THE TIP OF
THE EARTH.

by Fritz Swanson



**ON NOVEMBER 25, 1929,
LAURENCE MCKINLEY
GOULD ('23, PH.D. '25)
CHANGED HIS UNDERWEAR.
GOULD AND HIS COMPANIONS, GEORGE "MIKE"
THORNE, JACK O'BRIEN, NORMAN VAUGHAN,
EDDIE GOODALE, AND FREDDIE CROCKETT,
ALONG WITH 54 DOGS, HAD SET OUT IN LATE
OCTOBER ON AN EXPEDITION ACROSS THE
ROSS ICE SHELF TO THE BASE OF THE QUEEN
MAUD MOUNTAIN RANGE IN ANTARCTICA.**

It was Gould's contention that "real" explorers did not change their underwear very often. And so for three long weeks the men, driving teams of huskies across the ice, fording deep blue crevasses down which men could slip and be lost forever, forged on with sweaty and soiled underpants.

Norman Vaughan later wrote that Gould's announcement that a change was finally warranted was greeted by the team with a shout of joy, and a small party.

"We put on our new set of underclothing and packed away our dirty underthings. What a grand feeling—as if I had just enjoyed a Saturday night bath. That change of clothes gave us such an uplift, we made five extra miles the next day."

The Ross Ice Shelf, over which they sledged, is the largest ice shelf in Antarctica. It is approximately 500 miles across, and measures 188,000 square miles, about the same size as Spain. Daily temperatures can reach -10 degrees Fahrenheit — on a good day. Gould, a University of Michigan geologist, was the scientific leader on Admiral Richard Byrd's famous 1928 expedition to fly over the South Pole. Since the Ross Shelf was historically the gateway to the pole, it was Gould's job to lead a team to its southernmost point, scale the mountains that ascended to the Antarctic plateau, and perform a geologic survey while Byrd flew his Ford Trimotor to the pole and back.

On Thanksgiving Day, November 28, 1929, Richard Byrd made his historic flight. Gould's team was almost to the mountains. As Byrd flew past, he parachuted a care package to the men. In it, among other things, were the results of the November 14 football game between Harvard (the alma mater of Goodale, Vaughan, and Crockett) and Gould's Michigan.

Gould announced to his men that Michigan had defeated the Crimson 14 to 12. Later that day, Byrd circled the South Pole.

The world was rocked by news of Byrd's polar flight. Though it had taken 14 days for Gould and his men to get the sports scores, it took mere minutes for Byrd's achievement to circle the globe. Radio operators as far north as New York had picked up the weak transmissions Byrd sent out from Little America, his base on the ice shelf. The news of his success was announced in Times Square almost simultaneously to its occurrence. This kind of global immediacy was a world first, and few things except the landing of a man on the moon quite matched the excitement.

And yet, the real substance of this unique and pivotal expedition would remain unknown until after the men returned. The aerial mapping of the pole by Byrd was a substantial technical achievement, but Gould's geologic expedition was scientifically forward-looking and, in many ways, the first of a new breed of Antarctic expeditions.

THE HEROIC AGE OF ANTARCTIC EXPLORATION

Antarctic exploration had been, since the beginning of the 19th century, defined as a geographic quest. Naval men and whalers wanted to cross the landscape, and to map out the unexplored territories.

It wasn't until the Victorian era that people understood that scientific exploration, especially geologic exploration, was relevant in Antarctica. Many still assumed that ice-covered water dominated the landscape, and if there were land masses, they were merely small islands.

James Clark Ross shared this view. Ross, from whom the ice shelf took its name, had sailed in the 1840s down to the Antarctic seas in order to find a water passage to the South Pole, and had been stopped by the ice. But as he circumnavigated the continent, he took note of the mountains rising up out of the swirling snow, and the realization of the scale of the continent was starting to take hold.

But it wasn't until 1898 that the Southern Cross Expedition, led by Carsten Borchgrevink (a half-English, half-Norwegian explorer living in Australia), brought the first scientific expedition to the continent. They stayed a full winter on the Ross Ice Shelf (the first team to do so), making meteorological and magnetic observations the whole time, producing the first systematic portrait of the continent's weather, on which all future expeditions relied.

This was the leading edge of what is now called the Heroic Age of Antarctic Exploration, and was followed by a flurry of expeditions that inflamed the public imagination with claims of "first" and "farthest south," but also invigorated the scientific world with a slowly developing portrait of the continent.

It was in this world that Laurence McKinley Gould came of age. Born in 1896, two years before the Southern Cross Expedition, Gould grew up in the village of Lacota, Michigan, near the city of South Haven.

In 1901, when Gould was five years old, Robert Scott led the British National Antarctic Expedition (also known as the Discovery Expedition) down to

the Ross Sea to follow up on the work started by Borchgrevink.

In the expedition's third year, after scaling what was later called the Taylor Glacier to a height of 8,000 feet, 22-year-old Cambridge student Hartley Ferrar (who had been brought on the expedition "so that he could be made a man") observed that the mountains contained sandstone, and that the sandstone contained coal.

This was a monumental discovery. The sandstone implied that Antarctica was once open water, free from ice. And the coal implied that this wet continent once had plant life sufficient to be compressed into coal. Antarctica was once temperate, perhaps even subtropical.

But the men who organized these expeditions were focused on the race south, and the scientific discoveries were always constrained by these other goals, as well as the harshness of the environment.

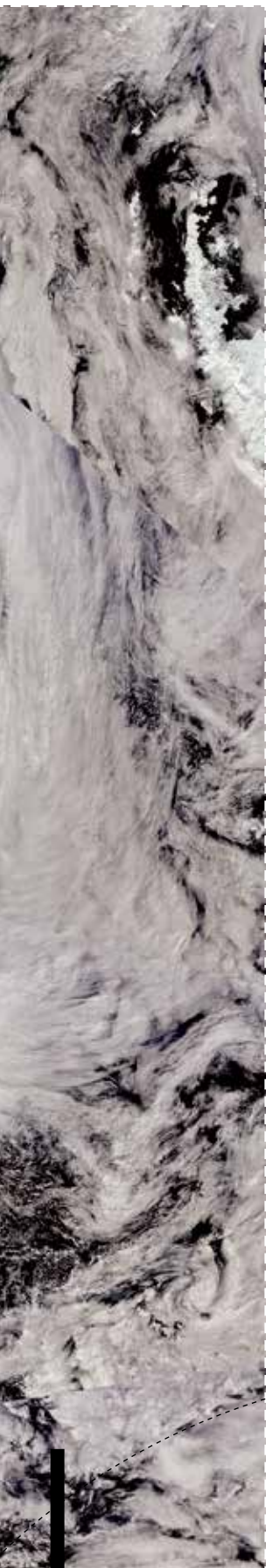
In 1910, Gould enrolled in South Haven High School. While he was excelling in the sciences, and thinking about how he would eventually pay for college, Antarctica's Heroic Age reached its climax.

The investigation of the continent had boiled down to a contest to simply get to the South Pole. Norwegian Roald Amundsen reached it first, beating out British explorer Robert Scott, on December 14, 1911. Scott arrived to the pole to find a Norwegian flag. Despondent, he and his team froze to death on the return.

Gould was 16, and the culture all around him was electric with these achievements and grisly failures. A few years later, in 1914, Ernest Shackleton attempted to be the first to cross the continent, but became stranded when his ship, the *Endurance*, was trapped in ice.

While Shackleton was starving and freezing, his ship torn apart, Gould was in Boca Raton, Florida, teaching elementary school and saving up money to go to college. In 1916, just as Shackleton was being collected by his rescuers, Gould arrived in Ann Arbor. But as World War I spread across Europe, he paused his career to enlist in the Ambulance Corps. For a year he trained in Pennsylvania, and in the summer of 1918 he was finally stationed in Italy. By the fall, he was in Verdun driving an ambulance near the front line. The war ended on November 11, but Gould and his men served the wounded for months longer, not leaving the work until the spring of 1919.





When Gould returned to Ann Arbor, he was set on becoming a scientist. By 1920 he had found a mentor in U-M geologist William Herbert Hobbs, a startling and quick-witted man with a huge red beard.

Even though he hadn't yet earned even his bachelor's degree, Gould was a teaching assistant in the Department of Geology by 1920, and by 1921, he was an instructor. This was the first step on a path that would eventually lead him to earn a Ph.D., and to become a full professor on the Michigan faculty.

SEDIMENTARY, MY DEAR WATSON

In 1926, Gould and his mentor Hobbs secured University support for a geologic expedition to Greenland and the Arctic Circle. That same year, Byrd became the first man to fly over the North Pole. In 1927, having lost to Charles Lindbergh in the race to be the first man to cross the Atlantic nonstop, Byrd turned his eyes south.

Where Scott and Shackleton and Amundsen saw Antarctica as a measure of a man's brawn, Byrd saw it from the American perspective: a technical challenge.

With financial backing from *The New York Times*, Byrd announced he would set out on an extended expedition to the pole, demonstrating how solid planning and advanced American technologies could conquer a landscape that had been so deadly just two decades earlier.

It was a brash announcement that was intended to frame the postwar world as an American one. In this sense, the Byrd expedition was the last Heroic Age Antarctic expedition, in that it sought only to certify and do easily what had been accomplished with such difficulty years earlier. But it was also the first in the modern age of Antarctic exploration, showing that what had once been challenging could now, through technology, be safe and manageable, if not easy. Byrd's techniques would be the platform upon which all future research was built.

Gould met Byrd at Hill Auditorium on November 22, 1927, after Byrd had given a lecture. Gould recalled that they "hit it off extremely well," and by the end of

the evening, Byrd had tentatively announced Gould as the expedition geologist.

For the next few months, after securing a leave of absence from the U-M Board of Regents, Gould worked diligently to plan out the scientific program, going so far as to assemble a 3,000-volume reference and entertainment library for Byrd's 82-man expeditionary team. All the while, *The New York Times* ginned up fanfare for the expedition, the men were feted by celebrities, and a dance craze, "The Byrd Hop," was sparked by the planning.

By December 28, 1928, Gould and the other men of the Byrd expedition stepped off their ship, *The City of New York*, onto the ice of the Ross Shelf. They had decided to approach the ice landing by way of the Bay of Whales, and to follow Amundsen's direct route from the Ross Sea to the pole.

ALL THE WHILE, THE NEW YORK TIMES GINNED UP FANFARE FOR THE EXPEDITION, THE MEN WERE FETED BY CELEBRITIES, AND A DANCE CRAZE, "THE BYRD HOP," WAS SPARKED BY THE PLANNING.

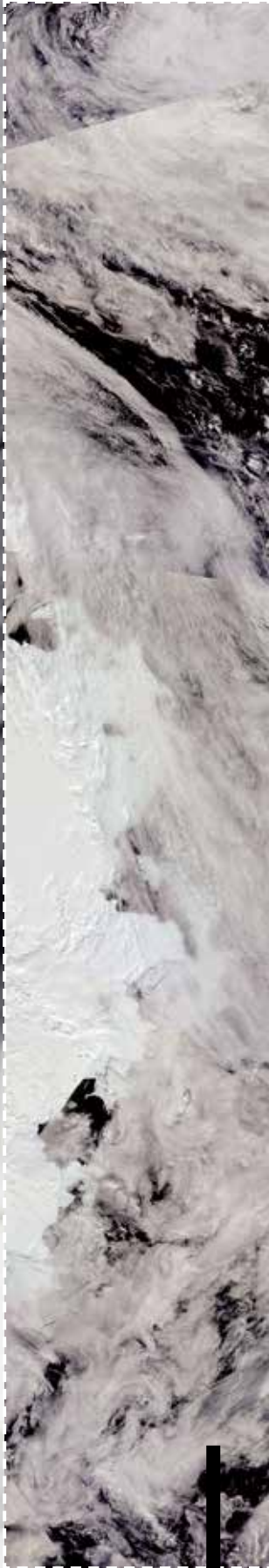
They had decided to achieve in one mission, with the aid of planning and technology, all of the things that the Heroic Age explorers had attempted over the course of decades, and at great cost of life and energy.

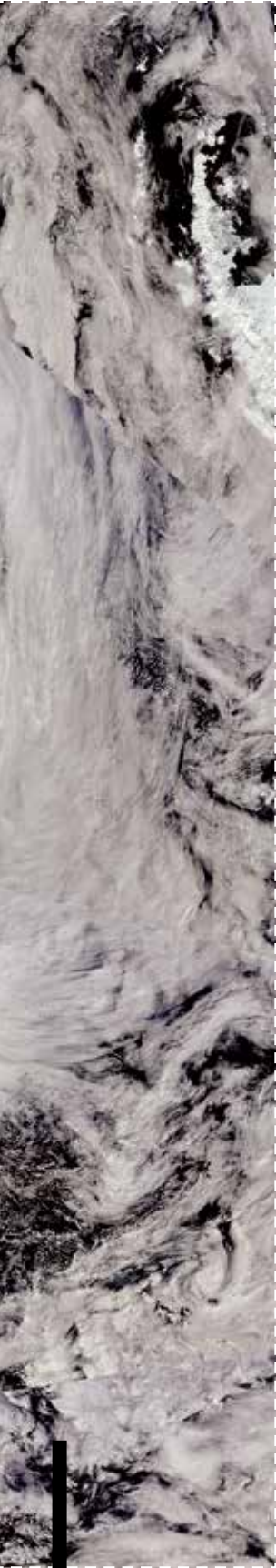
By the end of January, the party was sufficiently established on the ice shelf. Byrd was able to go for a reconnaissance flight, during which he discovered a new collection of nearby mountains unconnected to the vast ranges that surrounded the shelf. He called these the Rockefeller Mountains, named for John D. Rockefeller Jr.

When a break in the bad weather presented itself in early March, Gould convinced Byrd to allow him and two pilots to take one of the expedition's three planes on a short flight to the mountains in order to do exploratory work.

Byrd consented, but after Gould and his men left, the weather took a bad turn. With only a small

Laurence McKinley Gould studies a geologic map in September 1928 in preparation for his South Pole expedition with aviator Richard Byrd.





amount of exploratory work accomplished, and with the disappointing discovery that the mountains were solid granite (and therefore useless for the kind of detailed geologic work possible with sedimentary rock), Gould and his men found the wind and weather bearing down on them. Ultimately, they could not properly secure the aircraft to the ice. Winds in excess of 120 miles per hour scooped the plane up, flipped it over, and crashed it against the ice almost a mile away.

For a time the world thought Gould was lost to the ice. His mother told a reporter from the *South Haven Daily Tribune*: “He threw me a kiss as he left the house and told me, ‘I’ll see you again.’ We expected him back...” She then added, “Of course, I’m feeling pretty blue this morning. But Laurence has had so many hairbreadth escapes that we are not giving up hope.”

