

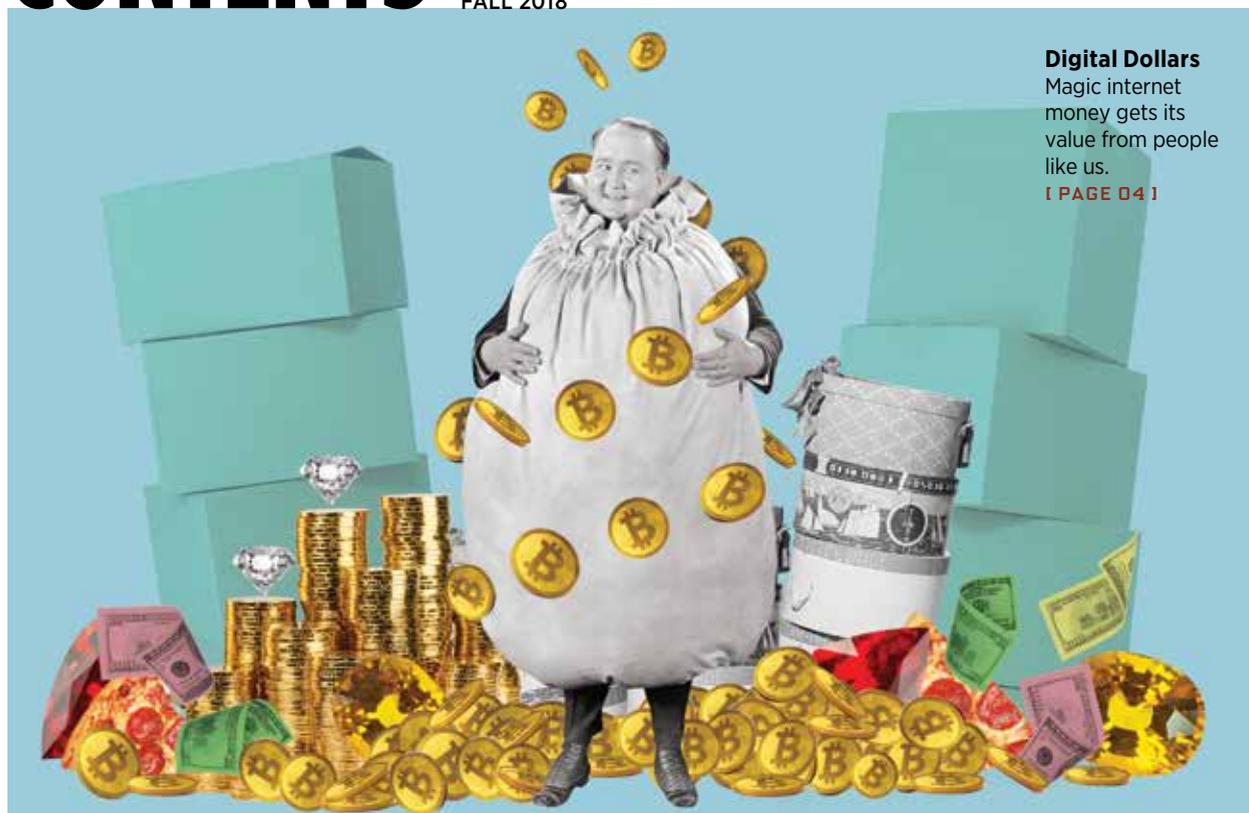


As LSA's Museum of Natural History moves from the Ruthven Building (right) to the newly built Biological Sciences Building (left), so do its specimens and artifacts. This extinct whale with feet, for example. The *Dorudon atrox* skeleton — with its hind limbs, feet, and toes — came from Egypt and represents an evolutionary transition from land back to the sea. Photo by Daryl Marshke.



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Magic internet money gets its value from people like us.

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No one is entirely self-sufficient. But accepting the challenge of doing something yourself puts you in closer contact with the natural world and with the world of human-made things. Spending time fixing your car or learning to paint with acrylics, to write a Petrarchan sonnet or grill an absolutely perfect medium-rare steak all connects you with the human traditions from which those practices and artifacts sprang and it also offers a moment of honest expression—a moment in which the things in your life have more of you in them. That spirit of discovery, of self-sufficiency, of invention and interconnection comes in many forms and many stories. In grappling with the origins of the human mind and the end of life. In helping students see the world around them more clearly. In investigating lost archives, new work spaces, radio soap operas, democracy and bipartisan politics. In inventing new ways to see ourselves and in diagnosing the ways we see ourselves reflected in the world around us. If we each become more powerful, then we all become more powerful, too. The whole is stronger for our individual efforts to be self-sustaining, to explore the things around us and say, “I’m human, so nothing that a human does—or makes—is alien to me.”

THE WHOLE

IS STRONGER

FOR OUR

INDIVIDUAL

EFFORTS

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Digital



Dollars

The worth of a digital currency like Bitcoin seems uncertain if you look only at its volatile exchange rate. But some say that its importance goes well beyond your wallet — that the true value of new digital currencies has more to do with what we make of them.



A common joke calls Bitcoin “magic internet money,” which actually makes some sense.

It works as digital money, but even easier, faster, more secure, and more anonymous than using online payment services with a credit card. Compared to dollar bills, the convenience of Bitcoin and other cryptocurrencies for things like sending money internationally or making micropayments online is like emailing a message instead of sending a stamped envelope.

