Art Without Borders

In researching this issue of LSA Magazine, we came across a slew of LSA writers and artists using science to inspire their work. In honor of our Mashup issue, here are a few of the boundary-smashing artworks we uncovered, each presented by way of every mashup’s best friend, a Venn diagram highlighting some singular quality.

Social awkwardness
Groundbreaking science degree
Things that aren’t planets
Talking animals
Journalism background
Things with planet-like names

COMEDY GOLD
IMOGEN QUEST
A weekly webcomic by graduate student Olivia Walch
Read more on p. 17

CURIOSITY AND GRIT
THE ONLY WOMAN IN THE ROOM: WHY SCIENCE IS STILL A BOYS’ CLUB
A memoir by Professor Eileen Pollack

PLUTO
PERCIVAL’S PLANET
A novel by Professor Michael Byers (M.F.A. ’96)

WEIRDO STREET ARTIST IN FISHERMAN’S WHARF

Sad music
Puppets
Sea life

AQUARIUM GIFT SHOP

BLACKFISH

OUR COVER features LSA student Candice Miller. Read her story on p. 64. Photographed by Scott Soderberg/Michigan Photography
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<td><strong>The Case for Diversity</strong>&lt;br&gt;Diversity affects how a group looks and how it performs. Professor Scott Page did the math, proving diversity makes groups stronger—something LSA knows from experience.&lt;br&gt;By Elizabeth Wason</td>
<td><strong>Mad Man</strong>&lt;br&gt;Thirty years before Photoshop, artist Robert Heinecken transformed advertising images into works of art. History of Art Professor Matt Biro shows us the life of a forgotten genius.&lt;br&gt;By Brian Short</td>
<td><strong>Adventures in Mathematics</strong>&lt;br&gt;An LSA graduate student challenges the boundaries between math and art, combining calculations with comic panels to illustrate why math rules.&lt;br&gt;By Elizabeth Wason</td>
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Vive La Différence

**IN ITS VERY CONCEPTION,** a university is a mashup: a place founded to bring smart, enterprising people together so they can work with and learn from one another. The best research gets done when people with an array of backgrounds look at the same thing from different perspectives. Faculty thrive in an environment that encourages collaboration and experimentation, and where seeking out different types of approaches is embraced. Students benefit from this type of environment in the classroom, but an equally important part of their time here comes from encountering people with wholly different life experiences, whether that be in their dorm or at a coffee shop or just walking across the Diag.

There is inspiration in interaction.

The best research gets done when people with an array of backgrounds look at the same thing from different perspectives.

That’s a guiding philosophy in LSA, where we stress a connection between community and learning, and encourage students to apply knowledge across courses and beyond campus through innovative teaching. In our Residential College, for instance — which soon will celebrate its 50th anniversary — the award-winning Telling It program uses a team-taught course as the platform for bringing students into contact with at-risk area youth with the aim of using the arts to effect change in lives and communities. That provides students with a unique avenue to approach an issue like social justice while exposing them to a range of viewpoints both inside and outside of class.

Another example is the College’s “22 Ways” series of courses, where a single topic is addressed in lectures by 22 different professors. Looking at a subject like food, new media, or race through the lenses of campus experts in a variety of disciplines not only stimulates new ways of thinking and learning, but it also demonstrates to students the breadth of knowledge and expertise that the College has to offer.

Of course, this all ties in with one of the College’s highest priorities: enhancing diversity. LSA and U-M have long-standing commitments to diversity, and last spring President Schlissel discussed two key motives for this commitment: Michigan’s responsibility as a public institution to serve all of humanity, and the centrality of diversity to excellence and the pursuit of knowledge. Quite simply, a diverse campus is essential for producing graduates who leave here with the ability to think creatively, communicate effectively, and relate to people different from themselves.

One of our successes in this regard is our Comprehensive Studies Program, which supports underrepresented students through coursework, advising, and other resources. But, to be sure, we still face challenges in our efforts to recruit both a diverse student body and faculty. That’s why I look forward to working closely in the coming year with College and University leadership as we assess our efforts to meet these challenges and help to develop U-M’s Strategic Plan for Diversity.

You can read a fascinating article about different ways to think about the benefits of diversity in the issue that follows, along with a host of stories that feature those surprising intersections where great people and great ideas come together to create something new and unexpected. That, after all, is when a university is at its best.

**Andrew D. Martin**
Professor of Political Science and Statistics, and Dean, College of LSA
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Visit LSA Today for weekly web exclusives plus in-depth magazine-related content.

www.lsa.umich.edu

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

AURAL FIXATION
LSA Ph.D. student Pascal Massinon uncovers how a reclusive New Yorker named Tony Schwartz became a recording pioneer without straying farther than a few blocks from his apartment.

ALL NATURAL
See stunning images from the Department of Ecology and Evolutionary Biology’s annual fieldwork photo contest.

SPIN CLASS
An LSA alumna gives lessons on the science and psychology of personal fitness.

DOG DAYS
Hear one LSA linguistics professor’s thoughts on dogs, work, and language.

Read past issues of LSA Magazine:
www.lsa.umich.edu/alumni/magazine
I just wanted to let you know that I recently started receiving my LSA Magazine. Anyway, it’s like a breath of fresh air — interesting, entertaining, colorful. My graduate-school alumni magazine is so overly academic, critical, and elitist, that it actually makes me uncomfortable! Nice work on exemplifying the diversity of LSA at U-M. I’m glad to see there’s a “right” way to do it. I hope other alums agree.

Michael Hanus (A.B. '03)

“Word Smiths”

Once upon a time, my wife and I bought a crossroads weekly newspaper — the Galien River Gazette — in Three Oaks, Michigan. That’s in Berrien County, almost in Indiana or Illinois. This after seven or eight years in journalism in Ann Arbor, Saginaw, and Detroit at newspapers and magazines that were as high tech as it got.

The Gazette was not exactly Gutenberg, but it wasn’t far ahead of it. We had a Mergenthaler linecasting machine, a flatbed press, and a C & P job press much like the one in the illustration [in “Word Smiths”]. There is and was nothing like being part of the physical process of putting type together and then inking it on paper. Thus, your “Word Smiths” piece was encouraging and delightful. It is refreshing that the Zell money is being put to good use — in my mind, any way — to put writers in touch with and in control of their craft.

I left the Gazette to become a journalism educator. I’ve enjoyed the academic life (well, there were a few days…) and frequently remember getting my start in journalism in my hometown, Niles, and later in the now-defunct journalism department at Michigan. And, of course, at the Michigan Daily.

I’ll share your piece with some local writers who will, I think, appreciate and applaud what you’re up to.

Wally Eberhard (A.B. ’55)

I want to thank Fritz Swanson for his article on Wolverine Press. I grew up in what was then a small town in Michigan, across the lake from the now defunct Lake Lansing Amusement Park, where my father built a letterpress print shop largely from other people’s unwanted machinery and equipment.

Though he acquired dozens of cases of type, there was not enough of one kind to print more than small brochures for various community groups. We often had to pirate letters from standing forms to use in others, and once did a 24-page handbook for the local high school of parodies, and subsequently a few other chapbooks, at least as much for the pleasure of working with a letterpress as for the satisfaction of seeing my poems in print.

Congratulations to Wolverine Press and my best wishes for your continued success.

Jan D. Hodge (A.B. ’63, A.M. ’64)

I always feel hopeful about the world after reading about the forward-thinking projects and research LSA faculty and students are doing. Keep up the good work.

Penelope Goldstein (A.B. ’75)
60 Minutes

The length of a useful nap, according to Department of Psychology researchers. Researchers asked test subjects to draw a series of impossible figures. Participants then either watched an hour-long nature documentary or took an hour-long nap. When both groups returned to their task, the nap-refreshed participants kept at their task for twice as long as the doc watchers. Now it’s official — napping makes you a better worker! Tell your boss we said so.

“My first lessons were kisses and a hammer.”

THE OPENING LINE OF “MADE IN DETROIT,” THE TITULAR POEM FROM THE NEW COLLECTION BY MARGE PIERCY (A.B. ’57), WHICH TOUCHES ON PIERCY’S CHILDHOOD IN THE MOTOR CITY. PIERCY HAS AUTHORED 18 VOLUMES OF POETRY, AND HER POEM “TO BE OF USE” IS READ ANNUALLY AT THE BEGINNING OF LSA’S NEW ENGLAND LITERATURE PROGRAM.

@neskirderf
Kristen Fredriksen
Oh YUM. Italian star cookies (Pan di Stelle) from EATaly! The bag says “a corner of the sky can be round”... Aww!

@ProfADM
Dean Andrew Martin
First block M sighting [abroad]: British National Gallery. #GoBlue

CONFessions
OF A ONE-MAN BAND

The name of a partially completed memoir by Orson Welles, in which the Citizen Kane star dishes on longtime friend Ernest Hemingway and ex-wife Rita Hayworth. The manuscript was discovered among new materials acquired by LSA’s Screen Arts Mavericks and Makers archive.

IN ASTRONOMY CIRCLES, “Q” stands for “the amplitude of primordial density fluctuations,” referring to the difference between regions of space that are relatively empty and regions that are relatively full of, well, stuff. Our universe has a relatively low Q, but it’s possible that other universes might have much higher Qs and possibly more life, according to a paper by Ta-You Wu Collegiate Professor of Physics Fred Adams, Alexander Ziwet Collegiate Professor of Mathematics Anthony Bloch, and LSA student Katherine Rowe Coppess. This includes the possibility of universes that are (comparatively) teeming with life, with multiple Earth-like planets within a single solar system.

THE FIRST GENTLEMAN OF RHODE ISLAND

The official title of Andy Moffit (A.B. ’91), whose wife, Gina Raimondo, became the 75th governor of Rhode Island in January. But Moffit’s life isn’t all ambassador dinners and black-tie gubernatorial fêtes; he also directs a prestigious management consulting firm.

PHOTO Getty images/CBS Photo Archive
“If you call out to one of the dead, all of them can hear you.”

CHARACTER ACTRESS LIN SHAYE (A.B. ’65) AS PSYCHIC ELISE RAINIER IN THE SUMMER SCREAMER INSIDIOUS: CHAPTER 3. SHAYE HAS DONE A BIT OF EVERYTHING, WITH A LIST OF FILM CREDITS THAT INCLUDES ALL THREE INSIDIOUS MOVIES, SNAKES ON A PLANE, DUMB AND DUMBER, AND THERE’S SOMETHING ABOUT MARY.

430 BCE

The first year of the Plague of Athens, an epidemic that lasted half a decade, which History Professor Powel H. Kazanjian Jr. (Ph.D. ’12) believes may have actually been an early outbreak of the Ebola virus. The identity of the disease has confounded medical historians for centuries and has been variously attributed to the bubonic plague, typhus fever, and anthrax.


LOCATION, LOCATION, LOCATION

The origins of several stories in this issue and online:

- Chicago
- Arizona
- Burns Park Elementary School
- The International Genetically Engineered Machine Competition
- The Circus
- Mount Olympus
- Wonderland
- Vaccine Court
- Dwight Lang’s House
- Midtown
- Cape Cod
- Festival de Cannes

1,000,000,000,000

The number of viruses—including more than 5,000 that had never been identified before—that LSA’s Department of Ecology and Evolutionary Biology researcher Melissa Beth Duhaime collected as part of a globe-spanning oceanic research expedition.

PAINTING Plague in an Ancient City by Michael Sweerts, courtesy LA County Museum of Art
Going the Extra Mile.

YOU CAN HELP.
LSA senior Rachel Ochoa has always been driven to achieve her goals. Since the age of 12, she has worked to earn money for college, whether sugaring donuts at an apple orchard, working at amusement parks, or waiting tables. After her first year at U-M, she was offered the chance to intern at Blue Cross Blue Shield. She was thrilled, but in order to take advantage of this opportunity and continue earning money for school, Rachel needed scholarship support.

EXPERIENCE OF A LIFETIME.
Thanks to the generosity of LSA internship scholarship donors, Rachel was able to obtain valuable experience in the professional world, giving her the support she needed to focus on her education and jump-start her career.