GOULD AND HIS MEN FOUND THE WIND AND WEATHER BEARING DOWN ON THEM. ULTIMATELY, THEY COULD NOT PROPERLY SECURE THE AIRCRAFT TO THE ICE. WINDS IN EXCESS OF 120 MILES PER HOUR SCOOPED THE PLANE UP, FLIPPED IT OVER, AND CRASHED IT AGAINST THE ICE ALMOST A MILE AWAY.

Byrd rescued the team a few days later and, though much of the food and equipment they’d taken with them in the first plane had to be abandoned, Gould hid a few rock samples amidst the remaining gear.

With the disappointing realization that his newly discovered Rockefeller Mountains would yield little scientific enlightenment, Gould turned his attention back to the Queen Maud range.

Amundsen had crested them with little care for their scientific inquiry. But Gould believed they might be part of the same geologic system as the mountains of Victoria Land at the coast. He wondered if they weren’t siblings to the mountains observed by Hartley Ferrar in 1903.

But the greatest question facing Gould was whether he could produce the science to prove any of it.

In December 1929, as he scaled the range, Gould saw the telltale signs of stratigraphy at the tops of the mountains. It indicated that he might finally find sedimentary rock, laid down eons ago by warm water, which would link the mountains with other

coastal ranges with the same composition. But as he climbed the mountains, he worried that what he was seeing was alternating dark and light bands of volcanic rock, which would be useless to his hypothesis.

On December 8, Gould and his men came to a saddle in the mountain, and they picked their way laterally “along a steep slope.” Below them gaped a chasm. “A serious slip,” he wrote later, “and we might have all ended up in it without leaving any trace at all.”

Finally they made it to a small outcropping.

There, he found a rock.

“That little piece of rock which I first picked up and which was not half as large as the palm of my hand had repaid me for the whole trip....[T]his little piece of yellow sandstone... told me beyond question” that this range was contiguous with Ferrar’s range to the west and that this was “the most stupendous fault block mountain system in the world.”

Later, Gould even found a thin seam of coal amidst another outcrop of the so-called “Beacon Sandstone.” He held a match to the black rock, and with some difficulty, it burned. All of the observations made previously about the continent’s geology and geography had just been confirmed, and the confirmation documented.

This was the scientific method, and Gould had brought it to the tip of the Earth.

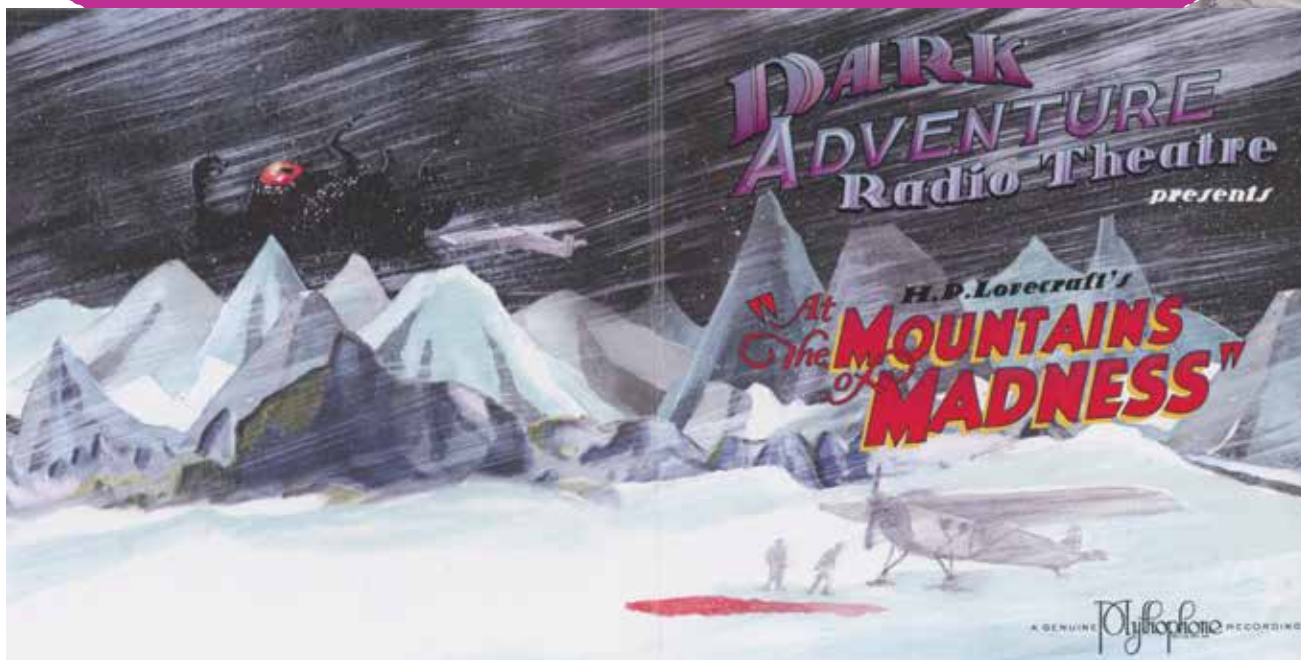
ON JANUARY 9, 1932, Gould resigned his position as associate professor of geology at the University of Michigan. He had been offered a very generous pay increase to join the geology faculty of Carleton College in Northfield, Minnesota, where he arrived in the fall as the highest-paid professor on campus.

By 1945 he was president of the college, serving until his retirement in 1962.

He returned to Antarctica six more times. On his second-to-last trip in 1977, at the age of 80, Gould stayed in the permanent barracks of McMurdo Station, established on Ross Island.

Remarking upon the increase in the level of comfort in comparison to the base camps of his early years he crowed, “My God I slept between sheets!”

Fritz Swanson teaches in LSA’s Department of English Language and Literature and is the founder of Manchester Press.



Mountains of Madness

HOW WRITER H.P. LOVECRAFT USED GOULD'S ANTARCTIC ADVENTURES TO INSPIRE A THRILLING STORY.

Born in 1890, writer H.P. Lovecraft grew up in the Heroic Age of Antarctic exploration, when the world watched as men like Robert Scott and Roald Amundsen and Ernest Shackleton battled to be the first to conquer the continent.

Lovecraft was at the apex of his literary career when Laurence McKinley Gould went missing at the edge of the Earth in 1929.

The Antarctic wasteland seemed to have swallowed Gould whole. His disappearance inspired Lovecraft to write his short novel, *At the Mountains of Madness*. In it, a university expedition sails down to Antarctica to perform geologic exploration. Once the group arrives, a small team flies out to explore a newly discovered mountain range. This advance

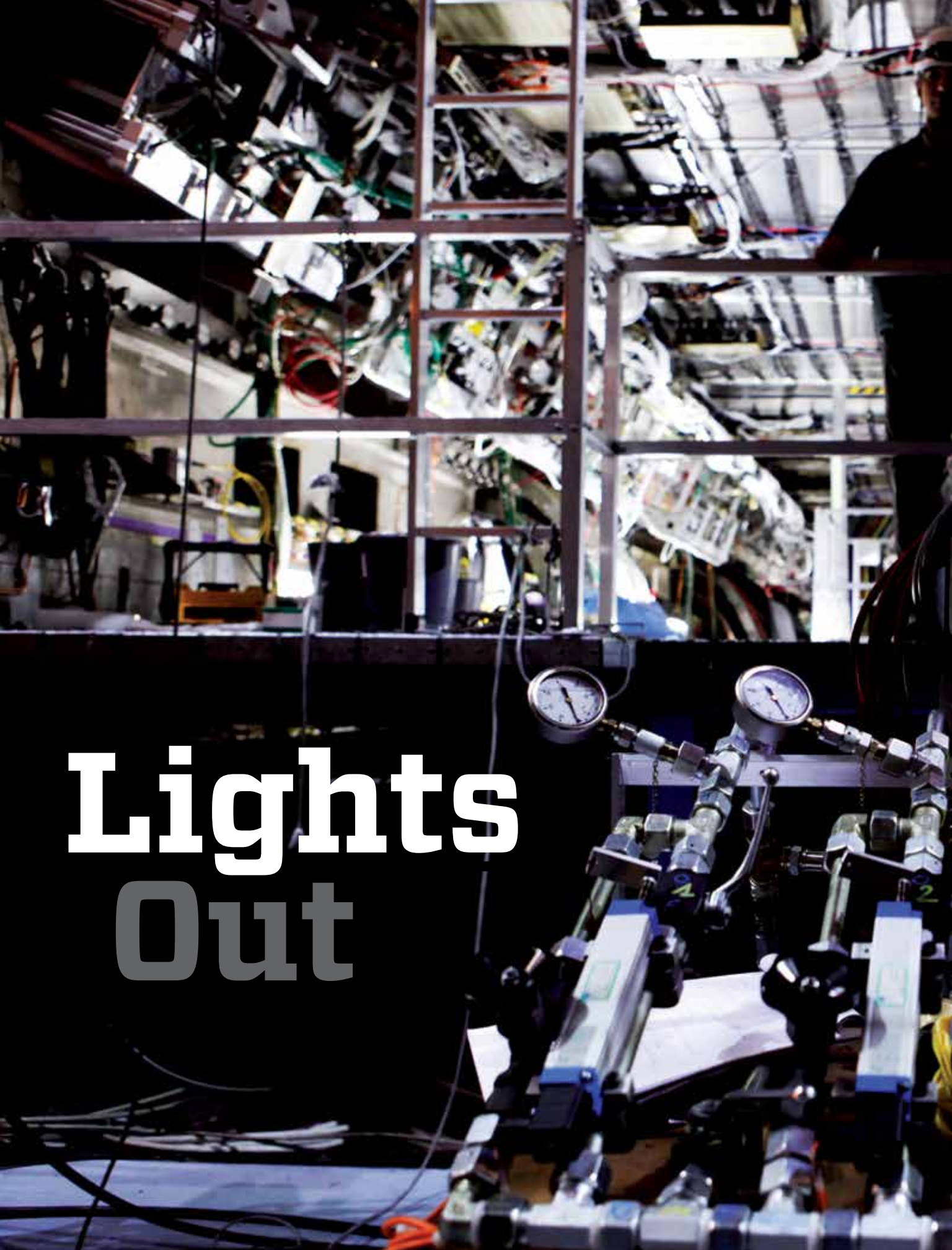
party is lost, and the leader has to organize a rescue mission.

In a 1987 article, Lovecraft scholar Jason C. Eckhardt successfully showed that Byrd's expedition was a template for the book. The specific plot of the novel precisely matches Gould's fateful excursion.

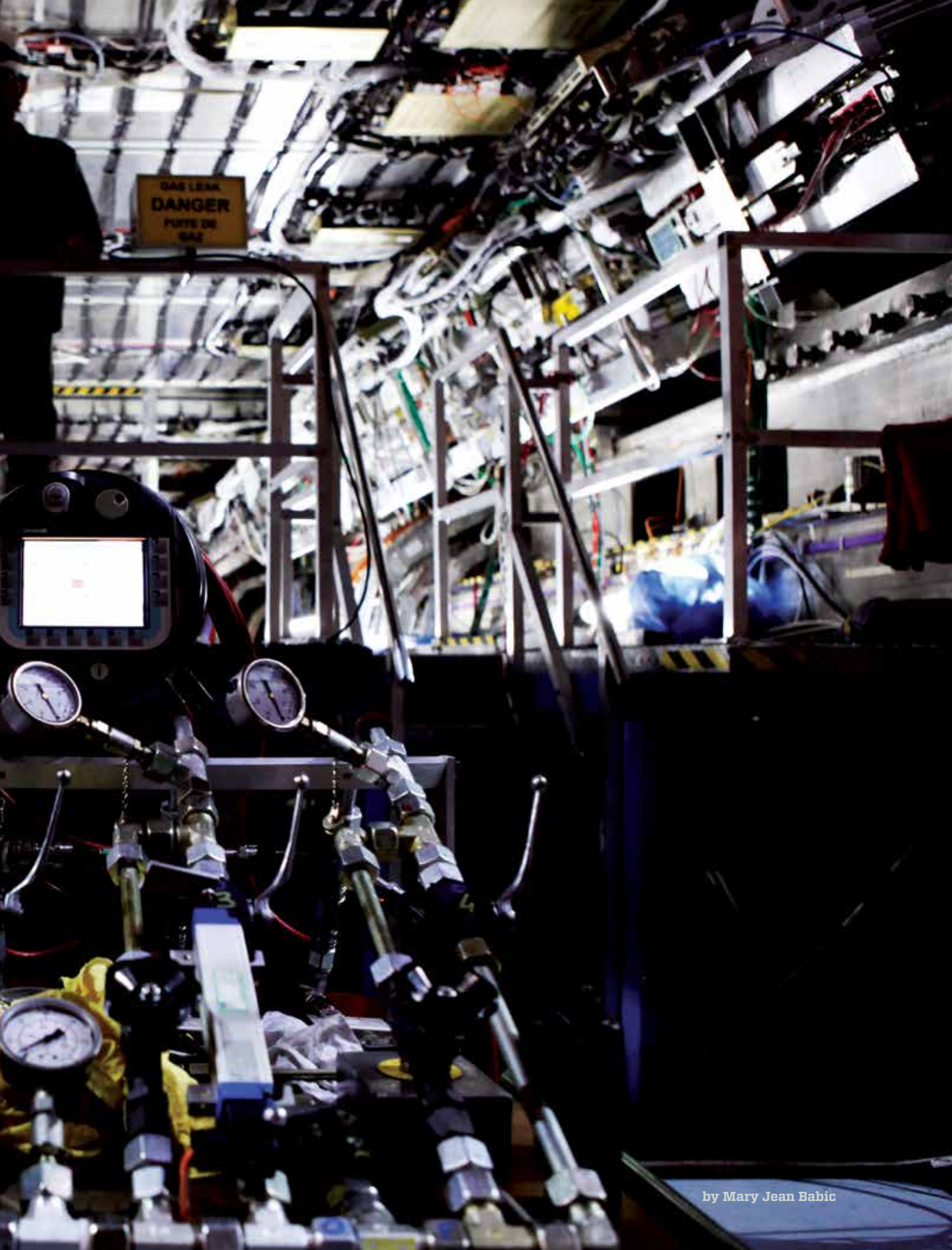
Gould was ultimately found and returned to camp safely. But in Lovecraft's tale, the outcome isn't so rosy. The expedition discovers a lost city from a prehistoric epoch. Monstrous creatures hunt down the explorers, and all but a few are lost. A few men, including the geologist, escape and try desperately to warn the world.