TAKE ACTION.
Give a gift today to become an LSA Victor and help Rachel and countless students like her attain their goals.

Move forward.
Give back.

EVERY GIFT MAKES A DIFFERENCE.

LSA Fund
Supporting Excellence

734.615.6376  www.lsa.umich.edu/alumni/giveonline
But people are remixes, too. We are remixed by our families and cultures. By the books we read. The conversations we have. The professors we work with. And no place is better at illuminating these connections than LSA.

From alumni to professors to students, LSA Victors are combining dissimilar topics to astounding effect, moving from math proofs to comic strips and writing sonnets about strontium. Our originality emerges not from some inborn perfection of character but out of the courage to step into the in-between spaces and figure out how the world really works.
Sharon Shattuck spent years preparing for a life in botany before moving to New York City to make documentary-style films. Here’s how she flipped the script.
before moving to New York City to make documentary-style films. Here’s how she flipped the script.

by Elizabeth Wason
Today is puppet-making day.

Within reach, filmmakers Sharon Shattuck (B.S. ’05) and Flora Lichtman have laid cutting mats, X-Acto knives, laptops, a camera, paper of various colors and sizes, a hot glue gun, LED lights, and a contraption called a Silhouette machine, which looks like a portable printer. As they spread art supplies across two large tables in the kitchen, they listen to the audio cut they’ve already finished for their project. Shattuck turns up the volume on the speaker, and volleying voices describe how paleoanthropologist Mary Leakey discovered ancient human footprints in the African savanna.

Shattuck gets to work making mammoths and camels. She creates the animal outlines and then feeds a sheet of paper into the Silhouette, which cuts with a precision that would be slow going if done by hand. “We call this the game-changer,” she says. “It completely changes the production flow, but I’m always trying to approximate handmade as much as possible.” Lichtman patiently transforms a long strip of paper into grass, cutting it blade by blade. She likes the meditative Zen aspect of working with her hands.

“We try to keep all of the little animals and plants that we make. We kind of have our own little Jim Henson thing going, where we pull out a drawer and it’s a bunch of ferns!” Shattuck says. “But being in New York, we can’t be very sentimental about space.”

Shattuck and Lichtman run Sweet Fern Productions, a multimedia company that uses paper puppets and animation to spread science stories in unexpected ways. They’re a small outfit — “It’s like a micro-business,” Shattuck says — but they’re committed to doing things differently. “It’s exciting that we have this vision for something weird and different, and we’ve been able to make that into something tangible.”

They’re working on the latest video in their Animated Life series for the New York Times. The fourth installment will feature Leakey’s discovery of ancient human footprints, while prior videos have highlighted a forgotten naturalist, microscopes, and Pangaea — the ancient land mass that broke into the separate continents we know today.

But Shattuck insists that the videos really aren’t about any of those things. “They’re about people who didn’t set out to find what they found,” she says. “They’re a celebration of underdogs and moments.
of discovery that change the way that we see the world.

After five or so hours of work, Lichtman has cut about six sheets of grass for their African savanna, and Shattuck has amassed more than a dozen ice-age animals. Next week, they’ll get together again to continue building their paper set. It’s been a long day, and Lichtman is ready to head home. But even as Lichtman says goodbye near the door, Shattuck keeps talking with oblivious enthusiasm about all of the various tree species they’ll be able to include in their paper savanna: “Sausage trees,” she says, “umbrella trees, acacias, date palms, baobabs...”

Shattuck is a big plant nerd. She majored in LSA’s Program in the Environment (PiE) during the first year of the program’s existence. She took an ecology class at the U-M Biological Station (UMBS) the summer after her freshman year and loved it. “It’s a different way of doing school,” she says, “and I really responded to that. It got me to start thinking of myself as a scientist.” Some friends there convinced her to take the woody plants course on campus as a sophomore. “That,” she says, “is when I got hooked on botany.”

She joined Burt Barnes (B.S. ’53, Ph.D. ’59), the late professor of ecology and evolutionary biology, in researching red maple trees, and she returned to UMBS to study invasive cattails with the Research Experience for Undergraduates Program. Even
Shattuck and Lichtman (bottom left, opposite page) innovate with each new video they produce: Magnets help them easily adjust parts of the paper set, LEDs serve as mini-spotlights, metallic wrapping paper depicts reflective water, and a Silhouette machine cuts plants and animals—such as the tiny trees pictured here—in intricate detail.

“When I was a little kid, I used to put on shows, and I would make everybody in my family sit down and watch. I would direct everybody around me, making my cousins dance or sing or whatever.”
after graduating from U-M, she went back to help teach botany and ecology courses at UMBS for several summers.

Shattuck also spent time on Barro Colorado Island in the Panama Canal, monitoring tree seedlings in an experiment to figure out how the forest developed and how it might look in the future. She parlayed that experience into a botanical research position at the Chicago Field Museum. Working with plants was her favorite thing, and she was on track to get a Ph.D. in botany. But the solitude of her botany work meant that sometimes she didn’t talk to a single soul for days at a time. She began feeling lonely and isolated. That’s when she made a drastic decision.

“I’ve got to go to the biggest city and work with people!” Shattuck vowed. “I’m going to communicate science and make movies and make science interesting.”

With no experience in film, Shattuck ditched the academic life of science and moved to New York. She got a master’s degree in digital journalism at New York University; produced videos for PBS, ProPublica, Slate, and Vice; made commercials for Estée Lauder and Louis Vuitton; and created short animations for live-action films.

Shattuck and Lichtman met in New York, got along right away, and made an experimental mini-documentary called Whale Fall, a meditation on what happens to a whale after it dies. People loved and shared the video, which by now has been viewed more than 500,000 times.

“For some reason, it felt like we had the vision. We were like, ‘We can do this!’ even though we’d never done it before,” Shattuck recalls. “And it worked.” That seminal project incorporated the signature paper-puppet aesthetic that has driven most of their collaborative work since then. What began as a fun side project turned into the founding of Sweet Fern Productions and creating science videos with funding from national educational organizations.

Her network of collaborators in New York City is one main reason why Shattuck is based there and not in northern Michigan. Otherwise, she says she would stay local to be with friends and family. She grew up in a small town on Little Traverse Bay, less than 30 miles away from UMBS.

“Do you ever think about when you were a really little kid, and what you liked to do?” Shattuck muses. “I used to put on shows, and I would make everybody in my family, and in my extended family, sit down and watch. I would direct everybody around me, making my cousins dance or sing or whatever.

The name of Shattuck and Lichtman’s multimedia production company, “Sweet Fern Productions,” comes from Comptonia peregrina, a plant that grows near the northern shores of Lake Michigan—Shattuck’s old stomping grounds. Funding comes from nonprofits that invest in science education, such as the Howard Hughes Medical Institute and the Alfred P. Sloan Foundation. The top two video stills show moments of live action among paper-puppet scenes. The bottom image shows Shattuck’s dad in From This Day Forward; Shattuck made the documentary independent of Sweet Fern Productions.
“I don’t know how that turned into documentary,” she says, “but at some point it turned into a fascination with reality. The truth is stranger than fiction, and you find a lot of crazy stories that are true.” Earlier this year, Shattuck released a feature-length documentary about how her parents’ marriage — and her family — survived her father coming out as a transgender woman. In her small hometown, Shattuck had little control over her own personal history. She and her family were just too visible in the community, and everyone knew and noticed that her dad wore women’s clothing. When Shattuck was in third grade, her dad, Michael, legally changed names to Trisha. Trisha presents as relatively gender neutral, but she prefers female pronouns and likes to wear makeup and a dress.

For most of her life, Shattuck wanted nothing more than to escape her family’s open secret. “She would literally walk around singing in the supermarket,” Shattuck says about Trisha, “and that was mortifying. It wasn’t just about having a transgender dad — it was about having a person who was hamming it up for the entire town.

“I think for a lot of kids of LGBT parents, you’re just as much in the closet until you start coming out about your parents,” she says in the film. When she left her hometown and got to U-M, Shattuck could divulge her family’s story on her own terms. The new control over her personal life was liberating. More recently, Shattuck produced From This Day Forward, the documentary about her family, to clarify aspects of her early family life that she’d never understood. She leads the very first scene of the film with Trisha humming a little tune.

“The whole point of my film is to get people to be kinder to one another,” Shattuck says. “It’s about showing people that a family like mine is completely normal, and loving, and just another flavor of what a family can be. “Everybody’s different,” she continues, “and there are so many different stories out there that need to be told.”

Shattuck leads the way to Mud Lake Bog and plunges her bare feet into the mossy carpet. The soft substrate gives way with an audible, watery sigh. Shattuck frequently stoops to examine the vegetation near her toes: sphagnum moss, pitcher plants, sundews. Beyond the line of trees, she sways on the floating island of moss that shifts and bounces beneath her feet. Shattuck has returned to UMBS, and this time she’s brought Lichtman and a different way of thinking about science. Back at the lecture hall, they show some videos to a packed auditorium — the largest, most diverse crowd that a resident researcher says he’s ever seen.

In one video, an intricately crafted polar bear snarls in the foreground as Pangaea theorist Alfred Wegener passes in his dogsled; smoke rises from his pipe in the shape of a continent. In another, microbe puppets swim in synchrony under microbiology pioneer Antonie van Leeuwenhoek’s homemade microscope, while a tiny paper reproduction of a Vermeer painting...
hangs on his wall, a wink to their shared hometown of Delft in the Netherlands. Although the videos for the New York Times are designed for viewing on small digital screens, the handcrafted paper puppets look incredible as larger-than-life projections in the lecture hall.

Shattuck and Lichtman are here to share tips and tricks for science communication by giving a camp lecture and interactive workshop. “Our philosophy is high-brow-lowbrow,” they say from the stage. “Scientifically accurate, but not high art.”

Shattuck says that crafting these paper-puppet videos allows her eyes to adjust to the world instead of a computer screen. For viewers, too, seeing the fun, creative stories is visually and mentally refreshing — especially because usually, science coverage comes prepackaged with lessons to learn and facts to memorize.

For viewers, seeing the fun, creative stories is mentally refreshing — especially because usually, science coverage comes prepackaged with lessons to learn and facts to memorize.

Filmmaking and science share roots, in Shattuck’s view. In her case, botany requires intimate observation and detailed drawings of plants, skills that serve her style of visual storytelling. But Shattuck has always considered herself a scientist first, artist second. And in both cases, she knows that gaining a better understanding sometimes just requires a shift in your point of view.

For most of this year, she’s taking her documentary, From This Day Forward, on tour at national and international film festivals.

Shattuck and Lichtman get together a few days a week to cut puppets, create storyboards, interview narrators, edit the audio, film the scenes, and edit the footage. Each video takes about six months to make.
DIVERSITY IS GOOD FOR YOU, NOT JUST IN A WARM AND FUZZY WAY, AND NOT JUST FOR SELECT GROUPS OF PEOPLE. DIVERSITY CREATES BETTER OUTCOMES FOR EVERYBODY, AS LSA PROFESSOR SCOTT PAGE (A.B. ’85) HAS SHOWN TO BE MATHEMATICALLY TRUE.

by Elizabeth Wason
Diversity beats sameness. We don’t have to search hard for examples: Take Netflix, which makes an airtight case for the power of diversity.

The movie streaming and rental service allows users to rate movies they view, then plugs user data into its proprietary algorithm to generate recommendations. In 2006, Netflix tapped the wisdom of crowds by inviting the public to compete in the Netflix Prize, with the goal of improving the quality of its suggestions for subscribers. The challenge: Increase the accuracy of the Netflix movie-rating algorithm by 10 percent. The reward: $1 million.

Rising to Netflix’s challenge, three researchers assembled a team they called BellKor and created a mathematical model that improved the algorithm by 6.8 percent. BellKor then combined dozens of different models to ratchet up their results even further. And when BellKor joined forces with a competitor, BigChaos, the combination of their models led to still greater improvement. Finally, another team called the Ensemble brought together international members from formerly competing teams, finishing at a dead heat with BellKor and BigChaos. The models submitted by both teams exceeded Netflix’s accuracy by just over 10 percent. And once again, combining the top two models led to even better results.

Scott E. Page (A.B. ’85), an honors math alumnus and current professor of complex systems, political science, and economics, often tells the story of the Netflix Prize to rooms full of listeners to demonstrate the benefits of diversity. The point of the story is simple: When diverse teams exploit diverse resources, they win. But that conclusion didn’t come easily.

**The Difference of Difference**

Before Page ever set off on what has become a nearly decade-long international lecture tour touting diversity, he’d done a little experiment. He built a few mathematical models to see if he could gain insights about how diverse problem solvers tackle difficult challenges.

“I stumbled on a counterintuitive finding,” he writes about his experiment. “Diverse groups of problem solvers — groups of people with diverse tools — consistently outperformed groups of the best and the brightest. If I formed two groups, one random (and therefore diverse) and one consisting of the best individual performers, the first group almost always did better. In my model, diversity trumped ability.”

The benefits of diversity play out in real life, too — in many different settings. Corporations and industries with diverse teams tend to have greater productivity and profits. An experiment in Michigan’s Washtenaw County compared mock juries that were either all white or diverse, and it found that diverse juries made fewer errors, discussed more of the evidence, and engaged in longer deliberations.

And there’s growing consensus about Page’s findings. A study coauthored by MIT professor and LSA alumnus Alex Pentland (B.G.S. ’76) affirms Page’s conclusion that groups of expert individuals aren’t guaranteed to succeed. Rather, Pentland and his colleagues found that groups perform better when they’re diverse and empathetic — that is, when they contain more females and if members have the chance to contribute equally.

Page was so bothered and intrigued by the phenomenon that he wrote a book about it. That book, *The Difference*, moves the conversation about diversity out of the ethical, political, and legal spheres. Instead, it uses math and logic to make the case that higher diversity yields greater tangible benefits.

Now, Page gets invited to consult with organizations like the Mellon Foundation, Google, the U.S. Federal Reserve, the U.S. Treasury, NASA, the Society of Women Engineers, and the American Dental Association. They’re taking his argument seriously and running with it in the real world.

Likewise, diverse perspectives are vital to the liberal arts mission of LSA. Departments throughout the College see value in diversity — with benefits both tangible and intangible — and are taking action as a result: They’re developing plans and programs to create a more diverse student body and faculty.
AT THE 1906 WEST OF ENGLAND FAT STOCK AND POULTRY EXHIBITION, 787 PEOPLE GUESSED THE WEIGHT OF A STEER ON DISPLAY.

Average estimate = 1,197 pounds

Collections of people can make accurate predictions. Collections of diverse people often make the most accurate predictions.

Other examples that demonstrate the “wisdom of crowds”

- Audience members guessing the right answer for the “ask the audience” lifeline on TV’s Who Wants to Be a Millionaire?
- Gamblers using online markets to bet on which teams will win NFL games
- Classrooms full of students estimating Scott Page’s weight by sight
Tim McKay and Vic Strecher (M.P.H. ’80, Ph.D. ’83) knew each other casually from living in the same neighborhood. Though neither of them realized it at the time, they both worked on campus — McKay as a professor of physics and astronomy and the director of LSA’s Honors Program, and Strecher as a professor in the U-M School of Public Health and founder of the Center for Health Communications Research. The first time they met was when they both performed — singing and dancing — in a local community theater company, the Burns Park Players. Only later did McKay find out that Strecher had won an award as the 2010 U-M Distinguished University Innovator of the Year. “I went to hear his talk, because he’s my friend. I had no idea what he did,” admits McKay.

At the award ceremony, Strecher talked about the open-source software package he helped create, which personalizes health advice for patients. “When I heard his talk and learned about his work, it was clear that he had the solution for my big problem,” says McKay, “which was how to personalize the learning experience for students in big classes.”

After Strecher’s talk, the two met to figure out how the public health software could be implemented in McKay’s introductory physics classes. They quickly came up with a plan and raised funds, and within about two years, McKay had created an open-source software package that he calls the Expert Electronic Coaching system, or E’Coach. Whereas before, McKay and other instructors struggled to give students individual attention — particularly in large lecture courses — E’Coach tailors feedback for students according to “diversity in every imaginable dimension,” McKay says.

“Goals, interests, background, demonstrated ability in the class — we’re thinking about the students that we serve in rich and new ways, recognizing that they’re much more diverse than we usually acknowledge, and thinking about how we might serve all of those different groups of people well.” And the data show that students who use E’Coach perform better in class.

McKay continued thinking along these lines, later establishing the Researching Evidence-Based Undergraduate Instructional and Learning Developments project (REBUILD) with faculty from the Departments of Physics, Chemistry, Biology, Math, and Astronomy. REBUILD aims to change the culture of teaching in these departments. The REBUILD faculty want to shift away from conventional teaching methods based simply on habit or tradition. Instead, they want to use scientific methods, data, and evidence to pinpoint the most effective ways of teaching science to undergraduates.

McKay and his colleagues in LSA brought together experts from the School of Public Health, the School of Education, the School of Information, and elsewhere to bolster the REBUILD team — an incredibly collaborative project.

“Michigan created an environment that made these projects much more possible than they would’ve been on any other campus,” McKay says. “The reason we build interdisciplinary projects here is because they bring huge advantages. When you have a team with a major mix of skills, they can do something that no team drawn from just one of those schools can do.” That includes using reams of data to achieve outcomes that may seem impossible at the start, such as tailoring classes to specially benefit every unique student in the lecture hall.

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We serve the most underrepresented students in the U-M community. They are students who come from working-class backgrounds, from under-resourced high schools, and from very small schools. They are the first in their families to go to college. In the last few years, we’ve also seen an increase in the number of students who come from the Upper Peninsula.

Dwight Fontenot (M.S. ’86, M.S. ’87, Ph.D., ’93), associate director of CSP
25 percent female, and 4 percent faculty of color to about 12 percent," Fierke says, “an enormous change in the face of the [chemistry] department.”

Last spring, ADVANCE invited nearly 50 people to a workshop called NextProf Science. All participants were approaching the faculty phase of their career and had an interest in promoting diversity in universities. With NextProf, Fierke explains, ADVANCE wanted to “show faculty at U-M that diverse candidates are out there. We really need to go out, look for them, and find them.”

Out of ADVANCE sprouted a master’s program that stemmed from a similar realization: If the goal is to foster a more diverse student body, one way to get there is to actively go out and recruit them. The first “bridge-to-Ph.D. program” was established in 2008 by the Department of Ecology and Evolutionary Biology (EEB); they call it the Frontiers Program. The idea spread throughout LSA from there.

Cagliyan Kurdak directs the bridging program in Applied Physics, which they’ve named the Imes-Moore Fellows Program, after two groundbreaking physicists: Elmer Imes (Ph.D. ’58), the second African American in the nation to earn a physics Ph.D., and Willie Hobbs Moore (B.S.E. ’38, M.S.E. ’61, Ph.D. ’72), the first African American woman in the nation to earn a physics Ph.D., both alumni of LSA’s Department of Physics. Kurdak describes the strategy of the program as “bringing in students that will make us proud down the road. We care about students who care about society.”

Kurdak gets excited when he sees that a male applicant is an enthusiastic member of the Society of Women in Physics, or if a student shows entrepreneurial promise by creating products out of salvaged goods as an undergraduate. That type of experience “is not captured in the transcript, not captured in any exam,” he says, but such unique students bring diverse ideas to the program. “We know those students will have a positive impact on society.”

Mark Hunter, a professor in EEB and the former director of Frontiers, elaborates that any of the programs on campus, from the undergraduate to the graduate level, should reflect the society to which we become even more excellent at what we do,” Sellers says, “in terms of innovation, problem-solving, and having a greater variety and excellence in our understanding of the human condition.” He’ll lead a campus-wide effort to increase diversity on campus, directly testing Page’s conviction that greater diversity leads to extraordinary outcomes.

Of course, interacting in diverse groups also comes with a challenge — there’s potential for conflict, and communicating across different perspectives and backgrounds simply can be difficult. Of course, interacting in diverse groups also comes with a challenge — there’s potential for conflict, and communicating across different perspectives and backgrounds simply can be difficult. Of course, interacting in diverse groups also comes with a challenge — there’s potential for conflict, and communicating across different perspectives and backgrounds simply can be difficult.

McKay, for one, wants to do a better job of shepherding students into and through science disciplines, rather than inadvertently weeding out students. He can evaluate the success of E’Coach and REBUILD by keeping track of how many students declare and actually graduate as science majors.

Hunter has kept an eye on what happens to Frontiers master’s students. Do they graduate with a master’s degree, do they continue into doctoral programs, do they find jobs outside of academia? “The expansion of such programs is another metric of success,” he adds, which translates into three or four bridging programs at U-M alone, with more popping up around the country.

Rob Sellers (Ph.D. ’90), a professor and former chair of the Department of Psychology, recently has taken on a new role as vice provost for equity, inclusion, and academic affairs. He plans to look for three major marks of progress in every diversity initiative on campus: Are the programs more diverse than they were? Do we have an environment that everyone feels is inclusive? Do people treat each other with respect?

One metric worth gauging is “the extent to which we become even more excellent at what we do,” Sellers says, “in terms of innovation, problem-solving, and having a greater variety and excellence in our understanding of the human condition.” He’ll lead a campus-wide effort to increase diversity on campus, directly testing Page’s conviction that greater diversity leads to extraordinary outcomes.

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But, Page says, “You cannot help but confront difference now — at the University and in the world — in a way that you didn’t 20 years ago.” If students prepare now for what they’ll inevitably encounter when they leave campus as alumni, they’ll be equipped to solve problems and innovate in a diverse world — not in spite of diversity, but because of it.

“We’ve got a complex reality. The only way you can possibly prevent really bad outcomes, come up with innovative ideas, predict what’s going to happen, is to have a diversity of ways to think about it,” Page says. Our biggest room for growth is to leverage the power of diversity. “It’s the only way.”
Too Much of a Good Thing

A FEW COMPLICATIONS IN THE CASE FOR DIVERSITY

Figure A.

NASA’s Mars Climate Orbiter mission failed in 1999 due to a simple confusion between metric system units (e.g., meters and grams) and imperial system units (e.g., yards and ounces) of measurement.

Figure B.

If small but subtle biases pervade an organization — for example, a bias against promoting women — then those biases combined with other hurdles can result in massive discrimination at the top. Even without any blatant discrimination occurring, you can still wind up with a homogenous — and therefore less effective — upper tier of employees.

While subtle but persistent biases can lead to massive disparities in the long term, the opposite also seems to be true: that small and persistent positive changes can massively improve a group’s diversity and performance over long periods of time.
Thirty years before Photoshop, artist Robert Heinecken used scissors, paste, and Con-Tact paper to transform advertising images from popular magazines into arresting works of art.

As the art world reconsiders Heinecken’s legacy, History of Art Professor Matt Biro is hard at work writing the first book-length treatment of his life and work.

by Brian Short

Reach out and touch someone. Obey your thirst. Don't squeeze the Charmin.

Advertisements are designed for one purpose — to get us to spend money.

But ads and commercials often end up having another, more subtle effect, says History of Art Professor Matt Biro: They can change how we think about ourselves.

The idea that things like movies, TV shows, magazines, and advertisements both cater to us and, in some ways, create us, is a powerful one. Biro encountered this concept
while studying postmodern photography in the 1980s, where art world stars like Richard Prince, Cindy Sherman, and Barbara Kruger remixed and repurposed mass media objects, applying pop art ideas to the field of photography with dramatic results.

By the mid-1990s, histories were already being written around the major figures of postmodern photography. But there was one artist included in these histories whose work Biro didn’t recognize.

Biro would eventually discover that the artist was an early pioneer of the remix strategies of appropriation art, an artist who spent much of his creative life reclaiming personal meaning from cold and calculating images published in the mass media. The man was a visionary who created transfixing imagery by combining photographs from articles and advertising decades before Photoshop.

But back in the 1980s, all Biro knew about the artist was one blurry photograph of the news anchor Connie Chung in an anthology. He didn’t even recognize the name. Who was Robert Heinecken?