Lovecraft's novel would go on to serve as inspiration for many pieces of modern horror.

Stephen King would later describe Lovecraft as "the dark prince" of American horror writing. Science fiction author Clive Barker likewise added that he was "one of the cornerstones of modern horror." And even now, the book is in development as a major motion picture directed by Guillermo del Toro.



Lights Out



by Mary Jean Babic

The Large Hadron Collider is experiencing a brief and well-earned rest before it powers up to experiment anew. Now that the so-called “God Particle” has been found, what will scientists look for next? LSA scientists who were on the forefront of the Higgs discovery weigh in on the future of physics.

The news came from the European Organization for Nuclear Research (CERN) in Geneva, Switzerland, on July 4, 2012: The long-sought Higgs boson had been discovered. This elusive, unique subatomic particle that gives mass to other particles fills in the last blank in the Standard Model — the summation of the 12 particles and four forces that make up everything in the universe, and the determining

principle of high-energy physics research for the past four decades. With a well-worn path between Ann Arbor and CERN, LSA faculty, staff, and students who contributed to the Higgs hunt — some 130 over the past 14 years — are taking stock of the post-Higgs landscape. Significant, textbook-rewriting leaps may be at hand, they say, on some of the universe’s most compelling questions.

“IT’S LIKE NO OTHER TIME IN MY CAREER, for sure,” says Physics Professor Gordon Kane, co-author of a major book, *The Higgs Hunter’s Guide* (Westview Press, 2000), about the search. “It’s one of the most exciting times in the history of all science.”

The first order of business has been to confirm that this new boson is, in fact, the particle theorized by British physicist Peter Higgs back in 1964. In the months since the discovery, researchers have been consumed with determining its characteristics, such as quantum number and spin, and continued to test the boson to see if it behaved the way it is supposed to. Physicists are a careful lot, and they waited until mid-March to confirm that they had, in fact, gotten it right.

The discovery will be “a new bridge to new territory,” says Professor Bing Zhou, one of CERN’s leading physicists, to

unknotting some of the big questions now facing physicists, such as supersymmetry, dark matter, and anti-matter.

For Kane, the next sure bet is on supersymmetry. He wrote a book of that title, published in 2000 (Basic Books), and is one of the topic’s leading researchers. Supersymmetry theorizes that all known elementary particles have partner particles that behave the same way but have different spin and greater mass. As yet, there’s

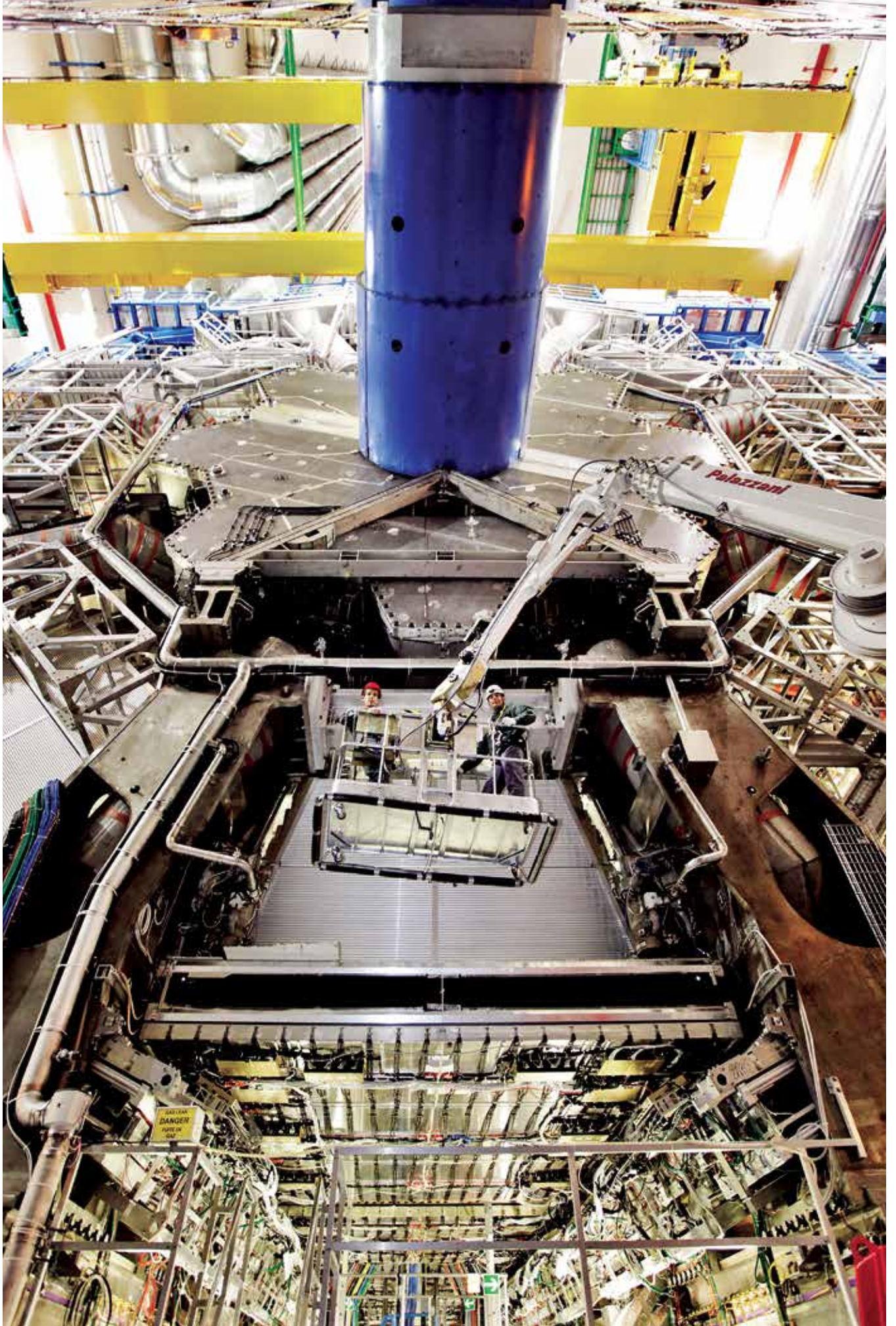
Research Scientist Edward Diehl (far left) stands alongside some of the 31,000 25-foot tubes he and a U-M team made for the ATLAS muon detector. Led by Physics Professors Bing Zhou and Homer Neal, the U-M ATLAS team spent more than a decade planning and building this complex muon machinery.

no direct evidence of supersymmetric partners, but Kane expects that predictions will be borne out in experiments inside CERN’s Large Hadron Collider (LHC), where protons are smashed together at tremendous speeds to recreate conditions at the birth of the universe.

“Supersymmetric partners should be seen next at the LHC, soon,” he says, showing the same confidence that led him to his famous \$100 bet with Stephen Hawking, more than a decade ago, that the Higgs would be found.

If they exist, these previously undetected heavy particles could explain dark matter, which scientists believe makes up a large portion of the universe but can’t be seen; it can only be inferred by its gravitational effects. The Higgs boson was detected at an energy level of 125 billion electron-volts, so knowing the Higgs’





“signal,” Zhou explains, will allow physicists to narrow down the range of signals in which they search for supersymmetric partners, hopefully providing a better shot at finding some.

It’s not only supersymmetric partners that might be revealed. Right now the quark is the smallest known particle, and nothing suggests there’s anything lurking within it. But Professor Homer A. Neal remembers his days as a physics graduate student, in the early 1960s, when the most basic constituent of matter was believed to be the electron. Lo and behold, in 1968 scientists discovered the quark. So when the LHC, after its two-year-long sabbatical, resumes operations in 2015 at nearly twice its energy level — seven trillion electron-volts, up from four trillion — all kinds of new things might pop up. “You may have five Higgs — if nature is indeed described by supersymmetry,” says Zhou. “Maybe there are five fish, and we only caught one.”

Also looking for more fish is Assistant Professor Junjie Zhu, whose work focuses in part on new physics, beyond the Standard Model. Before the Higgs discovery, he says, he and his colleagues were testing models to solve problems with unitarity in high-energy physics without introducing the Higgs. “With the discovery of the Higgs-like boson this past July, we do not need to consider such models anymore,” says Zhu. But his group wants to know if the Higgs alone produces the effects seen in some of their experiments, or if other heavy particles are playing a role. “With more data collected, we can gain higher and higher sensitivity to these particles.”

Indeed, armed with higher energy in the LHC, “we can reach for the deepest levels of understanding,” says Kane. “The boundaries of science have changed, in a sense, and we can answer what I call the primary questions.”

Mo Power, Mo Problems

Among the most basic dilemmas the Higgs may help reconcile is gravity — the force so familiar to anyone who’s ever slipped on an icy sidewalk, and a thorn in the side of the Standard Model. As CERN explains on its website: “The quantum theory [that] used to describe the micro world, and the general theory of relativity [that] used to describe the macro world, are like two children who refuse to play nicely together. No one has managed to make the two mathematically compatible in the context of the Standard Model.”

One possible route to resolving that dilemma is string theory. By treating subatomic particles not as points but as strings of Planck length (1.6×10^{-33} cm), the universe’s fundamental building blocks and forces become distinguishable by their vibrations, much like an A chord differs from a G chord when plucked on a guitar, although the strings look the same. Detecting strings would require particle detectors millions of times more powerful than the ones we have now, so experimental confirmation of gravitons is practically impossible. But theorists, such as Kane, are perfectly comfortable without direct experimental proof, so many believe strings to be a necessary component of the ultimate goal: a theory that fully explains all known physical phenomena in a simple set of elegant equations.

The complex machinery behind ATLAS, a particle physics experiment within the Large Hadron Collider. Parts of ATLAS were constructed at U-M, including tubes for the muon detector (see photo, p. 29). Muons are charged particles that may be produced when heavy particles decay. By forcing particles such as muons to interact, physicists could “see” their presences, ultimately helping them isolate the Higgs boson.

That theory very probably includes extra dimensions. While that’s a heady concept for non-scientists, for theoretical physicists extra dimensions are expected. They won’t ever be seen directly, says Kane, but their existence will be proven by their role in accurately predicting other phenomena. “We wouldn’t understand the world at all,” says Kane, “without living in extra dimensions.”

Then there’s antimatter. Not to be confused with dark matter, antimatter — which has been created in experiments at CERN — is formed of antiparticles that have the same mass as ordinary particles but the opposite charge. When matter and antimatter meet, they annihilate each other. Scientists believe the universe was created with equal amounts of both, but regular matter seems to have won out. Where did all the antimatter go? No one knows. The mystery remains an active area of research.

Higher energy levels in the LHC aren’t the only thing that will enhance physics experiments. It turns out that the statistical methods developed to quantify the Higgs discovery will save considerable time, so doctoral student Aaron Armbruster, who’s writing his dissertation on these methods under the supervision of Physics Professor Jianming Qian, expects them to be taken up, and expanded upon, in future research.

“A lot of my personal work revolved around implementing the methods into general tools that anyone could use,” says Armbruster. High-energy physics experiments often involve searching for phenomena that have been predicted but not yet seen; these methods allow for statistically valid approximations to replace extensive computing “so that the computation of certain quantities... can be done in a matter of hours or minutes rather than days.”

In fact, it was Armbruster who performed the final compilation to solidify

the Higgs discovery. “I was sort of the first person to see the final result that says, this particle is real,” says Armbruster. Perhaps having a front-row seat for the data made up for not getting an actual seat for the announcement — but then only a lucky few scored a spot in the CERN auditorium that day. Armbruster watched from a nearby conference room, as did Zhu, who played a major role in the Higgs hunt. Back in Ann Arbor, Zhou rose at 2:30 A.M., 8:30 A.M. in Geneva, and watched the announcement via webcast. She didn’t tear herself away from her computer for four hours.

“This was certainly a high-water mark of my career,” says Qian, who led a 130-person team in search of the

Higgs boson in a particular decay channel. “It was exhilarating and gratifying to watch the signal grow as the data accumulated. Many of us worked day and night to finalize the results.”

It was an emotional moment. Scientists knew they were witnessing a historic event, one for which they could claim a share of the credit. Today, many LSA physics faculty members can’t think about the discovery without thinking about their former colleague, Professor Rudolf Thun, who died on August 6, 2012, after a long career in physics and more than a decade of work with ATLAS, a particle physics experiment at the LHC. He and Zhou helped supervise the decade-long construction at U-M of a five-story piece of equipment, called a muon detector, on which ATLAS experiments, so critical to finding the Higgs, are carried out (see caption, p. 30).

It was Homer Neal who initiated the effort for U-M to join ATLAS in 1998. That was a bleak time for U.S. physicists. Five years earlier, Congress had killed the superconducting supercollider, then under construction in the suburbs of Dallas.

It was Homer Neal who initiated the effort for U-M to join ATLAS in 1998. That was a bleak time for U.S. physicists. Five years earlier, Congress had killed the superconducting supercollider, then under construction in the suburbs of Dallas. It was supposed to be the largest, most powerful collider in the world. Watching the project die, says Neal, who had been on its board of directors, “was one of the

most painful things I’ve ever noted.” Many physicists, feeling their life’s work had been flushed down the toilet, vowed never again

to take part in a big scientific undertaking. But construction on the LHC was ramping up in Switzerland, and in the end, Neal says, “scientists will go where they have to go to do their work.”

Neal now heads the U-M ATLAS group, one of the biggest in the experiment. In recent years he’s concentrated on developing techniques for studying particle quantum spin and will be applying these to help confirm that the spin and parity of the newly discovered particle is indeed that required of the Higgs by current theory. He also was involved in developing the computing infrastructure used in

The Fermi National Accelerator Laboratory, or Fermilab, is a high-energy particle physics lab just outside of Chicago. The site was considered for the development of the Large Hadron Collider, as was the superconducting supercollider facility just outside of Dallas before Congress killed it mid-construction. The LHC went to Switzerland, and today, plans for new colliders are underway internationally — but not domestically.





analyzing the mountains of data churned out by ATLAS. Most of the analysis, says Zhou, takes place off site, because CERN simply doesn't have enough resources to support such a vast job. In recent years Michigan has become a major computational center for ATLAS.

Meanwhile, says Qian, there is discussion of building a new collider, possibly in Japan, that's tailored to the study of the Higgs boson. This international linear collider will smash electrons and positrons instead of protons, making it a companion to the LHC, capable of exploring regions the LHC doesn't reach.

"Maybe there will be something else that revolutionizes our field," says Qian. "That's why you need research, to keep pushing the envelope."