**IMPOSSIBLE IS NOTHING**

Heinecken was born in 1931. After moving around during his very early years, he grew up in Riverside, California, and enrolled at UCLA after high school. But Heinecken struggled to keep his grades up in college. On the verge of losing his university deferment at the height of the Korean War, he applied with some friends to become a marine pilot, a move that everyone in the group thought gave them a better chance of surviving the war than being drafted into the infantry.

Heinecken was half an inch too short to qualify for pilot training, but he snuck past the tester with a trick that predicted his future standing in the art world: He filled his shoes with cut-out magazine pages.

By the time his training was finished, the war was already over, and Heinecken took advantage of the G.I. Bill to head back to school. Following a strong interest in graphic design, Heinecken got his bachelor’s and then his M.F.A. in printmaking. After school, he taught photography in downtown Los Angeles and was later hired as a professor at UCLA’s main campus, which was going through a sustained expansion as soldiers like Heinecken used the G.I. Bill to advance their education.
Today we’re used to personalized advertisements drawn from our Facebook profiles. But in the 1960s, the demographic targeting of consumers was revolutionary.

In the late ’60s and early ’70s, Heinecken began to do some of his most challenging work as an artist. He covered spinning cubes with chopped-up pictures of human bodies and made palimpsest pieces from then-current magazines, combining photojournalism and advertisements, war coverage and fashion-mag glamour shots. Heinecken’s work was shocking, politically charged, and filled with startling swerves and unforgettable juxtapositions. He was just getting started.

HAVE IT YOUR WAY
The 1960s saw a radical transformation of the magazine business in the United States. Before, most magazines were general interest items that appealed to a generic, largely undifferentiated subscriber base. Then, all of that changed. “They used to be mostly general news or entertainment magazines,” Biro explains. “Suddenly, in the ’60s, there were magazines for teens. There were magazines for hunters. There were magazines for golfers and for car lovers and for camera aficionados. And the advertisements were directed at those consumers, but they were also constructing those consumers. And Heinecken responds to that in his work.”

Twenty-first-century audiences are largely accustomed to personalized advertisements that draw information from their Facebook profiles and Twitter feeds. But in the 1960s, this kind of demographic targeting of consumers was revolutionary. During this period, Heinecken produced a series of dramatic art projects that addressed these cultural shifts. One is *Are You Raa* (1964–1968), which featured photograms — photographs created without a camera — of magazine and newspaper pages. The photograms combined images from opposing sides of the magazine page, resulting in prints that Biro describes as having an “x-ray” quality to them. Human forms commingle with advertising copy and brand-name consumer products, making figures that don’t just seem as if they are composed of products, but that they have been colonized or diluted by them.
For his piece *Periodical #1* (1969), Heinecken pulled 29 magazines apart and frankenstein-ed them together into 19 new “variants,” magazine-like objects filled with interrupted articles and advertisements that didn’t seem to fit with the surrounding pages. Ads from glamour magazines shilling high-end perfume were juxtaposed with down-home cooking recipes from *Good Housekeeping*. The effect was to disorient a reader with articles that emerged from nothing and then went nowhere, and with imagery that, stripped of context, demanded new interpretations.

“Heinecken took this radically divergent array of sources, including *Glamour* and *Guns and Ammo* and *Playboy* and *Newsweek*, and, by editing them together, he makes an object that speaks to a consumer that doesn’t yet exist,” Biro says. “Paging through it, the reader sees and feels that, and we respond by imagining new lifestyles and new forms of consumption that haven’t been categorized or defined yet.”

Another piece, *Periodical #5* (1971), involved copying a single image of brutal violence from American Vietnam War coverage from various glamour magazine advertisements. Heinecken then took the recreated magazines and smuggled them onto newsstands and into dentists’ offices so that people would encounter them unexpectedly — an abrupt reminder that America was fighting a war in a far away country.

“Heinecken was an ex-soldier,” Biro says, “and he had a very complex relationship with war. He had never been in a battle, but, like many people of the era, he was shocked and appalled by the Vietnam War and very critical of it.

“The magazines [in *Periodical #5*] were his way of protesting Vietnam in a very Heinecken fashion, following his artistic interests and getting us to examine how news shows and magazines affect our understanding of the war, and pointing out where we expect to see war imagery and where we don’t.”
YOU’VE COME A LONG WAY, BABY
Heinecken’s work continued to evolve and eventually included increasingly complicated photographic sculptures, film strips, installation pieces, “videograms” — photographs created by pressing photosensitive paper to the surface of a television set — and different forms of composite photographs, many of which explored the increasing influence of television in everyday life. As Biro researched Heinecken’s story and art, it became clear how much of a pioneer Heinecken truly was, using strategies in the 1960s and 1970s that didn’t become art-world mainstays until two decades later.

But Heinecken’s significance as a pioneer — one of the “roots,” Biro says — of appropriation art wasn’t largely recognized, and there were a few different reasons why. He was a West Coast artist, working largely in Los Angeles, while the most famous postmodern photographers were all based in New York. Heinecken also didn’t link his work with any particular philosophical movement, like the New York postmodernists did.

And while there were ways in which Heinecken was ahead of his time, there were also ways in which he seemed old fashioned, and not in a good way. As the women’s liberation movement was gaining more and more popular support in the ’60s and ’70s, Heinecken was producing work replete with nude images taken from “men’s magazines” of the era. Part of the value in this part of Heinecken’s work, Biro says, is that it explores the boundaries between beauty and profanity, re-interrogating millennia-old questions about the difference between “naked” and “nude,” and exploring the social effects of pornography. But to an audience concerned about objectifying imagery and sexual exploitation, large portions of Heinecken’s work seemed deaf to the issues of the era.

The Pictures Generation

“The Pictures Generation” is both the name of an exhibit presented at the Metropolitan Museum of Art in 2009 and the label given to the artists included in that exhibit — artists who, together, include many of the most influential figures of American postmodernism and appropriation art. Here are three members of the post-Heinecken vanguard.

CINDY SHERMAN
Sherman has made a career out of photographing herself, creating dramatic scenes such as the one pictured below in which she is transformed by makeup, prosthetics, costumes, wigs, backdrops, or lighting. At the heart of her work are important questions and ideas about objectification, glamorization, beauty, and identity.

RICHARD PRINCE
Prince is best known for his photographs of photographs, including images that originally appeared in the New York Times and a piece called Untitled (Cowboy) taken from a cigarette ad, the first “rephotograph” to go for more than $1 million at auction. A recent Prince exhibit included blown-up versions of pictures from Instagram that included usernames, comments, and the number of likes each photo received.

BARBARA KRUGER
Feminist and conceptual artist Barbara Kruger is most famous for her work with text, laying a few words (often in Futura Bold Oblique or Helvetica Ultra Condensed) over a picture or a field of color. A number of Kruger’s projects involved covering buses with text, including simple equations such as “BELIEF + DOUBT = SANITY” as well as song lyrics from Courtney Love’s band Hole, for example.
Pornographic images were illegal in California at the time, but undeveloped photographs containing explicit content were not. Heinecken purchased rolls of these undeveloped photographs and used them in his photographic work, drawing the viewer’s attention to questions of legality, perversity, beauty, and art.

In an era when Twitter feeds are stuffed with images remixed in Photoshop, Heinecken’s images still have the power to upset and disarm us.

And more people are paying attention to that art. The number of recent shows featuring Heinecken’s work is increasing, Biro says, including an exhibit at the Museum of Modern Art in 2014. The prices for his work are also going up, another sign of an artist’s growing popularity and relevance.

But maybe the surest proof that Heinecken’s career deserves real attention is the work itself. In an era when Twitter and Tumblr feeds are stuffed with images remixed in Photoshop, Heinecken’s images still have the power to upset and disarm us. The sight of human bodies composed of car parts, ad copy, and designer clothes makes explicit the blurry boundaries between mass media and personal identity, forcing us to reconsider how much power advertisements have over us — and how we can take that power back.

“Photography is a social force,” Biro says. “Heinecken didn’t take his own photographs, but his life, his interests, his political beliefs were all clearly present in his art. And all of that is very much about what’s happening today, about people finding things that speak to them and creating a very personal meaning out of imagery that you didn’t create yourself.”

THINK DIFFERENT

The time has come to fully examine Heinecken’s work and legacy, Biro says, warts and all, and he is currently working on the first book-length treatment of Heinecken’s life and work.

To research the project, Biro explored Heinecken’s estate, which is split between the Heinecken Trust in Chicago and the Center for Creative Photography in Tucson, Arizona. He read through a 600-page transcript of Heinecken’s own oral history and sifted through dozens of lectures and classes that Heinecken taught that were recorded, all of which allow Biro to “get very close,” he says, to what Heinecken actually intended with his art.

(Adventures in Mathematics)

Ignore convention! Use the element of surprise!
Deny any supposed boundary between math and art!
LSA graduate student Olivia Walch combines calculations with comics, not to explain a bunch of stodgy rules, but to illustrate why MATH RULES.

by Elizabeth Wason
AND ZEUS SPRANG FORTH FROM THE HEAVENS AND SAID UNTO THE PEOPLE,

ok so like some of you are going to be good at math and the rest of you are going to suck and that's just how it's gonna be.
TO THIS DAY, WE HONOR
ZEUSS'S EDICT...

THE NEXT STUDENT
WILL PLEASE
STEP UP TO
THE STAGE.

OH, VERY GOOD.
YES, THESE TIMES
TABLES NOTECARDS
ARE REALLY
PAYING OFF. YOUR
PARENTS ARE
HAVING YOU DO
EXTRA HOMEWORK
AT NIGHT?
SPLendid. AH, AND
I SEE YOU'RE A
BIT OF A
SHOW-OFF, TOO.
WELL THIS SEEMS
STRAIGHTFORWARD
ENOUGH.
GOOD AT
MATH!

YER ONE OF US
M'DEAR!

FOR NOW, AT
LEAST, WE CAN
KEEP
YOU OUT ANY
TIME.

BETTER HOPE
YOU LIKE
9TH GRADE
GEOMETRY

“Are you alright?” Alice asked the white rabbit, who seemed lost
in his own thoughts.

“All right? Yes, I suppose he is,” said the Hatter, “All right-brained,
not left. You’re either one or the other, you see. More tea?”

“Is that really so?” came Alice’s inquiry, which was met by
the Hatter with a contemptuous toss of his head.

“As different as teacups and oysters, my dear. Ravens and writing
desks.” And with a graceful flick of the wrist he moved to spread
butter onto his scone. “Like walruses and the moon.”

“Walruses and—?”

But it was too late!
And by the time he reached Algebra II,
the hare knew he would never catch up.

There was no hope:
the tortoise was always
moving forward

So by the time the
hare reached where
he had been, the
tortoise had already
moved on from that
spot.

And again.

And again.

To the hare, the worst part was:
The tortoise didn’t even
have to try.

THE MOON GOD,

Measure of the
Earth, calculated
the heaven and
counted the stars.

He made things equal
to the same thing,
equal to each other.

He made 0 and 1 and
bent nature around
them.

He made the
circumference of a
circle divided by its
diameter close, but
different, to three.

And when his wife looked on
and saw what he had done, she
told:

THAT’S PRETTY COOL.
WHAT ARE YOU GOING
TO DO WITH
THAT, TEACH?

strip continues on p. 39
If anyone tells you that math and art don’t mix, slap them upside the head.

Because this — “Olivia Walch says, gesturing to a desktop demo of the phone app she’s been working on, “shows that the two are obviously best buds.”

Walch is talking about the Draw Anything mobile app that she created with Matt Jacobs, her friend and fellow Ph.D. student in LSA’s Math Department. They won first place for it in the fifth semiannual MHacks competition last year, where they programmed the whole app in just 36 hours. The MHacks event was invented by the student organization MPowered to encourage entrepreneurship by challenging students to design, code, and build digital projects with commercial potential.

Draw Anything invokes the magic of math to offer step-by-step tutorials for how to draw any uploaded image. Using math and high-speed computations in the cloud, the app generates increasingly complex outlines of the image for an aspiring artist to follow. Walch animates her demo of the app with examples for drawing Mario, Pokémon, and Homer Simpson. But when the app translates Beyoncé’s face into a mess of scribbles, Walch admits that they’re still working to improve its accuracy.