Back to the Future

It's an exciting time, to be sure. Yet veterans Kane and Neal both sound melancholy notes about the future of high-energy physics, particularly in the United States. Dominating a wall in Neal's office is a large-format photograph of the tunnel that was dug in Texas for the superconducting supercollider. Light pours in from above; at the bottom stand two men, dwarfed by the vast cavern. The photo is a reminder of what could have been, and what's at stake. Had the supercollider survived, the Higgs might very well have been found there, years ago. And last year, the Tevatron collider at Fermilab (pictured, p. 32–33), near Chicago, was shut down, again due to lack of federal support. That leaves the LHC as the single instrument in the world for high-energy physics research.

"You can't exaggerate it too much — building this machine and having it work is a heroic, monumental achievement in human culture," says Kane. "Nothing

that big will happen again, because no society values that enough."

Neal can see why elected officials don't view supercolliders as a spending priority: What do abstruse physics experiments — which may not discover anything for years, if ever — have to do with the price of gas? But huge scientific complexes can spin off tech startups; after all, the World Wide Web was invented at CERN to allow far-flung scientists to share data quickly. If the convention for web addresses had been established as "hep"—high-energy physics — instead of "www," Kane muses, the field's contributions might be more widely appreciated.

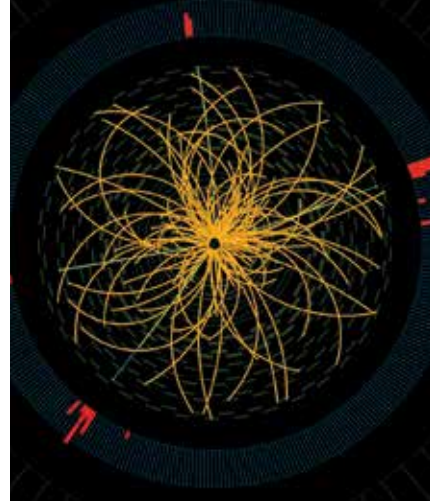
Neal's professional life has been devoted to finding the six predicted quarks in the Standard Model. Those are now found. The Higgs boson is found. His retirement, he says, is not far off. When he thinks about the future of physics, what Neal now wonders most is who will carry it forward.

It used to be, he says, that U-M professors would round up a few students on the weekend and drive to Fermilab, where students could observe actual experiments. No longer. "If we don't keep students interested, the United States will lose its edge," Neal says.

At CERN, Neal helps administer an undergraduate research program that brings U.S. students — including some from U-M — to Geneva each summer for hands-on experience. He's also working to develop a study-abroad program at CERN. Expanding opportunities for undergraduates "is something," he says, "I've taken on at almost a personal level.

"A bright kid could go into any field. Why should they go into a field where they've never seen an experiment?"

Mary Jean Babic is a freelance writer in Brooklyn, New York.



Fundamental Particles

THE U-M PIECE OF THE HIGGS BOSON DISCOVERY

According to a February 2013 *Wired* magazine article, the two Large Hadron Collider experiments, ATLAS and CMS, employ more than 6,000 scientists. And countless individuals have been involved with the search for the Higgs boson since theoretical physicists first predicted its existence nearly a half century ago.

Whether through crunching numbers on the sidelines or leading teams hunting for the Higgs boson in a decay channel, many Wolverines had a role to play in the particle's discovery. Collectively, more than 130 Michigan personnel have worked on this giant scientific project during the past 14 years. Twenty graduate students and 63 undergraduates have participated in the U-M ATLAS project alone. Here's a snippet of some of the key Higgs boson players:

PHYSICS PROFESSORS

Homer Neal
Jianming Qian
Rudolf Thun (1944-2012)
Bing Zhou

PHYSICS ASSISTANT PROFESSOR

Junjie Zhu

PHYSICS PROFESSOR EMERITUS

J. Chapman

RESEARCH SCIENTISTS

Edward Diehl
Daniel Levin
Shawn McKee
Haijun Yang
Zhengguo Zhao

ELECTRONICS ENGINEER

Robert Ball

SCIENTIFIC ENGINEER

Tiesheng Dai

42.22° N, 83.75° W

From **student hackers** to a timely act of grace, our tour of campus starts here.



CAMPUS

Trotter House Origins

How the battle for a bricks-and-mortar structure was really about moving racial integration from rhetoric to reality.

by James Tobin

THE BEST-KNOWN DEMAND of the Black Action Movement (BAM) strike of 1970 was a simple number: 10 percent.

African Americans at U-M in 1970 made up only a tiny fraction of all students — two or three percent. Yet the state’s population was 10 percent black. So the protesters wanted the University to guarantee an equal proportion of black enrollment by the fall of 1973.

But BAM’s leaders also talked about a problem that couldn’t be quantified. It was the social environment — the way it felt to be an African American student who came to Ann Arbor from a de facto segregated school to a campus where every classroom, organization, club, and activity was dominated by white students. The rhetoric of racial integration was all very well. But it didn’t do away with the everyday discomforts and slights that black students endured.

That was why BAM organizers demanded a student center specifically for African Americans. And from that demand grew the William Monroe Trotter House.

“Mainly,” wrote Thaddeus Harrison, Trotter House’s first director, “it was felt that the cultural shock experienced by black students with radically different backgrounds from their white counterparts on a predominately white campus might throw up obstacles in the educational process — feelings of disenfranchisement, depression, underachievement scholastically, and under-utilization of services, causing a

high turnover and drop-out rate.”

BAM’s leaders said the University could take a large step toward helping those students by providing a space just for them. And in 1971, exactly such a place was designated: a rambling, half-century-old house at the corner of South and East University Streets. It had been used for years as an annex of the School of Education. The Regents said no monies from the University’s General Fund should support a facility for only one group, so funding was authorized by the Martin Luther King Jr. Scholarship Fund, which depended on contributions from faculty, students, and alumni.

The house needed some fixing up and a lot of paint, but a crowd of students pitched in to get everything ready.

It also needed a name. The founders chose to honor William Monroe Trotter (1872–1934), an African American activist of his day.

The house opened for operation on November 15, 1971. It soon was crowded with people and activities: workshops for art students led by African American artists; sociology and psychology classes;

orientation meetings for incoming students; academic and career counseling; a chess clinic; parties and dances; and a heavily attended weekly luncheon.

Then, in May of 1972, a defective water heater started a fire, and the house was gutted. Not a month went by before a new and larger space — 11,300 square feet — was purchased to replace the old. It was a broad, brick house at 1443 Washtenaw, built in 1924 to house the Phi Kappa Sigma fraternity. The student center was soon reestablished.

In 1981, it was reconstituted as the Trotter Multicultural Center with the mission of enhancing multicultural awareness and understanding across the campus. More recently it joined with U-M’s Office of Multi-Ethnic Student Affairs to form MESA/Trotter, a single unit with two locations and a shared mission — “to promote student development and empower the campus community around issues of diversity and social justice through the lens of race and ethnicity.”

By the early 2000s, some 20,000 people each year were attending Trotter events.

It continues to fill vital needs at U-M, says Brittany Smith, a senior from Detroit who has played an active role in MESA/Trotter for four years.

“I would say that students on this campus need to feel intricately linked to their identity in the years they spend here,” she says. “But it’s also very necessary that they go across the aisle and understand views very different from their own.” ■

(PREVIOUS PAGE) **The original Trotter House** opened in 1971 at the corner of South and East University Streets. It was destroyed by a fire in 1972.

(BOTTOM LEFT) **Members of the Black Action Movement** host a canned-food drive in 1976.

(BOTTOM RIGHT) **Today, the William Monroe Trotter Multicultural Center** on Washtenaw Avenue works to enhance multicultural awareness across campus.





STUDENTS

Byte the Hand that Keyed You

LSA students are part of a University of Michigan group dedicated to computer hacking. But this isn't the rise of the next Anonymous. Instead, campus programmers collaborate to create code for products that help make the world a better place.

WITH ALL THE THREATS the United States faces — Iran, North Korea, and Al Qaeda, to name a few — President Obama has targeted something else he calls “one of the most serious economic and national security challenges we face as a nation.” It’s computer hacking.

So some might be surprised to hear hacking is alive and well at the University of Michigan. In fact, there’s even a new student group called Michigan Hackers.

But don’t let the name fool you. The student group does not participate in the dark side of hacking. There’s no breaking into video games to play for free, or stealing identities, infecting computers, or trying to launch missiles.

In fact, some of the projects built by students at a recent 24-hour “hack-a-thon” included an app that gives users CPR instructions after providing a screen to dial 911, an app that shows floor plans for a U-M building of your choosing, and a buddy system that links with another smartphone to make an alert noise when the other person strays away.

“The term hacking, as used in the popular media, has a negative connotation,” says Alex Halderman, assistant professor of electrical engineering and computer science at U-M, and an adviser to the group. “People think of breaking into systems, but

“People think of breaking into systems, but that’s not the original meaning. The much bigger idea has to do with creative, active mastery over computer systems in order to make computers maximally useful to us.”

that’s not the original meaning. The much bigger idea has to do with creative, active mastery over computer systems in order to make computers maximally useful to us.”

Max Seiden, a senior studying computer science and music and a founding member of Michigan Hackers, says it’s a “black hat/white hat thing” with the group.

“We like to prototype things,” he says. “Hackers want to see it built, so they will sit down and build it. Our members also are interested in the security side of things. Not breaking into things, but discovering a program’s vulnerabilities.”

For its hack-a-thons, the students — fueled by caffeine and pizza — form teams

and try to build something in 24 hours. This past November, the group held MHacks: Impact Hack-a-Thon to spur student teams to create things that can make a positive impact.

One of the requirements is that groups don’t start with prototypes already in the works. Using code from an earlier project as a template, however, is allowable. A goal of the event is to bring together teams of people who normally wouldn’t work with each other, start with an innovative idea, and build off of that.

Aubrey O’Neal, a first-year student majoring in German, helped develop a mobile app that could shut off a power strip at home where non-essential electronics were plugged in. They named it Chargii.

Her group divided up duties such as programming and finding hardware, and O’Neal researched whether the idea was new and how effective the energy savings could be. She later worked on a logo design, and put together a stop-motion whiteboard video — set to the ELO song “Mr. Blue Sky” — to “illustrate the depth of our idea.”

Meanwhile, on a separate team, Kaitlin Flynn, a third-year Ph.D. candidate in microbiology and immunology, collaborated on a web app that could fix a flaw in Google Docs and Facebook. When people with visual impairments view these sites in high-contrast mode, the clickable buttons disappear completely.

The group went to work on an app for the Chrome web browser that allows

(PREVIOUS PAGE) **Students from universities** across the United States and Canada collaborate in Palmer Commons as part of MHacks’ 36-hour hack-a-thons, where they create various web and mobile applications for prizes.

(THIS PAGE) **Alexander Biggs** (right), of the University of Toronto, and Miker Angalz (far left) of the University of Illinois at Urbana-Champaign, work in a hallway in the Palmer Commons during the hack-a-thon.

(OPPOSITE PAGE) **Chris Cole**, a student from Purdue University, demonstrates his group’s creation: a digital eyepiece that translates text.



for communication between the cursor's location on a page and the highlighted buttons. The team also wanted to add a hardware component — a mouse that would vibrate every time a user hovered over a button.

Not everything went as planned. Hack-a-thon participants say it's fairly certain that most of the projects will break or fall apart, typically in the middle of the night.

Flynn's team discovered that Google specifically blocks the kind of browser-to-computer communication that the team needed to make the mouse work. At the same time, they discovered that a vibrating mouse already existed. So the team tried making a new type of mouse interface, but was unsuccessful.

As the sun rose the next morning, the team only had about 20 lines of code. They put it into a script and tried to get the script to interface with the Firefox web browser.

"It worked — sort of," Flynn says. While their idea of a mouse had to be abandoned, she says the trials and tribulations her team endured are "what the spirit of hack-a-thons are about."

That means "coming together, having a great idea, building and modifying your idea based on if something works or not, and getting help from all sorts of people,"



Flynn says. "And it was really fun to boot."

At the end of the hack-a-thon, 13 teams — including those with Flynn and O'Neal — gave four-minute presentations to the judging panel for a chance at some of the more than \$5,000 in prize money. In addition to the top three places, awards were given for best underclassman hack, best graduate hack, people's choice, largest environmental impact, and most technical hack.

One team's app tracked a user's gas mileage, fuel costs, and overall environmental footprint. Another project allowed anonymous comment streams among Facebook friends. Still another allowed a user to listen to more than 3,000 sounds and never hear the same one twice. And for dorm dwellers, there was an app that lets a user place an order ahead of time for U-M dining halls.

Flynn's team took second place overall, while O'Neal's Chargii project took top honors. The Chargii team's presentation ran into some technical difficulties, but they were able to show the judges O'Neal's stop-motion video.

"Personally, it was extremely rewarding to me because my efforts of making the video played a definitive role in winning the award," she says.

With this hack-a-thon complete, the group is already looking to plan more. In the meantime, new ideas on impactful tools — some more useful than others — are being generated on the mgo-hack website under a running feature called "You Know What We Could Use" (see sidebar).

"Michigan Hackers as an organization is about bringing tech-minded, skilled people together to build something amazing," Flynn says. "It's not always about starting a company or building the next Blackberry Messenger or Facebook. It can just be about bringing a group of students together with widely varied backgrounds and seeing what comes of it. There is so much brainpower on campus — it's beneficial for everyone to put it to good use." ■



THERE'S AN APP FOR THAT

Or at least MHack thinks there should be. Here are some of the ideas for apps and tools they'd love to create, as featured on mgohack.com.

- Safe running/biking routes in Ann Arbor that are tailored to a user's typical distance
- A filter that prevents users from answering their phone if the caller is a robocall or prerecorded message
- An app that tells a person what restaurants are open at a certain time of day or night
- The "Yelp" of naps, through which users can submit nap spots around campus and would include ratings/comments on the quality of the snooze location
- An easy way to send a single message to someone, with distribution through every possible, relevant channel
- An app that keeps track of how much money a person owes friends, and sends debtors a Venmo link every month, through which they can pay up
- An app to request a cab in one click, and if multiple people request a cab from a nearby location, the app assigns them to the same cab so they can split the cost

by Erin Rosenberg



CAMPUS

Registration Incarnations

A brief history of the headaches, long lines, backpack naps, and automated voices that LSA students have endured to get the perfect class schedule.

MOST UNIVERSITY STUDENTS have three primary goals when registering for classes:

- 1 to land a spot in interesting courses in their major;
- 2 to satisfy distribution requirements in the least painful way possible; and
- 3 to avoid 8:00 A.M. classes at all costs.

But before students can lock in that perfect schedule, they must conquer course registration.

In a campus note published in a 1927 issue of the *Michigan Alumnus*, alumni were reassured: “To those who for four years stood first on one foot and then on

t’other during the registration seizure: Plans are under way to eliminate the waiting lines....”

The plan missed the mark, apparently, because decades later, students were still napping on their backpacks as they waited to register for classes. From the beginning to the end of the 20th century, the location of the lines changed, but little else: Students would line up at Waterman Gymnasium (which was demolished in 1977 to make way for renovations to the Chemistry Building), where course lists were posted on large signs. Students shuffled through lines to long tables,



(OPPOSITE PAGE) In the 1940s, students navigated long lines in Waterman Gymnasium in order to make class selections.

(ABOVE) By the 1960s, students picked up IBM cards and punched in their course selections, which were then read by a computer.

where they would pencil in their selections on a slip of paper or, later, punch them on a card. Clerks in the Office of the Registrar hand-tabulated the cards in earlier years; IBM computers streamlined the process in the 1950s, when registration assistants repeatedly reminded students, “Please do not bend the IBM card.”

“The lines were so long in this huge gym, it was daunting,” remembers Diane Binson (’65). “You weren’t sure you’d get your class, but for the most part, I don’t recall being disappointed.”

Even computers couldn’t elevate the process, at least at first. CRISP (Computer Registration Involving Student Participation) was born in 1972, when students in Professor Bernard Galler’s graduate programming course in LSA’s Department of Computer and Communication Sciences devised a new system for registration, incorporating a network of terminals and a central database system. Theoretically, it would update information in real time,

but it did nothing about the long lines. In fact, it might have exacerbated the problem as students queued for a CRISP terminal operator. “We had to line up at Angell Hall and wait in line for what seemed like forever,” recalls Josie Ann Lee (’96).

Like a cake — or maybe an onion — CRISP had layers of complexity. “The trick of it all was the fact that students needed to have a full schedule before financial aid funding would be released,” Todd McKinney (’93, M.F.A. ’95) recalls. “So we would schedule ourselves into classes we weren’t planning on attending, waiting for others to drop out of classes they weren’t planning on attending, until the whole thing worked itself out in some behind-the-scenes alchemy.”

Phone touch-tone registration came to campus in 1994, ending the long lines and ushering in a new era. Sort of. With the new system came an automated voice that students dubbed “the CRISP lady.” The CRISP lady’s repetitions of “please hold on...” and dispassionate admonitions left many students wanting to throw the phone at her imaginary, automated head. She occasionally disconnected calls for no discernible reason. In 1997, a student group fruitlessly petitioned for James Earl Jones (’55) to re-record the voice prompts.

The CRISP lady retired in 1999, the same year U-M launched Wolverine Access, a web-based registration system still in use today. The Office of the Registrar assigns students a login time based on number of credit hours completed. Students peruse the online Schedule of Classes, drop their selections in a virtual “backpack”—akin to a shopping cart for online retail—and enroll in those classes at their appointed registration date and time. However, the login times simply mean students can’t see how long the line is as they strive for the elusive, perfect schedule. “My friends definitely avoided Friday classes,” recalls Chantel Jennings (’11). “I don’t think I had that luxury until second semester senior year, and it was glorious.” ■



WAITING IN THE (TIME)LINE

1841: The first classes are held at the University’s new Ann Arbor location. There are seven students and two professors. Course selections are limited, but almost everyone gets their first choice.

1870: Madelon Stockwell is the first woman to register for classes at the University.

1919: The University purchases keypunch machines, opening the door for punchcard registration.

Mid-1920s: The Schedule of Classes is published.

1930: The advent of early registration allows select students to sign up for classes before everyone else.

1966: Computers are introduced to the registration process.

1972: Students in computer course CSS673 develop Computer Registration Involving Student Participation (CRISP).

1975: CRISP becomes the official method of course registration.

1994: CRISP becomes a touch-tone based phone system; the Schedule of Classes is available online for the first time.

1999: Wolverine Access replaces CRISP, marking the beginning of online registration.

by J. Adrian Wylie ('84)



ALUMNI

Unexpected Mercy

ACT OF GRACE

On March 15, 2013, Keisha Thomas visited campus to speak with students, accompanied by author Karen Simpson, whose novel, *Act of Grace*, centers around a young African American woman who saves the life of a Ku Klux Klan member. Hosted by the Prison Creative Arts Project, the event was part of LSA's "Understanding Race" Theme Semester.

ON A WARM SATURDAY MORNING in June of 1996, several hundred people gathered outside of Ann Arbor City Hall. The crowd was a mixture of protestors, press, and curious onlookers — all there because of the scheduled Ku Klux Klan rally. On the other side of the chain link fence were dozens of police officers wearing helmets and holding shields.

The official KKK rally start time was still 30 minutes away, but my Minolta camera, loaded with black-and-white film, was at the ready.

I positioned myself behind an anti-Klan protestor who was reading a prepared statement to the crowd. Suddenly, someone snatched the bullhorn out of her hands and made an announcement: "There is a known Nazi standing right there," he said, pointing to the back of the group. "We have to get him out of here." The accused was 35-year-old bystander Albert McKeel Jr.

My experience as a photojournalist kicked in.

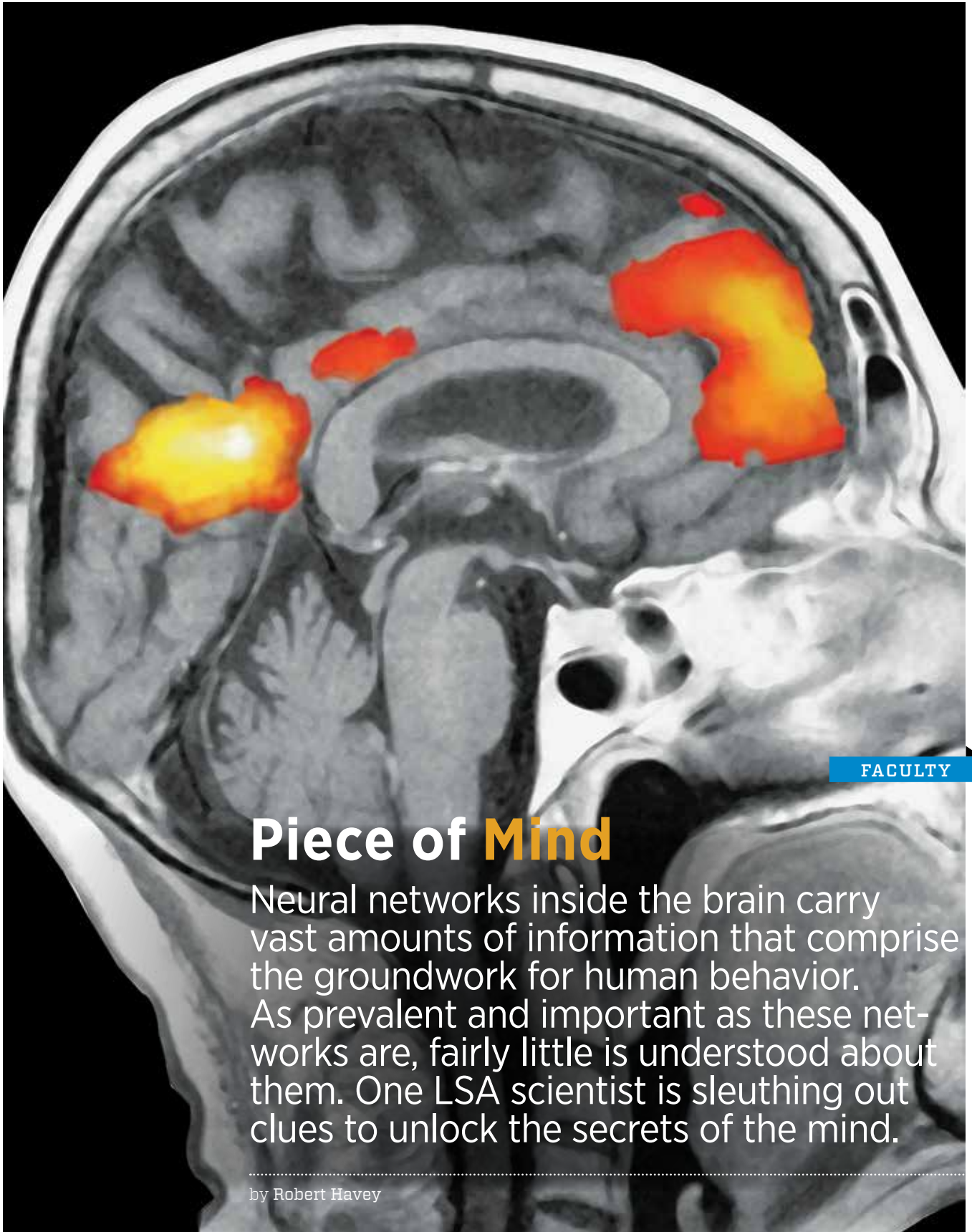
I tried to run in front of McKeel so that I could capture him walking toward me, the threatening crowd following. But just as I pulled alongside him, someone landed a punch to McKeel's face. He was knocked to the ground. The mob went into attack mode.

The gang yanked the cardboard protest signs off their wooden handles and began to beat, kick, and punch McKeel. The police kept their distance.

Then, desperate screams of "Stop! Stop! Stop!" sounded. They were coming from 18-year-old Keisha Thomas. She jumped between the mob and positioned her body to protect the victim.

McKeel remained motionless. Through my viewfinder I saw the Nazi "SS" tattoo on his shoulder and the Confederate flag emblazoned on his T-shirt. Thomas cradled McKeel's head as she continued to shield him.

The gang backed off, and the irony of that day — that a KKK sympathizer had his life saved by a selfless African American woman — has never left me. ■



FACULTY

Piece of **Mind**

Neural networks inside the brain carry vast amounts of information that comprise the groundwork for human behavior. As prevalent and important as these networks are, fairly little is understood about them. One LSA scientist is sleuthing out clues to unlock the secrets of the mind.

by Robert Havey

FOR EVERYTHING SCIENTISTS UNDERSTAND about the human mind, there is still much that's, well, gray matter. Why and how people make certain decisions, for example. Or why brain function declines with age.

Neurons — tiny interconnected cells that carry information — make up the most important part of our brains, and are key to understanding how brain function works. Professor of Psychology Thad Polk is among the many researchers on campus and around the world working to better map this exquisitely complex network that forms the bedrock of our thoughts and actions.

In his lab, Polk uses a technique called functional magnetic resonance imaging (fMRI) to look at what is happening inside the brain while it operates. “Our vascular system sends oxygenated blood to the parts of our brain that are active. The fMRI is sensitive to the change in oxygen levels,” Polk says. “By following that oxygen, you can estimate what parts of the brain are being used when someone is doing a task.”

Observing which of the 86 billion neurons are firing in any given situation makes up much of Polk's work. Although it's a myth that humans only use 10 percent of their brains, it's true that only a subset of neurons are active at a time. Each region of the brain is specialized to handle a certain type of computation, though the regions work in harmony to give rise to our thoughts. “When you think of your grandmother, there isn't a single ‘grandmother neuron’ that is active,” explains Polk. “Your representation of your grandmother is distributed over hundreds of thousands of neurons.”

In a recent study, Polk and his lab attempted to determine if the brains of smokers who quit the habit differ from the brains of smokers who try to quit but fail. Subjects were scanned by an fMRI machine while they read anti-smoking messages such as “you spend \$300 a month on cigarettes” and “your life expectancy would increase by 10 years if you quit smoking.” Then, after four months of a smoking cessation program, the images of the brains of people who were able to quit were compared to the people who failed.

“People who succeed in quitting tend to activate parts of their brains that reflect self-related processing when they see the smoking cessation messages,” says Polk. In other words, they were able to make the messages personal.

“One way to interpret this is that when the quitters see the messages about the negatives of smoking, if the person relates it to themselves, they are more likely to quit.”

Polk's lab is currently working on other research using fMRI in smoking cessation studies with the aim of potentially improving the techniques used to help people kick the habit.

“We are trying to make the connection between brain and behavior,” he says.

In another study, Polk and his colleagues looked at the way older people's brains processed images of faces and landmarks. There are distinct places in the brain that are used to recognize each of these things. Sometimes the activity might overlap, such as when

a person notices a rock that is shaped vaguely like a face, but the brain works more efficiently when only one region is called upon at a time. “We found that in older adults, the distinctive activation isn't so clear, so they might activate both regions for places or faces,” Polk says. This suggests our brains become less specialized as we get older and therefore less efficient.

Studies like this help answer obvious but unsolved questions about the brain. Why exactly does the performance of our mind decay as we age? Why does this decay affect some more than others?

“One of the things that attracted me to the field was that it's so young,” Polk says. “There's so much that we don't know about the brain. We are just scratching the surface.” ■



On the One Hand

Phantom limbs and the brain-body connection

by Sheryl James

Can you teach students what it “feels” like to have a phantom limb? In Professor Thad Polk's first-year seminar, *The Human Mind and Brain*, students simulated the phantom limb sensation through an in-class experiment.

As a student extended one arm onto a table, an artificial hand was placed next to it, divided by a partition. The student could not see the real hand. Another student simultaneously brushed both the real and artificial hands with a paintbrush in an effort to see if the student would start experiencing the stimulation of the artificial hand.

“I felt sensation in my real hand, but [also] kind of in the other ‘hand,’” says student Jesse Gold. “I was able to convince myself that the fake hand was maybe my real hand, and that I wasn't really sure which was which at the time.”

Polk chose the topic of phantom limbs “because it sheds light on the relationship between the mind and brain. People tend to think that what we experience is simply what our sensory organs deliver to us. But with phantom limbs, patients will experience a limb that is no longer there, so it suggests what we consciously experience may not always be what our perception delivers. Sometimes, our brain can concoct experiences that our senses are not delivering.”



A Detroit home, shrouded in shrubbery and ivy during summer months. These structures have been nicknamed “feral houses.”

STUDENTS

Beyond Blight

VACANT LOTS AND ABANDONED BUILDINGS are eyesores in cities across the United States, but one LSA student is investigating whether they might be ground zero for health concerns as well.

LSA junior Tiffany Carey grew up in Detroit and knows firsthand how much blight there is in the Motor City. Now, in the space where buildings and homes once stood, one allergenic plant, ragweed, is sprouting en masse.

Carey has begun to investigate whether ragweed and increased levels of pollen have a direct correlation to vacant lots in Detroit. During her first year in LSA, through the Undergraduate Research Opportunity Program (UROP), Carey began working with Professor Inés Ibáñez at the School of Natural Resources and Environment and with graduate student Daniel Katz, who helped shape the project’s scope.