To that end, she and Jacobs are knee deep in optimizing the app’s edge detection capabilities — the first step in the app’s calculations, and a fertile field of applied math research that’s necessary for things like medical imaging, self-driving cars, and automatically tagging friends’ faces in Facebook photos.

But why would anyone take art advice from a mathematician?

Olivia Sez:
“One of the jokes about Harry Potter is that there’s magic at Hogwarts, but he’s a C student. If you knew magic existed, wouldn’t you want to spend all your time learning how to do stuff with magic? Only Hermione really gets it. She’s like, ‘Magic exists! I’m gonna learn everything about it!’ For me, it’s that if I have an idea, I can actually make it a reality through math. Math is out there! Why wouldn’t I want to spend all my time learning how to do these cool things?!”
LAST COMIC STANDING
Walch isn’t your average mathematician. While her true love is math, she came close to being a syndicated cartoonist. Her comic, *Imogen Quest*, won the America’s Next Great Cartoonist contest, held by the *Washington Post*, while Walch was still an undergraduate. Her probability of winning the contest could have been calculated as a scant 0.2 percent amid the pool of 500 entries, but the subversive hilarity of her strip tipped the odds in her favor.

At 20 years old, Walch was not only the youngest finalist in the contest, but also the sole finalist with two X chromosomes. The *Washington Post* ran Walch’s comic every day for a month and offered to consider publishing it as a syndicated strip. “That was a really cool part of the prize,” Walch says. “And as awesome as syndicated cartooning would be, to me, doing research and getting my degree was more awesome.”

She still draws *Imogen Quest* every week as a webcomic, but she’d already made up her mind to go to graduate school.

DO THE MATH
An undergraduate research project about tridiagonal matrices was what first made Walch’s heart skip beats for math. “I was finding something that I couldn’t Google. Only I knew the answer in that moment. I thought, ‘I have awesome power. I’m starring into the edges of the known universe.’ And that was pretty addictive.” Her Ph.D. thesis is about the mathematics of circadian rhythms, otherwise known as biological clocks. She uses equations to describe how specialized cells in our eyes collect information about ambient light and help maintain our daily sleep cycles.

Walch stays agile hopping between algorithms and art. She plays around with edge detection and triangulation, painting digital “triangle art” portraits of her math heroes: for example, Grace Hopper, a computer scientist who ranked high in the Navy.
It's such a rewarding profession!

You really get to see them blossom under your care.

Look: Lucy might only know her scales right now, but if she sticks with it, she can become a virtuoso.

Gary is only painting by number right now, but I see masterpieces in his future.

Yvette is great at her times tables. With enough practice, one day she'll be able to multiply even bigger numbers.
OR: what if, instead,

WE TAKE MATH TO BE JUST ANOTHER ART

ONE THAT WITH PASSION AND PRACTICE

...can help anyone to make some sense of their universe.

strip continues on p. 42
and coined the term “debugging” for fixing a computer glitch; and Emmy Noether, the woman who invented modern algebra. Her comics find the lighter side of math, such as when Walch imagines a forbearing calculus teacher who allows students to text in the classroom — so long as the “texting” is limited to typing 80085 in their calculators. Another of her comics draws on a classic example from game theory to decide whether you should reply-all to unsubscribe from an email listserv. (Sadly, you should.) And she name-drops Cartesian coordinates to illustrate a point about her comics. “If you want to know a point, you need an x- and a y-coordinate,” she explains. “If I just give you a y-coordinate, it’s just a line, and there are so many choices for the x-coordinate. Same with comics: You need the comic and the intended audience to truly understand the jokes.”

She’s convinced that math gives us a new vantage point for viewing the world, along with new vocabulary that allows for better communication. “I think we have to spread the gospel of math, so that we can talk to each other more easily,” she says. Walch laments that math sometimes is perceived as a sort of secret mystical process that only a select few can understand and use. She believes that, soon enough, “learning more math is going to become commonplace, because we’re going to get better at teaching it. And then, when math is part of how we communicate with each other, we’re going to have a better ability to make our ideas clear, pose our statements properly, and put our ideas together. Talking to each other is going to get better and better.”

Which is great, she says, “for somebody like me, who walks around saying things like, ‘Maybe we should add math to that.’”

Fun Fact!

Isaac Newton drew boring squares around his integrals, but Gottfried Leibniz came up with the elegant swoosh notation that we use in calculus today. Mathematicians who draw, take note: Your illustrations may live on for hundreds of years.
From bioblocks to carnival barker, our tour of campus starts here.

Coming to college brings a mix of excitement and apprehension for everyone, but that is especially true for first-generation students. LSA’s First-Gens @ Michigan group makes it their mission to help students manage the pressure and problems that come along with being first.

by Susan Hutton
EVEN ON HIS FIRST DAY OF COLLEGE, first-generation student David Huynh (B.S. ’15) felt like he was already behind. 

Huynh’s high school didn’t offer AP Calculus, and in his first math class he heard his fellow students casually throw around the word “derivative.” Huynh had no idea what they were talking about. That meant that in addition to doing the regular homework, Huynh had to spend time catching up. “I’m astounded by how much I had to teach myself just to survive,” he says.

First-gen student Candyce Hill (A.B. ’12) noticed other differences. She heard about how many of her classmates had traveled across the United States and abroad, and how their parents had done much of the college administrative work for them.

While her friends’ parents signed them up for orientation and housing, Hill had to figure those things out herself. “It turns out that I knew a lot of things about my housing contract that my peers didn’t know,” she says, “because I read it.”

Carley Flanery (A.B. ’12, M.S.W. ’14, M.P.H. ’14) had never even heard the term “first-generation” before college. Flanery was the only one from her high school to go to college more than a couple of hours from home. Being at U-M was exciting, she says, and she had strong family support, but she missed life at home. Her friends were getting married and raising children. It was easy to feel alone.

But Flanery wasn’t. LSA’s First-Gens @ Michigan exists to support students like Huynh, Hill, and Flanery, to give them a team of faculty advisors and a community of like-minded students. First-generation students may be the first in their families to get a degree, but at U-M, they don’t have to forge the path by themselves.

WHERE EVERYBODY KNOWS YOUR NAME

Housed in LSA’s Department of Sociology, the First-Gens @ Michigan group is open to all first-generation undergraduate students regardless of major or school. Founded in 2007, the group organizes regular meetings and events for its members. It also provides a support group of friends that share an intuitive understanding of what it’s like to be a first-generation student: spending your summer working while friends travel, or suffering the sting of a comment made by someone who assumes everyone else in the room has had the same opportunities.

“It’s hard to overestimate the anxieties that first-generation students — and their families — feel,” says Dwight Lang, a lecturer in sociology, one of the group’s faculty advisors, and a former first-generation student himself. To outsiders, first-generation students often represent upward mobility, opportunity, and the American dream, Lang says, and there’s no arguing about the tremendous opportunities that these students have created for themselves.

But while all students leave home and separate from their family when they go to college, first-generation students are faced with the challenge of doing all of that...
while also acclimating to a socioeconomic climate often starkly different than the one they came from, and an environment that their parents never experienced and cannot help them with.

“These students are crossing class boundaries,” says Lang, “often for the first time in their lives. It’s important that we say, ‘You deserve to be here.’ That message makes such a difference.”

SACRIFICE AND SUCCESS

College ultimately prepares students for life after graduation, and the First-Gens @ Michigan group seeks to do the same. “College is a four-year opportunity to learn how to deal with people who don’t understand where you come from,” Lang advises the students. “I encourage students to be open. It’s a time to become comfortable with who you are and who you’re becoming as you’re acquiring a new identity”—all crucial skills for life after college.

Aspects of cultivating that identity had particular resonance for Hill because they were novel. “My sophomore year, my roommate was an international student. Before I came to U-M, I might have passed someone from another part of the world in the mall, but I’d never had the chance to actually talk to them,” she says. “That access and proximity gave me a feeling of wonder, and that feeling never changed.”

Flanery remembers when Greg Merritt (M.S. ’95), the senior associate director of University housing and a first-generation student advisor, sought her out to ask about her decision to go to graduate school. “He asked me why I wanted this degree, how it helped my career objectives. I didn’t even have career objectives,” she says. “He helped me think about my decision and to be intentional. I would not have been able to do that on my own, to ask myself those questions.”

And First-Gens @ Michigan is expanding. In 2015, U-M graduated 340 first-generation students with bachelor’s degrees — its largest class yet. And the First-Gens @ Michigan group has grown big enough to hold its own graduation, as well as a dinner with support from the Provost’s office.

“It felt surreal to walk through the Big House,” recalls Huynh. “It made me so happy to have my parents see me graduate. I can’t overstate how much they sacrificed for me, and how much of their lives were lived out for my benefit. It breaks my heart that they didn’t have the opportunities I had. They lived out their ideal lives through me, and I felt overwhelmed to see my parents watch me as I walked down in my cap and gown, and to be able to say, ‘I made it, Mom and Dad.’”

First-Gens @ Michigan’s first graduation party was a potluck dinner at advisor Dwight Lang’s house in 2008. This year, the group held a catered event (pictured above) at the Michigan Union with more than 340 people—students and their family members—in attendance.

PHOTOS (Left) Scott C. Soderberg/Michigan Photography; (right) Rob Hess
by Rachel Reed

The Gene Team
The Michigan Synthetic Biology Team is rewriting the facts of life.

**IMAGINE A WORLD WHERE NO ONE GOES**
hungry because food can be grown plentifully, pesticide-free. A world where diseases are easily cured or avoided. A world in which an ordinary-looking seed grows not into a tree, but a house.

That might sound like science fiction, but to members of the Michigan Synthetic Biology Team (MSBT), it’s just science.

Synthetic biology, which has been called “genetic engineering on steroids” by Ron Weiss, director of MIT’s Synthetic Biology Center, aims to create new organic systems that do exactly what we tell them to. Researchers place orders for existing, artificial, or altered genes with a click of a computer mouse, and those genes are delivered to their doorsteps a few weeks later. Then the researchers combine these Lego-like “bricks” of DNA to create genes or genomes not found in nature that have been engineered to perform a specific task of their choosing. The process is a lot like computer programming, just within organic material instead of computers.

Although the science is still in its infancy, members of the MSBT believe it
Students in the club boast a range of majors, from mathematics to microbiology to cellular and molecular biology. Some aren’t science majors at all; they come armed only with their interest in synthetic biology and a willingness to learn.
A new genetic tool called CRISPR could help eradicate malaria, develop personalized gene therapy for HIV patients, cure genetic diseases, control agricultural pests and invasive species, revolutionize biological experiments, and achieve other amazing feats to benefit humanity. But behind its great power lurks potential—and potentially calamitous—danger.

CRISPR is a piece of bacterial DNA that targets and destroys viral predators, naturally acting like an immune system that protects bacteria from infection, illness, and death. Recently, scientists started repurposing CRISPR to target and edit DNA in other organisms the way we might repurpose a shoe heel to hammer nails. But CRISPR is no clumsy substitute—as a tool, it’s more precise than any other genome-editing method yet invented. It’s also fast, inexpensive, and easy enough for even non-experts to use.

Any mistakes in the genetic code, for instance, also would spread unchecked through the population, potentially changing entire ecosystems.

by Elizabeth Wason

Jennifer Knister, a cellular and molecular biology and biomedical engineering student and the team’s current principal investigator, is excited to see where the project takes them.

“I get the chance to design a technical application and figure out how to implement and test it,” Knister says. “This is graduate-level work in a field of biology, and I get to do it as an undergrad with way more freedom than a traditional lab.”

And while the team is well aware of fears by some that the technology could have unpredicted consequences or be used for nefarious purposes, they’re already working to keep it a positive force for the whole world.

“There are concerns, as with any new technology,” says Dunham. “But in our organization, we are constantly thinking about safety, and about using it responsibly. And ultimately, there are a lot of great possibilities for synthetic biology.”

“Synthetic biology has the potential to cure diseases, engineer better crops to produce more food, or completely reprogram us,” Ferguson says. “It’s the future.”