“People have done ragweed experiments before,” Carey says, “but never in the capacity of land use among an underrepresented community.”

Carey enlisted the help of local students in the Detroit Public Schools to obtain pollen samples. She partnered with a

biology teacher at Western International High School, where the school’s 9th- and 10th-grade biology students helped Carey put pollen collectors in vacant lots, parks, and other areas to measure ragweed levels.

“This took a science lesson out of the textbook and made it applicable,” Carey says. Surveys among the kids before and after the project show their enthusiasm for science and that their desire to do more experiments increased.

Carey is currently compiling the results of her research, and she hopes to publish a paper on her findings before graduation.

“Right now, vacant lots are only seen as a crime issue or an aesthetic issue. But when you can say plants in vacant lots produce a huge amount of allergenic pollen, which in turn makes people sick, that changes the message. If you have a lot of people with allergies or respiratory issues because of higher exposure to allergens — once you connect it to vacant lots, that has policy implications.”

The real-world application of the work fuels Carey. “What has made science meaningful to me, and has kept me going, is that I can see the impact it has on people. When you have a project that hits people where they live, that’s what is important.” ■



ALUMNI

The Amazing, Real-Life Adventures of **Ming Chen**

One of the stars of the reality television show *Comic Book Men* dishes on director Kevin Smith, Batman cereal, and his unusual road to success as a geek.

WHEN MING CHEN ('96) SAT HUNCHED OVER A MAC in a U-M computer lab all night during a blizzard in 1995, he didn't foresee himself starring in a reality TV show. Or hosting two podcasts. Or working with Hollywood players on both coasts.

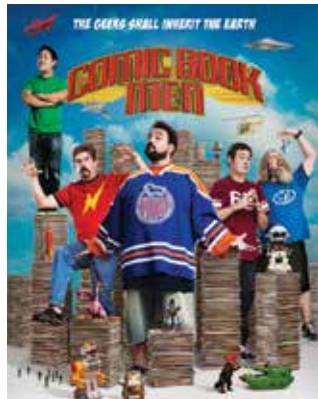
Chen just wanted to kill time doing something he loved: creating a website. Specifically, a fan site for a new movie at the time, *Clerks*, by Kevin Smith. Like the guys in the flick, Chen worked at a video shop, and *Clerks'* raunchy, geeky humor appealed to him. "I was hooked in 10 minutes," he recalls. Two months later he got a life-changing email for his efforts. It was from *Clerks'* director-writer-star, Kevin Smith.

Smith liked what he saw and where the new "Internet thing" was going. He asked if Chen would build a site for his company, View Askew Productions. "I couldn't say no to that," Chen says. "Putting together websites was something I loved to do. I would have done it for anybody, but for *him*? Totally."



(TOP) In an episode of *Comic Book Men*, comics icon Stan Lee (above left), who co-created characters such as Spider-Man, Iron Man, and the Hulk, stands with Chen inside Jay and Silent Bob's Secret Stash.

(BOTTOM) The promo art for *Comic Book Men*, which airs on AMC.



Chen worked for Smith while building his career in the Washington, D.C. area, followed by a gig for Ben Affleck and Matt Damon's LivePlanet production company in L.A. His work for View Askew remained part-time until 2002, when Smith offered him a full-time job. The only catch? He had to move to New Jersey.

"Absolutely," Chen replied. He'd been enamored with the Garden State since he saw *Clerks*, and the move would bring him closer to his girlfriend, a Jersey girl he met at Michigan.

Chen moved east in 2002, got married, and started his full-time job as webmaster at View Askew. These days you can usually find him at the comic book shop/pop culture wonderland that is his current workplace, Jay and Silent Bob's Secret Stash in Red Bank. Comics, posters, and original cartoon art crowd the Superman-blue walls, along with Smith's movie memorabilia. It's the hub of Smith's media empire, which includes a cavalcade of podcasts on his SModCo network, three of which feature Chen.

The Stash is also home base for the AMC network's reality show *Comic Book Men*, chronicling the adventures and passions of Chen, Smith, and the rest of the store's staff.

Chen wears a lot of hats, both on the show and off. "Titles are weird things here," he admits, acknowledging his role as an event planner, merchandiser, "president when Kevin's not around," and the guy who does all the jobs no one else wants — or can do. And he likes it that way. He *loves* it.

So do television viewers, who have taken to the off-color banter, pop-culture geekery, and bizarre antics of *Comic Book Men's* cast. Television critic David Wiegand of the *San Francisco Chronicle* called the show an "amusing geekfest."

Chen willingly assumes the crummiest stunts on the show and cheerfully takes heaps of abuse from the other guys. With his full-time duties, young family, and 8-10 hour filming days from July to September, it can be overwhelming — but worth it. "I like doing things that everybody doesn't get to do," he says. "Being on a TV show is one of them. Working with Kevin, that's another." Of the boss, Chen says, "He's a great guy."

Chen enjoys the variety the show offers. "Are we going to see any *Star Wars* memorabilia today? Are we going out in the woods? Am I eating 23-year-old cereal?" (The Stash's manager and Chen-tormentor, Walt Flanagan, once agreed to buy a collector's unopened box of Michael Keaton-era Batman cereal on the condition that Chen eat some. "It tasted like the year 1989," he recalls.) On the upside, he also got to drive a vintage Batmobile, so there's *that*.

"It's always fun to see yourself on TV, I'm not gonna lie," he says. "It's a good opening line at cocktail parties. And you go to Starbucks and they put an extra shot of vanilla in your latte."

Chen says his career — the Hollywood stint, the podcasts, the TV show and all — stemmed from the fact that he pursued something off the beaten path.

"A lot of people go to college with a career in mind," he says. "Then you find something else you love. Follow that." ■

by Fritz Swanson



FACULTY

Friendships, Fissures, and Fission

In the waning months of WWII, a University of Michigan physicist led the hunt to capture the father of quantum mechanics, Werner Heisenberg, who was suspected of spearheading the Nazi nuclear bomb program. The quest pitted physicist against physicist — and friend against friend.

IN MID-APRIL 1945, LSA Physics Professor Samuel Goudsmit was caught in a traffic jam.

He and a collection of other scientists were driving through the forest of Germany. Fighter planes soared overhead, and the trees were burning.

“The road was one long line of British army trucks and tanks and armored cars bumper to bumper,” he wrote years later. In front of them was the advancing Allied army. Streaming past them, away from the front, were thousands and thousands of refugees pushing all of their belongings along the bombed road in anything with wheels.

Goudsmit’s Jeep inched toward the shelling and the gunfire. A man with a mattress on his back trudged in the opposite direction.

For the last year, Goudsmit had been riding along with the advancing Allied forces that had landed on D-Day. He’d been granted leave from U-M to become the scientific head of the Alsos team in Europe, an extension of the Manhattan Project. The team’s purpose was to capture atomic scientists and intelligence in Nazi-occupied Europe, before the Russians, the French, or anyone else even knew they were there.

On Tuesday, April 24, 1945, the Alsos military force poured into the village of Hechingen, nestled at the foot of the Swabian Alps, on the edge of the Black Forest. In a wing of the village hospital, the troops found a laboratory — the center of the Nazi atomic bomb program.

But when Goudsmit stepped into the space, he found himself confronted with a photograph. In the picture, he is standing next to physicist Werner Heisenberg, the suspected leader of the Nazi atomic bomb program. In the picture, Goudsmit and Heisenberg are smiling. They are in Ann Arbor.

An angry, suspicious Colonel Boris Pash, military leader of the Alsos operation, stared down Goudsmit, waiting for an explanation of the image. It wasn't an easy one.

The story started six years earlier, on the last Sunday of July 1939, during a garden party that LSA Dean Edward Kraus hosted at his home.

WAR LOOMS LARGE

Dean Kraus hosted the Ann Arbor soirée in honor of Heisenberg, then the renowned German nuclear physicist who had published his famous paper on the uncertainty principle in 1927, and won the Nobel Prize for the creation of quantum mechanics in 1932. The party was at the behest of Goudsmit, who was famous in his own right for discovering that electrons have spin. Also in attendance was John Kraus, a professor of physics, as well as U-M Vice President Clarence Yoakum, and physicist Enrico Fermi, who would go on to build the world's first nuclear reactor.

Though none in attendance knew exactly when the late-summer calm would break, they all knew that war was brewing in Europe, and troubled times were ahead. In his book *Physics and Beyond*, Heisenberg reports a conversation he had with his friend Fermi during the visit.

“Whatever makes you stay in Germany?” Fermi asked. “Here,” he said, referring to the yard, and the city of Ann Arbor, and to all of America, “[Europeans can] live without being weighed down by the heavy ballast of their historical past. In Italy I was a great man; here I am once again a young physicist.”

This question weighed heavily on Heisenberg.

He and his scientific colleagues weren't constrained by old political boundaries; instead, they came from the nations of physics, mineralogy, crystallography, and biology. And when they gathered at parties like the one hosted by Dean Kraus and Professor Goudsmit, it was as part of a rambling transnational tour with colleagues from every country and every city. Science was crossing all political boundaries, ignoring the divisions of the past, and truly becoming an international network.

Heisenberg confessed to Fermi his uncertainty about returning to Germany. On the one hand, he was born a German, and Germany needed him. Given Germany's unstable leadership, Heisenberg said of his own duty, “People must learn to prevent

catastrophes, not to run away from them.”

“But,” he also added, “Try as [I] may, [one] individual can often do nothing whatever to prevent the great mass of people from taking the wrong path.”

Reflecting on the enormity of the decision he faced, he said to Fermi on that lawn in Ann Arbor, “We have to decide for ourselves and cannot tell in advance whether we are doing right or wrong. Probably a bit of both.”

Then they all posed for a picture. Goudsmit, Yoakum, Heisenberg, Fermi, and John Kraus all smiled. LSA Dean Edward Kraus took the photograph.

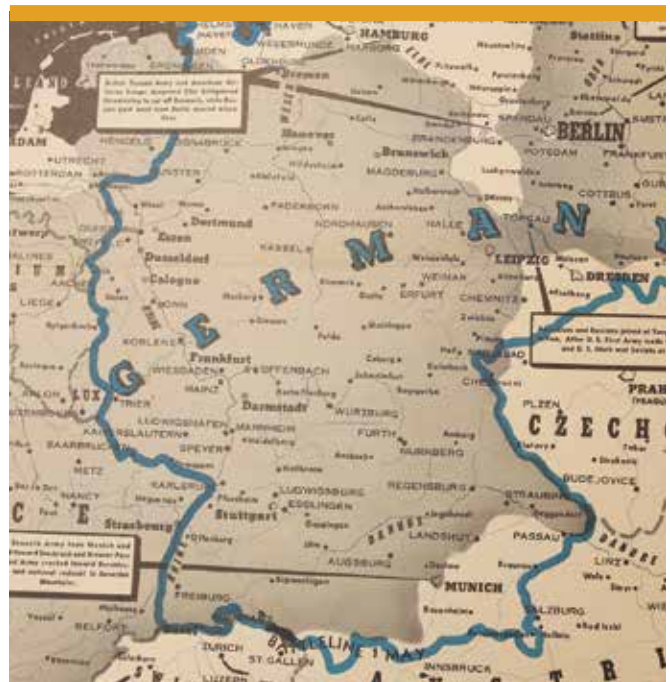
A month later, Heisenberg returned to Germany. Aboard the *Europa*, he observed that as he sailed toward his home, he was virtually alone, everyone else sailing the other way.

Hitler invaded Poland on September 1, 1939. Only days later, Heisenberg and many of the other German scientists that Kraus and Goudsmit were friends with were called to serve their country.

Heisenberg assumed he would be a sharpshooter, which was what he had trained to do. Instead, he was placed in the Army Ordinance Department, and was asked to build a bomb.

(PREVIOUS PAGE) **Ann Arbor, July 1939**, at the home of LSA Dean Edward Kraus. From left to right: Samuel Goudsmit, Clarence Yoakum, Werner Heisenberg, Enrico Fermi, and John Kraus. Edward Kraus preserved the image in his photo album, now housed at the Bentley Historical Library, titled “Photos of Many Famous Scientists.”

(THIS PAGE) **The military publication “Newsmag”** from May 1945 shows the Allied front lines in Europe advancing toward the Elbe River. Along this front were LSA Physics Professor Samuel Goudsmit and the Alsos military force searching for the heart of the Nazi atomic program.



THE RACE TO SUSTAINED FISSION

War quickly divided the scientists who had once collaborated so closely.

In a letter addressed to President Roosevelt, Albert Einstein and physicist Leo Szilard warned that nuclear fission was very close to a reality, and that Germany was starting to stockpile Czechoslovakian uranium. Once Heisenberg returned to Germany — having just spoken with his scientific colleagues about the nuclear fission research they were conducting — surely he

Goudsmit, Fermi, Szilard, Einstein, Heisenberg, Otto Hahn, Frédéric Joliot-Curie, Edward Teller, Robert Oppenheimer — all of these men knew each other.

and other European scientists under Nazi sway would start working on a bomb.

From this letter was born the Manhattan Project, the race to build an atomic bomb before the Axis Powers.

As Fermi moved west from Columbia to assemble his team of nuclear physicists at the University of Chicago, Goudsmit took his leave from U-M and went east, to MIT and England, to work on radar. But as the scientists were assembled into their different areas of war work, talk turned to their missing friends, Heisenberg among them. And as the Allied scientists showed the military what the bomb was capable of, the military also started to worry about what German physics might produce.

By December 1942, Fermi's team had successfully built a nuclear chain reaction under the football stadium at the University of Chicago. This final experimental proof that sustained fission was possible accelerated bomb development, and escalated anxiety over the German program. The Allies were so very close to completion — but would the Axis get there first? The military wanted to do everything it could to make sure the answer was no.

In September 1943, military leaders created the Alsos mission and, in March 1944, Goudsmit was brought to England and put in charge of it. Following the D-Day invasion of June, Alsos forces pushed through France and into Germany, capturing scientists and labs as quickly as they could.

Goudsmit knew the players, he knew the physics, and as a Dutch émigré who had studied in the Netherlands, he knew the languages and geography of Northern Europe. But most importantly, the military believed that because he wasn't directly involved with the Manhattan Project, he didn't know any important atomic secrets, and so if he were captured he couldn't reveal anything destructive.