42.22° N, 83.75° W

Michigan Synthetic Biology Team members explain the process of DNA extraction to Women in Science and Engineering (WISE) camp participants. U-M’s WISE Program seeks to boost the numbers of girls and women pursuing degrees in engineering, math, science, and technology.

by Elizabeth Wason

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up results, a few scientists have used CRISPR to engineer aggressive genes that self-replicate and incorporate themselves wherever they land.

In mosquitoes, one such aggressive gene can block the spread of malaria and work its way into the DNA of all local mosquitoes at top speed, potentially even spreading through the entire species. As a method of eradicating malaria, it might be ingenious. But the ramifications of such methods are enormous and as yet totally unknown.

Any mistakes in the genetic code, for instance, also would spread unchecked through the population, potentially changing entire ecosystems. So researchers working with aggressive genes have been required to store CRISPR-enhanced organisms within three layers of containment and locked behind five doors with fingerprint-scanning security. Many scientists have called for a moratorium on some CRISPR methods—including aggressive genes and edits to human embryos—amid worries that the technology is advancing more quickly than our ability to reflect on the consequences.

Abby Lamb, an MCDB Ph.D. student, thinks a lot about how to harness the powers of CRISPR while avoiding the pitfalls. Lamb studies the noncoding portions of DNA—regions that were once called “junk” DNA and were long assumed to have no function.

“If you think about it, your entire genome is in every single one of your cells, for the most part. That means that in the tips of your fingers, you have the genes necessary to make your brain,” she says. “But your fingertips are not making brains! It’s because there are lots of complicated things in noncoding regions that tell this gene, which makes neurons, to turn on only in neural tissues.”

Lamb says that CRISPR can help us get to the bottom of those complicated processes. She spends much of her time testing and honing CRISPR methods, and carefully engineering the genes that she’ll introduce into lab organisms.

According to Seed, the historically indiscriminate application of innovations like CRISPR has produced such major contemporary challenges as antibiotic and pesticide resistance. “But how many peoples’ lives have been saved by the use of antibiotics?” she prompts. “Countless, right?”

Seed and Lamb are optimistic about maximizing CRISPR’s benefits, but they agree that researchers should proceed with caution. “So many of these concerns are the ramifications of anything that we do when we interrupt nature,” Seed says, “no matter how we do it.”

**Aggressive Genes**

*Malaria spreads when mosquitoes bite and transmit* *Plasmodium*. *CRISPR* can block transmission extremely efficiently when we use a process called gene drive.

**STEP 1:**

Sneak the CRISPR system into a mosquito’s cell on a DNA loop coding for Cas9 protein (A), guide RNA (B), and portions that match mosquito DNA (C/D).

**STEP 2:**

Mosquito cell manufactures Cas9 and gRNA, which combine.

**STEP 3:**

gRNA finds a precise location in mosquito DNA (A). Cas9 cuts there (B).

**STEP 4:**

Mosquito DNA repairs itself using DNA loop as a template. Mosquito DNA now contains CRISPR.

**STEP 5:**

CRISPR self-replicates without human intervention.

**STEP 6:**

CRISPR propagates when mosquitoes mate. All offspring carry the CRISPR system. Mosquitos no longer transmit malaria where CRISPR is prevalent.

**WARNING**

MISTAKES IN THE GENETIC CODE CAN SPREAD JUST AS EFFICIENTLY. WE’D HAVE FEW OPTIONS FOR STOPPING ITS SPREAD. THE IMPACT ON AN ECOSYSTEM COULD BE MONSTROUS, UNPREDICTABLE, AND IRREVERSIBLE.
IN 1852, THE UNIVERSITY OF MICHIGAN campus was an open meadow where cows roamed and hay was harvested. There, Professor Henry Tappan became U-M’s first president — a man of vision and imperturbable poise.

Tappan wanted a “university worthy of the name” with a curriculum that favored science, engineering, and research. His haughty manner rubbed the regents the wrong way, but he inspired reverence among the students. He called them “boys,” and they, over time and with affection, came to call him Old Tap.

Professor as well as president, Tappan was lecturing one morning on the topic of space when a slight, sallow man interrupted. “Is the president of the University in this room?”

The speaker was William Hutchings, known first as the Boy Lightning Calculator of Barnum’s American Museum and later as Professor Hutchings. The skittish math prodigy made computations of incredible complexity, and he eventually rose to regional fame as the author of The Lightning Calculator, a book of mathematics that claimed to include “new processes of addition,” and later as a veteran sideshow Barker who introduced the Ossified Man and Dog-Faced Boy at a dime-store museum.

Hutchings chose Tappan’s class as the stage on which to showcase his powers of mathematical deduction. Old Tap decided to give the “prof” 10 minutes.

A student wrote a long column of numbers on the board while the calculator contorted, fidgeted, and fussed, finally delivering the correct sum after giving the board just a quick glance — a process he repeated several times.

Tappan, intrigued, peppered the man with questions: Was the technique mental? Mechanical? And how was the man’s health? To Tappan, the man seemed feeble.

Hutchings offered to prove his mental and physical soundness to Tappan if Tappan invited the man to dinner — a proposal so improper the students gasped and tittered. Even the unflappable Tappan looked off balance.

But Old Tap recovered quickly and politely declined. “I regret to say I am myself invited out today,” he told the Lightning Calculator.

The Calculator bowed gallantly and left. The room quiet again, Tappan returned to his lecture.
Forever Is a Long Time to Guess

After graduation, Charlene Kaye hit the road for New York City to find her voice. Now her thriving music career includes singing lead vocals with one of indie rock’s avant-garde standouts.

by Matt Nelson
MUSICIAN CHARLENE KAYE (A.B. ’09) is a performer as versatile as she is bold. She shreds guitar as a member of an all-female glam rock cover band. She writes and performs her own music, including two eclectic albums, the first of which she recorded while still an undergraduate at U-M. And she’s not afraid to get poppy, as she did a few years ago on the hit single “Dress and Tie” with friend and Glee superstar Darren Criss (A.B. ’09). But back in 2005, Kaye was just another first-year student trying to find her place. She was drawn to music and had grown up playing classical piano and other instruments. The event that truly fired her passion, though, took place not in a concert hall or a lecture hall, but at the Blind Pig.

“I saw Feist when I was a freshman — way before she blew up,” Kaye says of the then-rising vocalist. “She was so comfortable but so fierce. I remember thinking ‘That’s what I want to do’ as I walked back to my dorm.” Kaye hurled herself into the local music scene, seeking out open-mic nights, playing keyboard for an experimental group named Perhapsy (after an e.e. cummings poem) with fellow U-M student Derek Barber (B.F.A. ’08), and even forming her own band. As a junior, she wrote and recorded her debut album, the acoustically hushed Things I Will Need in the Past.

She also made good friends. At her very first campus open-mic at Bursley Hall, Kaye met Criss, who went on to star in the Internet sensation A Very Potter Musical while at U-M and was later launched to stardom as Blaine Anderson on Glee. All these experiences provided plenty of fodder for Kaye in favorite classes like Creative Musicianship with Residential College Lecturer Mark Kirschenmann (Ph.D. ’02).

“It was such an unconventional class,” she says. “We would share and workshop our own music, but sometimes we’d just get way into it and pick apart songs we loved for two hours.”

TURNING THE TABLES
After graduation, Kaye had a choice to make: She could head to graduate school and get her teaching degree, or she could “caravan it out to New York with the rest of the musician friends I’d made and just try to do the damn thing,” she says. While Kaye was honing her craft as a musician and waitressing, Criss and the other U-M grads behind the Potter musical had formed StarKid, a troupe dedicated to leveraging the web to make theater work more accessible. In 2011, they reached out to see if Kaye would be interested in playing guitar in their backing band and opening for them on their first national tour.

“I said ‘Hell yes,’ and that led to two nationwide tours playing for thousands of people every night,” Kaye explains. “At that point, I figured I had a good enough reason to quit my waitressing job.” At the time, Kaye was already working on her next solo album, Animal Love, which she made after supporters nearly doubled her original Kickstarter goal. More propulsive and electric than her previous work, it proved Kaye to be an artist comfortable wearing many hats. And that’s particularly true in her gig as the stand-in for Slash in a beloved side project, the cover band Guns N’ Hoses. (The band’s bio promises their sound will “break hearts and a few jaws” at every show.)

Touring for the past year and a half, San Fermin (above) has opened for the likes of St. Vincent, Spoon, the Arctic Monkeys, the National, and alt-J. A rehearsal by Kaye’s cover band, Guns N’ Hoses (right), prompted surprise visitor Slash to tweet, “Sounded pretty tight, I have to say.”

“The best you can do is make music that feels honest and interesting to you — because if you don’t, you’re not really telling your full story.”
There isn’t a crest to the wave. You work to create more work; you play shows so that you can keep playing shows.”

better guitarist and shredding enthusiast, and now I inject that kind of intensity and fun into every performance I do.”

SANS REGRETS
Stepping into someone else’s shoes also prepared Kaye for the moment when a friend emailed to see if she would be interested in auditioning for Brooklyn-based singer-songwriter Ellis Ludwig-Leone’s band, San Fermin. The band’s richly orchestrated 2013 debut had garnered critical praise, and Kaye admits she was intimidated not only by the idea of singing someone else’s music, but also by Ludwig-Leone’s complex melodies and intricate songwriting and vocals.

But the partnership clicked, and this spring they released the album *Jackrabbit*, the tour for which has taken Kaye from Dublin to Denver.

“I guess I did it to see what I was capable of,” says Kaye. “And I’m so glad I did. It’s definitely changed the way I sing, the way I write, and how I think about music.”

That perspective is invaluable as Kaye continues to write her own songs, eager for the next challenge and always aware of the uncertainty that she embraced by stepping into that car bound for New York six years ago.

“There isn’t a crest to the wave, not really,” she says. “You work to create more work. You play shows so that you can keep playing shows. The best you can do is make music that feels honest and interesting to you — because if you don’t, you’re not really telling your full story, and you won’t find the people out there who truly resonate with what you do.”

It’s an approach that echoes the refrain of a track on Kaye’s album *Animal Love*: “Focus hard on every following step, ’cause forever is a long, long time to guess.”

Liann had made home movies ever since she was young,” says Charlene, “so it only seemed natural to collaborate when she decided to be a filmmaker and I a musician.”

I’m proud to say I sold her on Michigan after revealing my secret weapon — taking her to the Michigan A Capellooza event and watching her jaw drop, after which there was no turning back.”

PHOTOS (Above) Shervin Lainez; (right) Konrad Brattke
Get to the (Data) Point

Rachel Schutt helped shape the field of data science by publishing one of the first textbooks in the discipline. Now, she’s applying her skills to create a sustainable business model for journalism.

RACHEL SCHUTT (A.B. ’97) commutes by subway from the Upper West Side of Manhattan to her office in the News Corporation building, just around the corner from Times Square. She heads through lobby security and up the elevator to the eighth floor, passing 21st Century Fox at one end of the building and crossing the hall toward her News Corp office. Near the entrance are walls covered by giant television screens and slanting shelves stacked with the day’s newspapers published by News Corp’s nine companies: the New York Post, the Wall Street Journal, the Times of London, the Daily Telegraph, and others.

As chief data scientist, Schutt has been defining her role ever since she arrived at the company two years ago. Simply put, her job is to answer this question: How can data help shape the future of news?

“For me, it’s about building a sustainable business model for journalism,” says Schutt, who believes strongly in journalism as a social good. “But it’s been very heavily disrupted by the Internet. So how do we get revenue in order to pay journalists so that we can keep newspapers going and stories coming?”

The answer involves big data. Think of the 15 million unique visitors to the Wall Street Journal website each day, lingering for x minutes, clicking on y and z related articles, each click carrying a timestamp and origin. That’s the kind of high-volume, fast-accumulating, miscellaneous information that Schutt has to sift through. Add those to yet more data on News Corp’s other online publications and, say, stats about the print subscriptions, and you start to understand the skill and creativity required to make sense of it all.

Schutt uses those data to inform and
build best practices for the business and the newsroom. She searches for patterns amid the data points, “attempting to create order out of chaos,” as she puts it. Based on patterns of user behavior, Schutt can automate strategies to retain newspaper subscribers and generate ad revenue. She can use statistics to predict whether visitors are likely to renew their subscriptions; if not, the marketing team creates messaging and incentives to keep readers coming back. That’s the business side.

“But we’re also interested in the design element,” she continues. “On the newsroom side, there are examples where the data science teams help the newsroom tell stories with data. To me, that’s where the future is, in terms of creative opportunities.” For instance: producing interactive infographics, or quickly processing the text in 30,000 emails released by former Secretary of State and presidential hopeful Hillary Clinton to see whether the emails contain a newsworthy pattern.

“Any of the world’s data becomes something we can work on,” Schutt says. “There are so many new kinds of data, which we can use to find stories anywhere in the world.”

**THINKING BIG**

Schutt’s winding career path — from honors math in LSA to News Corp in NYC — took her through a couple of master’s degrees and a Ph.D.; included stints as a consultant, high school teacher, and statistician at Google; and eventually led her to publish a seminal textbook on the emerging field of data science.

The book, called *Doing Data Science*, grew out of a course she taught at Columbia University. “Teaching the course was an effort to explore this new thing for myself — it was a vehicle to research this new area called big data,” Schutt says. “So I did it at night, while I was working at Google. It felt like I was onto something.”

Schutt, the book’s co-author, Cathy O’Neil, and students in the course sensed the opportunity to influence future conversations about working with big data. They thought deeply about not just the technical, math-laden aspects of the field, but also the human side of the numbers, the values and ethics required to do data science right.

Throughout the book, Schutt and O’Neil pose thought experiments that reflect some of these ethical considerations. “In a statistics or computer science class, ethics doesn’t normally come up. Just doing that probably was an innovation,” Schutt says. “The philosophical and human element, I’ve always felt, is completely missing in other books in similar fields. And it still is.”

> Any of the world’s data becomes something we can work on. There are so many new kinds of data, which we can use to find stories anywhere in the world.
Atomic Pentameter

Benjamin Landry’s poetry bridges the space between topics like ecology, history, dance, and identity. His latest collection uses the periodic table of elements to illuminate the ways that language can shape and surprise us.

WRITER BENJAMIN LANDRY (M.F.A. ’13) can immediately tell the scientists from the poets who come to his readings. There’s nowhere to hide.

“The scientists sit up straight,” Landry says. “They have a different posture, and their way of listening is very different than poets. Science folk will look right at you, while poets don’t want to make eye contact. They just want to listen to the words because they’re trying to imagine the poem as it appears on the page.”

Particle and Wave, Landry’s first book of poetry, features poems with titles taken from the periodic table, including such elements as hafnium, lithium, oxygen, and bismuth. One of the effects of reading the book is to be reminded of how separate and different each element is on its own — not just the obvious differences between lead and gold, but also the more incredible gulf separating a noble gas like helium from a radioactive material like uranium or plutonium.

The poet’s more recent work takes on a diversity of issues, including white-nose syndrome, a disease killing bats across North America, and literary critic Walter Benjamin’s unfinished “Arcades” project.

Another project of Landry’s — a collaboration with Peter Sparling, U-M’s Rudolf Arnheim Distinguished Professor of Dance — yielded a series of poems on movement and performance. One poem called “The Snowy Owl” inspired Sparling to transform it into a new dance, and a short film of the piece was featured at this year’s Cannes Film Festival.

But whether Landry is writing about ecological disasters or Martha Graham’s dance moves, he finds the structure of tackling a single subject with a series of poems liberating, and hopes his readers find something that speaks to them in his work.

“It feels so refreshing to get so many kinds of responses to a poem,” Landry says. “A person will come up to you after a reading and tell you how a particular image in a poem reminded them of something in their own childhood, which of course you had no idea about. But it’s always charming when a poem escapes your control and becomes a part of somebody else’s experience.”

Benjamin Landry’s poetry bridges the space between topics like ecology, history, dance, and identity. His latest collection uses the periodic table of elements to illuminate the ways that language can shape and surprise us.
From secret courts to time-travel showtunes, our interactive ride accelerates this second.

Who Calls the Shots?

Vaccines are indisputably a crowning public health achievement, credited with the elimination of some devastating diseases. But in the rare instances that vaccines do cause harm, such cases are heard by a specialized court that almost no one has heard of.

by Susan Hutton
TWO GENERATIONS AGO, parents credited vaccines with preventing polio and whooping cough. Today, they’re just as likely to associate vaccines with autism. Visit a Mommy & Me class or an online parenting forum, and you’re bound to encounter parents who say they have decided to delay or even skip certain shots against the advice of their pediatricians because they’re afraid that vaccines are not safe.

Anna Kirkland, Arthur F. Thurnau Professor and associate professor of women’s studies and political science, disagrees. “In fact,” she says, “there is scientific consensus that parents’ top health concerns — autism, ADHD, compromised immune systems — have no relationship to vaccines at all.”

But while vaccines have been proven to have no relation to these problems, there are very rare instances where vaccine injuries do occur. “Because we’ve made vaccines mandatory for school entry,” Kirkland says, “we also need a compensation system if something goes wrong.”

file claims against the Secretary of Health and Human Services rather than drug companies. Awards come from a fund created by a 75-cent surcharge that’s added to every vaccine dose. Cases are decided by appointed judges known as special masters, and the government’s interests are defended by lawyers from the Justice Department.

The vaccine court was designed to compensate injuries quickly, generously, and with scientific credibility, says Kirkland, but it can’t realistically do all of that. For efficiency, the court uses a vaccine injury table, which lists conditions known to be linked to vaccines. “If you’re vaccinated and develop a condition on the table within a certain period of time, the court presumes the vaccine caused the injury and awards your claim,” Kirkland says, whose book Vaccine Trials: The Law and Politics of Vaccine Injury will be published in 2016. The trouble is, the table doesn’t have many injuries on it.

Recognized vaccine injuries include things like chronic arthritis and such very rare conditions as thrombocytopenic purpura, a disorder that can cause bruising and excessive bleeding. Other injuries may eventually be added to the vaccine court’s injury table, but studies need to produce the data first.

Weighing the benefits of ridding society of certain diseases against rare but inevitable injuries caused by vaccines is a tricky calculus, says Kirkland. The court has tried to democratize the process.

Weighing the benefits of ridding society of certain diseases against rare but inevitable injuries caused by vaccines is a tricky calculus, says Kirkland. The court has tried to democratize the process. Everyone — parents, activists, doctors, public health researchers, and lawyers — gets some opportunity to say what counts as a vaccine injury. But it’s the court that decides.

Of course, for people who have already decided against vaccination due to suspicions about government, science, or Big Pharma, a federal court decision is unlikely to be taken as the final word. To this mix, says Kirkland, add mothers who were told every bite they take in pregnancy matters, who feel responsible for managing the health of their families, and “it’s easy to feel like you’re some sort of sap if you just follow the guidelines and don’t individualize your children’s vaccine schedule.”

Kirkland admits it can be hard to get good evidence about whether a vaccine really caused a person’s injury, and it’s the court’s job to balance personal freedoms and public good. “Our society is free of some horrible diseases because we invested in developing vaccines and we mandate their use. This immunization social order inevitably creates difficult questions, and the court’s efforts to help society navigate them with facts and science have been all to the good.”

The scene at a polio clinic sponsored by the Urban League of Greater Muskegon in 1959. The polio vaccine was created in 1952 by Dr. Jonas Salk, and human trials of the vaccine started five years later.
Take Your Best Shot

The earliest attempts at inoculation against disease (in this case, probably smallpox) occurred 1,000 years ago in China, where a powder made from ground-up scabs (it gets worse) was shot into the patient’s nostril (I told you). Luckily, vaccine technology has come a long, long, long way since then.

ACROSS
1. Polio vaccine developer Jonas
6. Siddhartha author Hermann
16. Spy-fi author Deighton
23. Free-for-all
25. “Für ___” (Beethoven dedication)
28. Group-mailing aid
30. DVD predecessor
32. Valentine’s Day mo.
34. Shoreline recess
35. Worth an F
36. “Nana” author Zola
40. The “I” of “ICBM”
42. ___ Know (“Who’s on First?” third baseman)
43. Some Bantu speakers
45. Blood-typing letters
46. Max Theiler won a ___ Prize in 1951 for developing a yellow fever vaccine
48. Non-exploding firecracker
50. Like a cliché
54. Bret of Fox News
59. Krupp Works city
61. Blood-typing letters
65. Midler of “The Rose”
69. The Lord of the Rings hero
71. Terminus of the 1925 Great Race of Mercy to deliver diphtheria antitoxin
72. Lines on a GPS: Abbr.
73. March of ___ born, 1938
74. Developer of the oral polio vaccine
75. Stephen of ___ Jenner
76. Compose a letter
77. Zamboni’s milieu
78. Scrabble piece
79. Shoo ___ (Certain winners)
80. Concorde, e.g.
81. Sam- ___ (Seuss character)
82. Air- ___ smallpox vaccine developed in Paris, 1909
83. The second Mrs. Perón
84. “... ___ finest hour”: Churchill
85. Measles sickened both sides in the ___ War
86. Yellowfin tuna, on ___ been real!”
87. Brazilian dance
88. Y ___ (listing of accepted vaccine-related injuries)
89. Raise objections
90. “A” list
91. “... ___ finest hour”: Churchill
92. Air- ___ smallpox vaccine developed in Paris, 1909
93. Overhead railways
94. “This ___ my day!”

DOWN
1. Take a cruise
2. Ed of Lou Grant
3. Talk radio’s G. Gordon ___
4. Li ___-shek
5. Sheep’s call
6. Total agreement
7. A Christmas ___ “ (1891 story of a girl who is cured of diphtheria with antitoxin prepared from sheep)
8. Site of a 1648 quarantine for ships from the West Indies
9. Flightless Aussie bird
10. Complain relentlessly to
11. Blackens on a barbecue
12. In rare instances, vaccines may be suspected of causing ___
13. ___ flu pandemic of 1957
14. Catch red-handed
15. Land where smallpox inoculation supposedly occurred in 1000 CE
17. Nebraska’s largest city
18. Asian location of a 1545 smallpox epidemic
19. Ethiopia’s ___ Selassie
20. ___ cubes (delivery system for oral polio vaccines)
21. Was the front-runner
22. ASCAP counterpart
24. Guiding principle
26. Common spot for a vaccination
27. Reuben bread
29. Be covetous of
31. Some art studios
33. Purplish bloom
35. “Rights of Man” author Thomas
37. ___ flu vaccine, developed 1976
39. Prison uprisings
41. “That’s show ___!”
44. Disneyland was the source of a 2015 ___ outbreak
46. Max Theiler won a ___ Prize in 1951 for developing a yellow fever vaccine
48. Non-exploding firecracker
50. Like a cliché
51. Broadcast workers’ union
53. The West African ___ epidemic of 2014
55. Ford Explorer or Cadillac Escalade
56. Injury ___ (listing of accepted vaccine-related injuries)
58. The “T” in “DPT vaccine”
59. Krupp Works city
60. ___ culpa
62. Office of Special Masters of the U.S. ___ of Federal Claims
64. In the 1980s, damages were awarded for civil ___ relating to the DPT vaccine
65. Midler of “The Rose”
67. ___ flu vaccine, developed 1976
68. ___ Know (“Who’s on First?” third baseman)
69. The Lord of the Rings hero
70. “___ Man” director Sam
71. Terminus of the 1925 Great Race of Mercy to deliver diphtheria antitoxin
72. Lines on a GPS: Abbr.
73. March of ___ born, 1938
74. Developer of the oral polio vaccine
75. Comic Foxx
77. Zamboni’s milieu
78. Scrabble piece
80. Concorde, e.g.
82. Place to buy or sell
84. Election Day day: Abbr.
86. “___ been real!”
88. Yellowfin tuna, on Hawaiian menus
The Future of Comedy

Alumnus Stephen Levinson has been making audiences laugh working for Late Night with Conan O’Brien and Comedy Central. His new album features a slew of comedy stars from Saturday Night Live and primetime TV all telling the history of future America — because, you know, history is always funny.