Of course, this misunderstanding was the whole problem. Goudsmit, Fermi, Szilard, Einstein, Heisenberg, Otto Hahn, Frédéric Joliot-Curie, Edward Teller, Robert Oppenheimer — all of these men knew each other. They knew each other's work, they knew what each other specialized in, and they understood each other personally. If they saw a list of people, just names on paper, they could guess what the scientific project was. The international network of scientists that had grown up in peacetime was now a dangerous, and uncertain, tool of war.

This is what Colonel Pash couldn't understand as he waved the photo at Goudsmit in the belly of the Nazi bomb laboratory. Here was Heisenberg, his hands in his pockets, smiling in the sun and tucked in between U-M Vice-President Yoakum and Fermi. Goudsmit was leaning in from Heisenberg's right; John Kraus was on Heisenberg's left.

These men were friends.

CAPTURING HEISENBERG

Goudsmit placated Pash in part by confirming that the Germans did not have the bomb. They were still debating proper reactor designs. Why remains unclear to this day. Some argue that Heisenberg and others dragged their feet. Immediately following the war, Heisenberg offered this argument to anyone who would listen.

From what he saw, however, Goudsmit concluded the Germans had merely failed. The men were unmotivated, the military uninterested.

"Hitler [was] profoundly wary of experts of all sorts and still more mistrustful of academic people," wrote historian McGeorge Bundy in his book *Danger and Survival: Choices About the Bomb in the First Fifty Years*. "His view of nuclear physics, in particular, was hopelessly confused by his pathological anti-Semitism; Jewish physics, he called it."

And so in spring 1944, Heisenberg toiled away in a Black Forest village, building a rudimentary reactor in a cave beneath a medieval church.

No one can say what was in his heart, whether he slow-walked the project as a kind of sabotage, or if he had just failed to master the physics that would build the bomb.

But once he heard the advancing tanks coming up from France, Heisenberg realized he needed to retreat. Just days before Goudsmit arrived, Heisenberg glided out of the village on his bicycle, the cherry trees just coming into bloom.

On May 4, up in the mountains above the tree line, Heisenberg was finally caught by Colonel Pash and his men. It was morning, snow had fallen on the pink blossoms, and the exhausted Heisenberg, who had been actively eluding Alsos for weeks, was finally apprehended.

Heisenberg was transferred to England for questioning along with a handful of other German scientists. Their conversations were recorded. Six months later, Heisenberg returned to Germany, a free man.

GOUDSMIT LEFT U-M IN 1946. He went on to teach at Northwestern, and then to run the Brookhaven National Laboratory, where nuclear research is still conducted.

Heisenberg stayed in Germany and took over the Kaiser Wilhelm Institute for Physics, renaming it the Max Planck Institute for Physics and Astrophysics in order to make a clean break from Germany's militaristic history.

Goudsmit and Heisenberg, like all of the scientists after the war, saw their relationship irrevocably shaken. But as the Iron Curtain descended across Europe, the two men remained firmly on the same side.

Personally, though, they never reconciled. ■

(TOP) **German physicist Werner Heisenberg**, the Nobel Prize-winning creator of quantum mechanics, was captured at the end of World War II. He was detained through Operation Epsilon, whereby Allied forces brought Heisenberg and nine other scientists to Godmanchester, England, on suspicion of aiding Nazi Germany's efforts to build an atomic bomb.

(BOTTOM) **Samuel Goudsmit**, right, and Lieutenant Toepel in Stadtilm, Germany, working as part of the Alsos team. In addition to capturing Heisenberg, Alsos also succeeded in procuring "stores of uranium ore and other nuclear raw materials, and thousands of research documents regarding the development of atomic energy," according to atomicheritage.org.





FACULTY

The Laura Ingalls Legacy

The beloved *Little House* series and its corresponding real-life locations are literary hotspots for **Laura Ingalls Wilder fans**. One professor takes a closer look at the people and places dedicated to the pioneer's legacy.

IN JULY 2012, more than 100 people gathered in Mankato, Minnesota, to attend workshops, cooking demonstrations, plays, a pageant, and a spelling bee. Some dressed in modern clothing — while others dressed straight out of 1874.

LauraPalooza, as it's known, is a gathering of researchers and fans of Laura Ingalls Wilder's *Little House on the Prairie* book series. In attendance was Michelle McClellan, an LSA assistant professor in the Department of History and the Residential College. She is herself a "bonnethead" — a term many use to describe Wilder's fans — and is also looking closely at the gatherings from an academic perspective.

Specifically McClellan is investigating "heritage tourism" — or visits to geographic locations for their historical or fictional associations — at the sites connected with the *Little House* books.

"People often want to go to the places that served as the settings for their favorite stories, even when the stories are fictional. There's an impulse to explore that, often to feel a deeper connection with the characters and themes," McClellan says. She cites *Anne of Green Gables* as a major draw in Canada, *Little Women* in Massachusetts, and *Downton Abbey* in England.

There are eight main sites in the United States associated with the *Little House* series — two are located in Minnesota, while the others are in Wisconsin, Kansas, Iowa, South Dakota, Missouri, and New York. Wilder wrote the books as an adult, but based them upon her own experiences as a child in the late 1800s.

"The books themselves have been very influential in American popular culture. It's a story that's reassuringly familiar about settling the West. Since they were written for children, they weren't necessarily taken seriously as cultural products for a long time. But within the last 25 years, there has been more scholarly attention," McClellan says.

The sites that she researches are generally remote places, some with only a few hundred residents. Yet they often host up to 20,000 visitors annually. As a result, the communities must determine what to emphasize or sell to Wilder's fans. Since the physical environment features prominently in the books, McClellan says that communities often try to make the landscape and ambience feel as it was in Wilder's time.

"The sites often advertise themselves as the most authentic — [Laura Ingalls Wilder] lived

here the longest' or 'This place is the least changed.' They're selling a particular interpretation that might match the books, but not necessarily the historical record," she says.

Attending LauraPalooza is just one way that McClellan examines how the communities embrace the bonnethead culture. She says that the visitor demographics are "hugely skewed to females" and notes that they are often multigenerational trips; women who grew up reading the books and/or watching the 1970s television show bring their daughters. Some towns aim to be kid-friendly by offering products such as ragdolls and hands-on activities such as horse rides, quilting, and churning butter.

Scholars have written biographies about Wilder and literary analyses of the books themselves. But McClellan's focus is a new one, looking at how fans connect the books and the places.

"This is intellectually interesting to me, but it also is really close to heart," says McClellan, adding that reading *Little House* as a child made her want to become a historian. "It's gratifying to bring those realms together, but it's also complicated. While I'm a fan of the books, I'm visiting these sites as a historian."

She notes that visitors often return to the sites multiple times. Others, however, may not necessarily be as fulfilled by their visits. She has overheard "This isn't what it was like on TV," or "This isn't what I pictured."

"The Laura in the books is a girl and a young woman, but she wrote them much later in life during the 1930s and 1940s. So a question becomes: Which Laura are you looking for? Are you looking for the fictionalized heroine of these books? Or are you looking for this historical person who lived to be 90 years old? That's where I think people can get unsettled. People usually want the girl from the books — not necessarily historical accuracy, which can be more complicated." ■



(OPPOSITE PAGE) **Laura Ingalls Wilder** signs one of her books circa 1940. Ingalls Wilder died in 1957 at the age of 90.

(THIS PAGE) **Professor Michelle McClellan** stands in Plum Creek, north of Walnut Grove, Minnesota, the setting for the fourth book in the *Little House* series.



ALUMNI

All Things Considered

How a **National Public Radio** pioneer is communicating all the news that was once fit for your radio dial but can now be downloaded, tweeted, liked, and shared. #notyourmomsnews

IN THE WINTER OF 1978 Margaret Low Smith, a sophomore in LSA's Residential College, shot and produced a documentary about the health and fitness craze. Conceived as a way to avoid writing a term paper for a Russian cinema class, the experience changed her life.

"It was definitely an 'aha' moment," says Smith ('80) now the Senior Vice President for News at NPR. "I remember holing up in my dorm room in East Quad, editing that film and thinking, 'This is so much fun. This is what I want to do.' I loved it."

Although she didn't become a filmmaker, she was hooked on the power of storytelling. Today, as the top news hound at NPR, she's challenged to tell stories in a variety of new formats, including social media, and on digital platforms — all in a non-stop 24-hour news cycle.

"It's like learning a new language while you're racing down the tracks," says Smith, who assumed her new post in January 2011. "Now we are so much more than a broadcast news organization. It's thrilling."

Social media is now an essential tool for NPR. During last year's election, for example, correspondent Ari Shapiro, who was covering the Romney campaign, continuously posted tweets and photos on Instagram that took NPR's audience on the trail and helped them experience the campaign in real time, Smith says.

"At the end of the day, no matter what the medium, our core values remain the same: distinctive reporting, great story-telling, and great narrative," Smith says. "The essential ingredients must endure in a blog post, a photograph, or a story downloaded through a mobile app. The challenge is to hold onto those values and expand the way we tell stories."

Managing the use of social media as a news source on breaking stories also presents new challenges, she says.

Last December during the Sandy Hook school shooting, as social media offered differing accounts of the shooter, number of victims, and other details, Smith says NPR worked furiously to verify details independently before reporting them.

"Social media is a tool to gather information, but we still use the same principles of sourcing: Do we have multiple sources and are they reliable," she says.

To accommodate its evolving mission, NPR just moved into a new building where Smith will continue to oversee the work

(OPPOSITE PAGE) **Alumna Margaret Low Smith and Robert Siegel**, host of NPR's *All Things Considered*, track results on the night of the 2012 presidential election. As part of the 24-hour news cycle, NPR has embraced social media outlets for its storytelling and news coverage. The public radio pioneer has launched eight Tumblr pages, including the central account, npr.tumblr.com, which showcases offbeat images and videos about a range of topics—from stories about new exhibits at the National Archives to unusual recipes (Thanksgiving stuffing made from Girl Scout cookies, anyone?).

(THIS PAGE) **Low Smith at her desk** in NPR's Washington, D.C., headquarters. With bureaus and offices throughout the world, NPR reaches 26 million listeners every week.

of nearly 400 broadcast and digital journalists across the country and in 17 bureaus around the world. The network serves 26 million weekly listeners, 19 million monthly digital users, and has more than 800 member stations. Smith has also set a newsroom initiative to deepen coverage of race, ethnicity, and culture on all platforms.

It's a long way from when Smith started at NPR in 1982 as a production assistant, in the reel-to-reel tape radio world.

After graduation she made her way to New York, where she juggled a job for a city councilman with waitressing at night to make ends meet. Then she met an independent producer who asked her to create an NPR documentary about the labor movement. The producer couldn't pay her, so she decided to work for free.

With that experience she landed a temporary gig in 1982 at the fledgling network in Washington, D.C. It quickly became a permanent overnight production job for *Morning Edition*. Working the night shift she also met her future husband, Greg Smith. Over three decades Smith rose through numerous senior production and programming roles and won major awards.

She has guided NPR through coverage of significant news stories, including the Arab Spring, the death of Osama bin Laden, and the 2012 presidential election.

Recently, she has overseen coverage of the civil war in Syria, where 28 reporters were killed last year. Smith says her journalistic instincts to cover a major global story sometimes give way to motherly anxiety, when extra hours pass between check-ins from NPR reporters on the ground. "My emotions run the whole cycle," says Smith, the mother of two sons. "What do we need to do to cover the story and make sure our journalists stay safe? We can take all the precautions in the world but it's still a risky business."

Smith works a grueling schedule, squeezing in a pre-dawn run or a swim before heading to the network from her suburban Washington home.

"I put in long hours, but it's worth it," she says. "I fall in love with what we do every day." ■



by Dan Shine



FACULTY

Video Thrilled the Chemistry Star

One professor's quest to film a molecule has resulted in scientific breakthroughs at the curious intersection of chemistry, math, geometry, biology, and...movies.

PROFESSOR HASHIM AL-HASHIMI has a dream — an impossible dream, if you will — to make a movie of a molecule. And while he acknowledges that he likely will never attain his life goal, the pursuit still consumes him.

“It’s with me all the time,” says Al-Hashimi, the J. Lawrence Oncley Collegiate Professor of Chemistry and Biophysics. “The first thing I think about when I wake up often relates to some aspect of how to make a movie of a biomolecule. And it is often the last thing I think about before I go to sleep.”

Chasing something so seemingly unattainable may appear fruitless, but Al-Hashimi calls it “a worthy pursuit.”

His relentless passion may not be fully realized, but his work trying to film a molecule has resulted in some groundbreaking imaging techniques in his lab. One of these techniques recently helped discover the smallest and fastest known molecular switches made of RNA, a chemical relative of DNA.

Standard imaging techniques could not capture these tiny, lightning-quick RNA switches, which change shape to send responses to other biomolecules in a cell, until Al-Hashimi’s team pioneered a new

method. They used a modified form of nuclear magnetic resonance spectroscopy (NMR), which is similar to an MRI, and formulated a strategy to trap and then capture the fleeting RNA structures.

These “micro-switches,” as Al-Hashimi describes them, provide potential targets for drug development, including antiviral and antibiotic drugs.

Filming these fleeting micro-switches — along with other recent breakthroughs — has enabled Al-Hashimi and his group to image other, more common, molecular movements, and has provided a glimmer, slight as it might be, that his life goal is possible.

In these quantum-level flicks, called “atomic movies,” Al-Hashimi says he and his team “have come very close to attaining an experimentally determined atomic movie for an RNA molecule. I never thought this would be possible. It seems like atomic movies of entire cells are now also within reach.”

For his breakthroughs, Al-Hashimi received the 2013 Vilcek Prize for Creative Promise in Biomedical Science and a recent Thought Leader award from Agilent Technologies that came with \$500,000.

/ PERIODIC STAPLE

Growing up, Al-Hashimi says his family was “pro math, pro science.” His father was a veterinary scientist (his mother studied languages) who worked for the pharmaceutical giant Eli Lilly.

“I grew up surrounded by my father’s Eli Lilly colleagues and that pharmaceutical atmosphere, so there always was a scientific thread in the house,” says Al-Hashimi, whose sister is a biochemist.

A native of Lebanon, he went to high school in Wales, and then studied at the Imperial College in London, where he got a bachelor’s degree in chemistry. He moved to the United States to attend Yale, where he received his Ph.D. in biophysical chemistry.

Al-Hashimi was doing his post-doctorate work at Memorial Sloan-Kettering Cancer Center in New York City when he first traveled to Ann Arbor. He needed to

(OPPOSITE PAGE) **Professor** Hashim Al-Hashimi (left) in the lab with Ph.D. candidate Federico Gottardo, who studies unusual forms of DNA.