It’s 72 Degrees in Suburban Los Angeles. The mellow L.A. sun shines down on rows of identical white houses with identically subdued backyards filled with swishing sprinklers and yapping dogs. But down the street, indie rocker Andrew W.K. is determined to crack the quiet, roaring into the microphone from an open garage and blasting the neighborhood with chants of “We’re going to party on your grave, party on your grave!” It’s just another day in the production of 2776, a comedy album co-written by Stephen Levinson (A.B. ’95) and released last year in support of the literacy nonprofit OneKid OneWorld.

The plot of the album, which is available on iTunes, follows a far-flung future America fighting against an alien invader bent on global destruction in the year 2776. To prove the country’s worth, the president (played by Will Forte) takes the alien conqueror (played by Martha Plimpton) on a journey through America’s 1,000-year history, touching on topics like the ongoing gentrification of New York City, the collapse of California into the Pacific Ocean; and the Supreme Court’s ruling on the ultimate legality of rock and roll including fake reporting, off-key singing, and awesome voice-guitar sounds by esteemed NPR legal correspondent Nina Totenberg.

The tracks flit through musical genres — rock, rap, pop, even Broadway-style show tunes — and feature more than 80 performers, including Aubrey Plaza, k.d. lang, Alex Trebek, and dozens more. Musician Aimee Mann sings a torch song as the common cold to the scientist who cured it. Patton Oswalt plays a disappointed God, begrudgingly rescinding his blessing from America. Forte, as the president, opens the album singing that the “State of the Union is good… enough.” And with that, listeners know exactly what they’re in for: a bouncy, irreverent ride.

SAY SOMETHING FUNNY

Levinson’s own ride began at Michigan. He caught the comedy bug early, serving as editor of the Gargoyle humor magazine at U-M before heading to New York after graduation to pursue a career in comedy. There, he worked as a writer and performer for a variety of comedy shows and art venues, including Late Night with Conan O’Brien, the 92Y Tribeca performance space, and Comedy Central. He also wrote and directed short films, including Jewno, a parody of the Jason Reitman comedy-drama Juno, which Levinson screened at film festivals worldwide. Most recently, Levinson worked as a staff writer for Midterm Mayhem, a nightly political comedy show hosted by Kal Penn on the Fusion Network.

In 2012, Levinson and his brother, Joel, teamed with former Daily Show writer Rob Kutner to produce It’s OK to… Do Stuff, a parody of the 1972 feel-good kids’ album Alumnus Stephen Levinson has been making audiences laugh working for Late Night with Conan O’Brien and Comedy Central. His new album features a slew of comedy stars from Saturday Night Live and primetime TV all telling the history of future America — because, you know, history is always funny.

We started recording in a garage. We had Andrew W.K. and Aimee Mann there with a desk and a computer, and we had to wait for the people next door to stop mowing their lawns so we could record.”
Free to Be... You and Me. At the time, they had invited Mann to take part. Scheduling constraints conspired against the collaboration, but Mann offered to help with the next album. Levinson, a devout fan, vowed to bring a follow-up album to life, and 2776 was born.

THE HISTORY OF FUTURE AMERICA

Despite the parade of A-list comedic talent, the project was made mostly as a labor of love with no budget. While the recording sessions were necessarily bare bones, they were still memorable.

“We started recording the album in Joel’s garage,” Levinson says. “We had Andrew W.K. and Aimee Mann there with a desk and a computer, and we had to wait for the people next door to stop mowing their lawns so we could record.”

The project required incredibly long hours and the associated havoc of recording an album anywhere they could — in two different countries, multiple states, and countless recording studios. But all of that hard work paid off with an album that served a good cause.

With proceeds going to the OneKid OneWorld charity, 2776 attracted an all-star cast of celebrities, including Aimee Mann (above), Andrew W.K. (left), Neko Case, Margaret Cho, Ed Helms, Dick Cavett, Ira Glass, Bobcat Goldthwait, and Triumph the Insult Comic Dog.

"God Blessed America," sung to POTUS (Will Forte) by God (Patton Oswalt).

“I gave you resources, I helped you expand! I backed your armed forces in land after land. I’ve heeded your nagging and incessant demands. Heretofore, but no more. You’re unblessed! You’re de-exalted. I made you the salt of the earth, most of which you salted.”

The proceeds from 2776 go to OneKid OneWorld, a nonprofit dedicated to providing educational resources in impoverished communities in Kenya and El Salvador. The organization seeks to improve the lives of children by offering all kinds of support, providing everything from desks to teacher salaries to solar generators that keep the lights on so students can study at night.

“No one got paid. Any money we’ve raised has gone straight to OneKid OneWorld, and it’s a really good fit,” Levinson says. The match worked in large part, he says, because OneKid OneWorld has its own comedy roots. The organization was founded by Josh Bycel, a comedy writer and producer. “They weren’t going to turn us away because we had a bad word or two on the album,” Levinson says.

The album’s darkly humorous tone also made its producers want to contribute to something more positive, says Levinson, to balance the act of pointing out what’s wrong with the world by doing something to make it better.

“In a way, with this album, we were saying that we’re screwing up the planet with all this craziness that’s going on,” Levinson says. “So we wanted to work with a charity that makes a difference and helps the next generation. They do great work for kids, and we knew we wanted to be part of that.”

Of course, we will all need as much help as we can possibly get when the mole people finally attack.
SQUIRTING FLOWERS AND SPACESHIPS

While stories of brutal, dog-eat-dog dystopian futures are a dime a dozen, futuristic comedies are much more rare.

S

show us how well you know the overlapping worlds of slapstick and spaceships by matching the quote and the movie title with their spot on the timeline at the bottom of the page. And don’t get any ideas about volunteering for an experimental cryogenic freezing program run by a rogue military unit. Or a sleazeball corporation. Or a reclusive genius. Don’t do it. I promise, it’s for the best.

A “You blew up my wood bar stools. You know how hard it is to get wood on the moon?”

B “When I asked my mother where babies come from, she thought I said ‘rabies.’ She said you get them from being bitten by a dog.”

C “I’m the Secretary of State, brought to you by Carl’s Jr.”

D “So you must remember the days when this library was the only way to learn about the world.”

E “I hope no one minds, but I have no intention of facing this sober.”

1 The Adventures of Pluto Nash
Trouble follows when lunar nightclub owner Pluto Nash (Eddie Murphy) refuses to sell his place to a secretive entrepreneur.

2 The Ice Pirates
Billed as the “space comedy you didn’t know you were waiting to see,” The Ice Pirates takes place in a “far distant future” where water is controlled by a small group of aliens bent on galactic domination. The comedy is strictly screwball, with puns and pratfalls and Bruce Vilanch as an android named Wendon.

3 Robot and Frank
When retired jewel thief Frank Weld (played by Frank Langella) has a robot assistant foisted on him, Weld decides to use his new helper to restart his lapsed criminal career by nabbing an antique copy of Don Quixote from the local library.

4 Idiocracy
An army librarian named Joe (played by Luke Wilson) goes into suspended animation and wakes up far in the future to find he is the smartest man alive in a virulently anti-intellectual society.

5 Sleeper
Woody Allen’s futuristic slapstick movie follows Miles Monroe (played by Allen), the jazz-playing owner of the “Happy Carrot” health food store, who is unfrozen in the future to fight in a rebellion against a largely inept police state.

DID WE MISS ANY?

Beam us a tweet @UMichLSA

[Timeline: The near future (2087) - 2173 - 2505 - the distant future (2505)]
IT ARRIVED IN a plain-looking envelope.

I had no idea what the envelope held or whether or not it was important. When I opened it, though, I was surprised to find my very first passport, dark blue and just a little smaller than my hand. I yelped in excitement. With this passport, I would travel to South Africa, a trip I hoped would shape the rest of my life.

I traveled to South Africa this summer as part of LSA Professor Nesha Haniff’s Pedagogy of Action Program, where we visited three cities: Johannesburg, Durban, and Cape Town. There, my professor, other students, and I talked to a number of different communities about HIV and AIDS, using a module — basically a simplified lecture — that people could take and use to explain HIV and AIDS to their family, friends, and coworkers. Sharing the module with community members was a process of constant adjustment because many of the community members had had different experiences with people who have or have had HIV or AIDS, all of which seemed to have made a lasting impression on them.

Almost every week we changed locations, and in each new city it felt like we were starting over again. But in each new place I was learning to trust not only that I could effectively share our message, but also that the community would take something useful from our time together.

Trust became very important to me. During my trip, one quote from the Brazilian educator and philosopher Paulo Freire kept going through my mind: “They talk about the people, but they do not trust them; and trusting the people is the indispensable precondition for revolutionary change.” I had to trust myself to be open to everything this experience had to offer — learning everything I could from my time teaching and from talking to the people my professor had connections with in South Africa.

I also experienced many different forms of art in South Africa, particularly dance. Our group created and participated in multiple dance pieces as a way to thank our South African partners. Learning and participating in dance took discipline, but it also pushed me to see the beauty in movement and collaboration. And I saw these same qualities in the city of Johannesburg.

Now that I have returned home, I recognize the changes that occurred within me. I learned so much about myself, I think more critically, and I am open to appreciating — and trusting — communities that I have never been in before. Just as importantly, I know how to responsibly engage with a community that is not my own. As I return to the life of a busy college student, I still take time to slow down, to reflect, and to really get to know the people around me.

Every so often I look at my passport and think of how it started my long walk to freedom.

Freedom

by Candice Miller (’18)

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Every so often I look at my passport and think of how it started my long walk to freedom.
As a country, South Africa has gone through rapid and radical transitions in the past twenty years, experiencing an explosion in the rate of HIV infections at the same time that the country was transforming after the fall of apartheid in 1996. Here are a few of the incredible changes that South Africa has experienced in the last two and a half decades.

### A Decade Gone
South Africans lost a decade off of their lives between 1992 and 2006, dropping from an average life expectancy of 62.3 down to 51.6. Then, with education and treatment conditions improving, the average life expectancy began to rise again, climbing to 54 in 2010.

### Earning Power
While incomes of black South Africans have increased 169 percent between 2001 and 2011, white South Africans still earn an average of six times as much as black South Africans.

### Lining Pockets
By 2004, South Africa had risen as high as 44th out of 145 countries included in Transparency International’s index of perceived corruption. But by 2011, South Africa had fallen to 72 out of 177 countries in the report.

### Growth in Wealth
<table>
<thead>
<tr>
<th>Year</th>
<th>% of GDP growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>1992</td>
<td>2.1</td>
</tr>
<tr>
<td>1994</td>
<td>4.3</td>
</tr>
<tr>
<td>1996</td>
<td>4.3</td>
</tr>
<tr>
<td>1998</td>
<td>0.2</td>
</tr>
<tr>
<td>2000</td>
<td>4.3</td>
</tr>
</tbody>
</table>

### Hit the Switch
<table>
<thead>
<tr>
<th>Year</th>
<th>% of South Africans with electricity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>50.9</td>
</tr>
<tr>
<td>2012</td>
<td>85.3</td>
</tr>
</tbody>
</table>

### Life Matters
<table>
<thead>
<tr>
<th>Year</th>
<th>Homicides per 100,000 people (U.S. is 4.7 by comparison)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>66.9</td>
</tr>
<tr>
<td>2012</td>
<td>31.3</td>
</tr>
</tbody>
</table>

### Hanging Your Hat
<table>
<thead>
<tr>
<th>Year</th>
<th>% of people living in formal dwellings</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>65.1</td>
</tr>
<tr>
<td>2011</td>
<td>77.6</td>
</tr>
</tbody>
</table>

### Increasing Inequality
<table>
<thead>
<tr>
<th>Year</th>
<th>Gini coefficient* (lower is better)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1993</td>
<td>0.59</td>
</tr>
<tr>
<td>2009</td>
<td>0.63</td>
</tr>
</tbody>
</table>

*A measure of income inequality in a given country.
It’s a great day to be a victor.

24 hours. That’s 1,440 minutes to support what you love about Michigan. On Tuesday, December 1, 2015, take part in Giving Blue Day. You can help transform lives, shape the world, and make great things happen.

Join us. Be a victor for Michigan.