(THIS PAGE) **Ph.D. candidates** Heidi Alvey (left) and Kevin Ilekka (center) work in Al-Hashimi’s chemistry lab alongside undergraduate student Mitchell McBairty.



use an NMR, and U-M had one of the few high-field machines in the country.

“So I came here to Ann Arbor to use an 800 MHz NMR spectrometer, and I met with a professor and had a chat,” Al-Hashimi says. “He told me that there was a position open and encouraged me to apply.”

He got the job, but deferred for a year until he finished his work in New York. In 2002, he joined U-M to teach and do research. He was excited to join the fraternity of college professors, yet he had never given a lecture or stood in front of a class until he taught his first course at U-M.

“The first time it was absolutely nerve-racking,” he says. “I remember I spent the entire summer before reading up on the course. It was a big responsibility, and I just loved it from the first moment I did it.”

He became interested in geometric shapes and structures of molecules while studying in London and wanted to incorporate those passions into his U-M

lab. He recalled how he and his roommates “would spend all night, like typical nerds, solving brain teasers.”

Al-Hashimi and one roommate applied mathematical descriptions of knots, or “knot theory,” to describe the 3-D shapes of protein molecules. It got him hooked on geometric shapes of molecules and their mathematical descriptions.

“With DNA you draw these beautiful structures and become fascinated with the question, ‘How do these things move?’” Al-Hashimi says. “Of course, these descriptions assume they’re static. Truth is, these things are very dynamic.

“So I wanted to build a lab that uses tools and concepts from physics and math to describe the geometry of biomolecules and their roles in biology.”

Al-Hashimi created just such a lab at U-M, in which he says there’s lots of flexibility about how to explore topics of study. For certain projects, for example, he may sit down with students and decide on the goal of making an inroad in some area, such as improving imaging. Other times, his students on their own initiative tell him they want to test out some theory.

“In fact, I would argue for this switch here [that made the recent news], one of the students in my lab decided for no particular reason to explore a new type or method of imaging,” Al-Hashimi says. “So the student ended up developing an experiment that paved the way to see, for the first time, fleeting structures of RNA and DNA. And that’s why it pays to be at U-M, because you have great students.”

SEEING BEYOND THE SAFETY GOGGLES

Al-Hashimi encourages collaboration in his lab and around campus, often reaching out to other professors who might help educate him on a certain topic. He also likes to step back after an inroad has been made to let others — including students — take the lead to see if they can nudge things further. He calls it “harvesting the opportunity.”

“Students and post-docs can make many

interesting observations or develop useful techniques, but you have to be ready to recognize the implications of these advances and the new opportunities they create,” he says. “That requires a vision.”

But while other professors might rush off to publish a paper or journal article on their recent breakthrough, Al-Hashimi prefers to marinate on what has just occurred.

“It can pay off to wait for the pieces of the puzzle to emerge and then solve the entire problem,” he says. “It makes it easier to see how all the different observations fit together and then, suddenly, you not only know what is going on, but what are the laws guiding it. It is almost like reading the mind of God, getting insights into how it all evolved, and how it all works.”

When inroads are made in the lab, Al-Hashimi describes them as “the best feeling ever. The problem with it, of course, is that you keep wanting more.”

Al-Hashimi says he will probe deeper into his research to find more universal truths when it comes to RNA switches.

“We can much more easily go and say, for example, ‘Are these alternative structures evolutionarily conserved?’” In other words, has the gene remained unchanged throughout evolution? “If the answer is yes, you can bet they are functionally important. Otherwise evolution wouldn’t have bothered.”

He is confident he will continue to make inroads partly because of what he calls the U-M “environment” — a “harmonious balance” between colleagues, students, and infrastructure.

“If I wasn’t able to collaborate with my colleagues, have our students mix, and give students access to the best equipment, we couldn’t do anything,” he says.

And he will happily chase his dream, his goal of making a movie of a molecule.

“Sometimes I’m amazed that I’m paid to do this,” Al-Hashimi says. “If I were rich, I would pay someone to allow me to do this. That’s how much I enjoy it.” ■

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CAMPUS

Radio Free Ann Arbor

Scratching the records on 40 years of WCBN history

by Katie Vloet

TURN ON WCBN, and you may catch a song by Ella Fitzgerald, Cee Lo Green, or Frank Zappa. Or you might hear something that sounds like a welder in a boxing ring. You never know.

Therein lies the charm of the station that is run out of the basement of the Student Activities Building and is celebrating 40 years on the FM dial. It is a free-form station in the age of corporate radio, iTunes, and Taylor Swift. And the people who send out the music over WCBN's airwaves, as well as the listeners, wouldn't have it any other way.

"Radio, especially freeform radio, can bring music to one's ears that would never have gotten there otherwise," says Fiona Clowney, a DJ on WCBN and a junior pursuing a degree in ecology and evolutionary biology. Noting that a lot of her peers listen to music on the Internet, she points out that going online "allows people to narrow their interests" through, for instance, a Pandora station that finds artists similar to those the

listener already likes. But, she says, "maybe, just maybe, you want something new, something unexpected."

The station began on the AM dial in 1952, when three dorm-based stations joined to form the original WCBN. *Saturday Night Live's* Gilda Radner was a weathergirl in the mid '60s; the station won awards for its news reporting on the Vietnam War; and programming was eclectic but largely jazz-centric.

The station switched to FM in 1972 to reach more people with its music and topical, forward-thinking public-affairs programming. With 10 watts of power,

that meant North Campus, on a good day. It now operates at 200 watts (hello, Ypsilanti!), with further growth to a whopping 3,000 watts coming soon to broadcast the current mix of music, news, and sports. While always student-run, the station has allowed community members to serve as DJs, while at other times the on-air slots were restricted to students. Today, non-students are welcome, and the station embraces this connection with the community.

Through the years, WCBN has been a home to students who would go on to careers in journalism and related fields, such as Tamar Charney. The 1990 psychology graduate is now the program director at Michigan Radio, the NPR affiliate that reaches most of the state — the same job she once held at WCBN. "I ended up at CBN just for fun," she says, "but I really got bitten by the radio bug, and making that connection with listeners."

Many others went on to careers in non-radio fields but still credit

(PREVIOUS PAGE) **LSA senior** Brandon Beaupre hosts his WCBN show *Ones all Over the Place* from 6:00–9:00 A.M.

(THIS PAGE) **LSA sophomore** Cameron Bothner cues up music for his show, *Ceci N'est Pas Free Form*. As the station's development director, he helps raise money during the annual fund drive and even taught himself to program databases. "Everyone does what they can. You learn applicable skills, and you get to be in a place where people talk about subjects like Chinese languages, property law, and of course music."

(OPPOSITE PAGE) **WCBN's vinyl collection** is legendary, but the station actually has more CDs—around 50,000, as compared to 35,000 records.



their time at WCBN with shaping their collegiate experience. Nathan DeYonker, a 2001 chemistry graduate and now a research scientist in the Department of Chemistry at the University of Memphis, recalls some

unusual moments that were highlights of his undergraduate years.

For example, of the three turntables in the main studio, DeYonker says that one operated perfectly, another “had kind of an unsteady warbling speed, and the third was operated on by unknown forces. It would suddenly speed up real fast, slow down, move back and forth.”

What’s a radio host to do? Run a race, of course. “We had three copies of the soundtrack to *Jesus Christ Superstar* in the studio and decided to race them on the turntables. I think slow and steady won the race.”

Perhaps that’s not surprising for a station that played “It’s My Party” for approximately 18 straight hours the day after President Reagan was elected in 1980.

“I remember someone playing a song

from Dylan’s album, *Self Portrait*, which is usually regarded as one of his worst, and they played it along with the sound of a cat eating,” says Sean Westergaard, a 1991 geographical sciences major who was a

DJ while a student and is one today as a community member. “That’s the great thing about CBN; it doesn’t let you feel comfortable. You don’t know what you’ll hear next.”

And what you hear next may

just be a great song that you never knew existed. “I like to think there are people out there who’ve never heard this before. There are poor, benighted people out there who have never heard Roxy Music,” says Sue Dise, a 1977 journalism grad who worked at WCBN as a student and still has a Monday-morning show. She’s also a news videographer for WDIV-4 in Detroit — a job she got in large part because of the skills she learned at WCBN as a student. “I love playing something, and some 20-year-old calls up and says, ‘What’s this?’ That’s the best part of all — inflicting my superior musical tastes on other people.” ■

“I ended up at CBN just for fun,” she says, “but I really got bitten by the radio bug, and making that connection with listeners.”



AIRWAVE EXAM

Does your frequency need to be boosted on these WCBN history questions, or are you broadcasting at full force? Answers below.

- Which one of these is *not* the name of a WCBN show?
 - Area of Refuge
 - Booze Broads Boards & Rods
 - Wild Combinations with DJ Polly Pocket
 - Tight Pants
- Which is WCBN’s slogan?
 - The Sunshine Station
 - Freeing Your Mind for Over 30 Years
 - Land of Perpetual Sunshine
 - The Station With a Soul
- Which of these alumni did *not* work at WCBN?
 - Actor James Earl Jones
 - Author Mary Gaitskill
 - Poet John Sinclair
 - Comedienne Gilda Radner
- Which of these recording artists were *not* played on WCBN during the first month of 2013?
 - Leonard Nimoy
 - Tiny Tim
 - Metallica
 - Justin Bieber





Steven Ball, carillonneur and a professor in the School of Music, Theater, and Dance, teaches students to play the massive bells in Burton Tower and welcomes visitors daily from 12:00 to 12:30 P.M. to see the carillon in action.

For Whom the Bells Toll

The Charles Baird Carillon in the Burton Memorial Tower issues ringing melodies from 53 bells — weighing anywhere from 21 pounds to 12 tons — and has been a campus staple for 75 years.

IT'S SUCH AN INGRAINED PART of campus life that it may go unnoticed: just background noise from noon to 12:30 P.M. when classes are in session, and also before commencement ceremonies and

during special events. Songs can range from “The Victors” to Led Zeppelin’s “Stairway to Heaven” to Lady Gaga’s “Poker Face.”

“I encourage the students to be very creative,” says Steven Ball, the University’s seventh carillonneur and carillon instructor. “Going back to the 17th century, the carillon played the music of the day. It was the Muzak of the time. We want to keep it relevant to society.”

This massive musical machine, made up of 43,000 pounds of bells (21.5 tons) that take up the 10th floor of the tower, is a piece of University history. Charles Baird, a former athletic director, donated the money to build the carillon in 1936. Early on, the clock bells replaced the University janitor’s job of waking students by ringing handbells.

Once it was in operation, U-M became the first school in North America to teach carillon music. U-M is also the first campus to have two carillons, the other being the Lurie Carillon on North Campus.

In 2011, carillonneurs from around the world came to see and play the Baird Carillon on the occasion of its 75th year. The anniversary also included a restoration that brought back the original keyboard and original bells from a number of scattered places, including an Ohio warehouse. New bells were cast in England in 1974.

The carillon is “a national treasure,” says Ball, who teaches students to strike the baton-like keys and press the foot pedals that pull its strings and levers.

“Most people never stop to think about it,” says Ball. “They never realize that somebody is making music up there. People never even know who you are.” ■



GET A SNEAK PEEK INSIDE THE CARILLON
www.lsa.umich.edu



The First Time

by Jacquise A. Purifoy ('04)



DO YOU REMEMBER YOUR FIRST TIME?

I do. I was 13, and I got pregnant the first time I had sex. I was too afraid to tell anybody out of fear of what would happen. That meant no prenatal medicine, no routine doctor's visits. The night before I gave birth, I went to basketball practice.

On April 8, 1996, my daughter Jasmine was born while I was still in eighth grade at Joy Middle School in Detroit. In the hospital, my mother, who worked as a bus driver for 30 years, made me promise I would graduate from high school and then college. She told me people would expect me to fail, to have more children. I made up my mind to be more than a statistic. My mother and I shook hands on it.

Even though Jasmine was born with coronary fistula, a rare heart condition, I remained on the Honor Roll for all four years in high school. She had open-heart surgery during finals week when I was in the 10th grade, yet I was still inducted into the National Honor Society that year. I had a part-time job on top of parenting, while also being the captain of the basketball and softball teams, and I still graduated high school as the Salutatorian of my class.

You can bet that was a first — for me and my high school both.

But all that was a cinch compared to how challenging it would be to continue to raise Jasmine when I came to U-M. In Markley Hall, I was the only person with a kid, working to balance a fulltime schedule while acclimating to college life. In English, there were 31 books on the syllabus, most of them review for my fellow classmates who'd read *The Iliad* or *The Odyssey* in high school. Not me — they were all more firsts. I literally had to stay up all night to finish the readings, while also making sure that my daughter's needs were taken care of.

I always made it a point to go to office hours regularly, but not even my supportive professors could imagine I'd graduate from U-M in less than four years, while double majoring in English and American culture — and that I'd secure employment four days after graduation.

Jasmine's first time in the Big House was for commencement. She watched me get my degree — the first one in my family to graduate college — and saw the culmination of all the tears, temporary setbacks, and successes.

After graduation, I enrolled at Thomas M. Cooley Law School. I graduated in May 2010 and passed the bar the first time. I was sworn into the State Bar of Michigan on November 24, 2010. Now, I am spending my time launching a law practice with a focus on small businesses, start-ups, and non-profits.

U-M challenged me to be comfortable in my own skin, to be proud that I was from Detroit, to accept I was a single mother, to not be afraid of hard work. Today, I celebrate not just firsts, but seconds. In the fall of 2014, Jasmine will begin her college experience — hopefully at U-M, but if not here, then at another school that will train her to be resilient, hardworking, and compassionate about serving others first.

My journey started out with firsts. But today, my success is generational. ■

Jacquise Purifoy is an attorney practicing in the greater Detroit area, with a focus on helping social entrepreneurs rebuild their communities.

THE GAME OF LIFE

JACQUISE

M
Graduate from U-M in less than four years — with a double major



Graduate high school with honors

2010: Finish law school and pass the bar — first try



April 1996: Jasmine is born

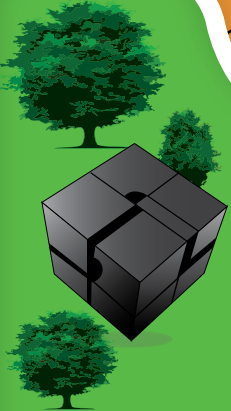


Pregnant at age 13



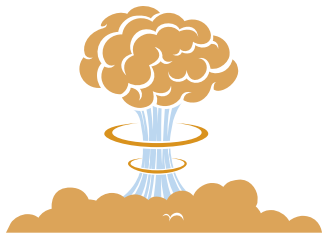
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Fall 2014: Jasmine begins college



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