In December 2017, the exchange rate of Bitcoin exploded to just over \$19,000 per coin – compared to five years before, when one bitcoin went for less than \$50 in the open market.

As Bitcoin’s popularity and notoriety grew, strange news involving unfamiliar trends such as CryptoKitties and Dogecoins added an air of levity and even illegitimacy to the whole enterprise. An illicit online marketplace, Silk Road, became infamous as a place to buy illegal drugs, a direct result of the security and anonymity of paying with Bitcoin. Investors lost hundreds of millions through failed Bitcoin exchange services, online heists, and scam imitation coins that hit the market.

In all this cryptocurrency hype and confusion, an LSA alumna became an investor.

Sam* (B.S. 2017) had a bright outlook with her LSA degree as a double-major in honors math and honors physics and was on her way to a Ph.D. program in physics at Stanford. But even as an undergrad at U-M, she stressed over the uncertainty of an academic profession and her financial future.

“I want to have a shot in academia,” Sam says, “but I know very well that most people who get a Ph.D. in physics won’t be able to find a faculty job.” Even with high hopes of making it as a professor, Sam anticipated several years of tight budgeting before getting there. One way she brainstormed to hedge her bets while still pursuing the research she loved was to get in on some cryptocurrencies.

“I just wanted to feel secure about my life, and I realized it would be good to put some of my pocket money into long-term investments,” Sam says. “I’m treating it like a bank with a weird rate of interest.”

Since early 2017, Sam has seen about a tenfold return. She chided herself as she checked on her holdings: “Why did I not put in more money?!” But she’s stayed calm and doesn’t plan to cash out anytime soon. At least, not until she’s done with grad school.

“It’s a life investment,” she says. “I’m a true believer with other believers around me, and we encourage each other. Even when the price goes down, we still hold our coins tight.”

The Birth of Worth

“At the end of the day, the worth of Bitcoin depends on the value people ascribe to it,” says Lynette Shaw, an assistant professor in LSA’s Center for the Study of Complex Systems and a postdoctoral scholar in the Michigan Society of Fellows. “The question is whether you think Bitcoin will stick around and become more important.”

She says that belief in cryptocurrencies comes from various pockets of society. Positive perception derives in part from a faith in future profits by speculative investors. Other stakeholders include citizens in places like Zimbabwe, Argentina, and Greece, who don’t trust their countries’ currencies, along with political revolutionaries who place a premium on personal privacy.

The slippery definitions and diverse appeal gave a lot of different groups reasons to get interested and adopt Bitcoin, says Shaw, which helped drive up its value. “If it hadn’t been for the ability of different groups to do different things with cryptocurrency, it would not have spread to the degree it did in terms of adoption,” Shaw says.

*Sam wishes to use only her first name to avoid becoming Bitcoin-famous.

Bitcoin jackpot

BITCOIN

- Invented in 2008 by a person or group bearing the pseudonym **Satoshi Nakamoto**. Their true identity remains a mystery to this day
- The basis of a multi-billion-dollar financial technology industry
- Not a physical coin! People keep their bitcoins in “digital wallets”
- Bitcoin depends on its underlying **blockchain** technology



MINING BITCOIN

- New bitcoins get minted as a reward for the winners who mine them in an ongoing competition to solve a series of cryptographic puzzles which adds transactions to a record called the **blockchain**.
- Miners used to get a reward of 50 bitcoins per block validation. The pot decreases over time:
 - FIRST**, to 25 bitcoins
 - NOW**, winners get 12.5 bitcoin
 - LATER**, the reward will decrease to six bitcoins
- Once 21 million bitcoins are mined, no more new bitcoins.
- A network of computers owned by individuals, organizations, and companies mines Bitcoin and maintains the blockchain.
- Only very powerful computers can mine Bitcoin these days.

THE BITCOIN BLOCKCHAIN

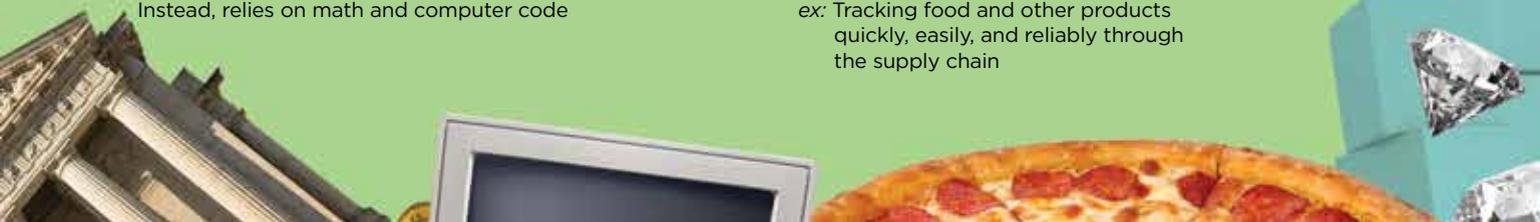
- A decentralized record of transactions also known as a **distributed ledger**
- Keeps track of who's paid how much Bitcoin to whom
- The technology that makes Bitcoin work as a digital currency

DOESN'T require trust
NOR a clean credit history
NOR official oversight
NOR any government

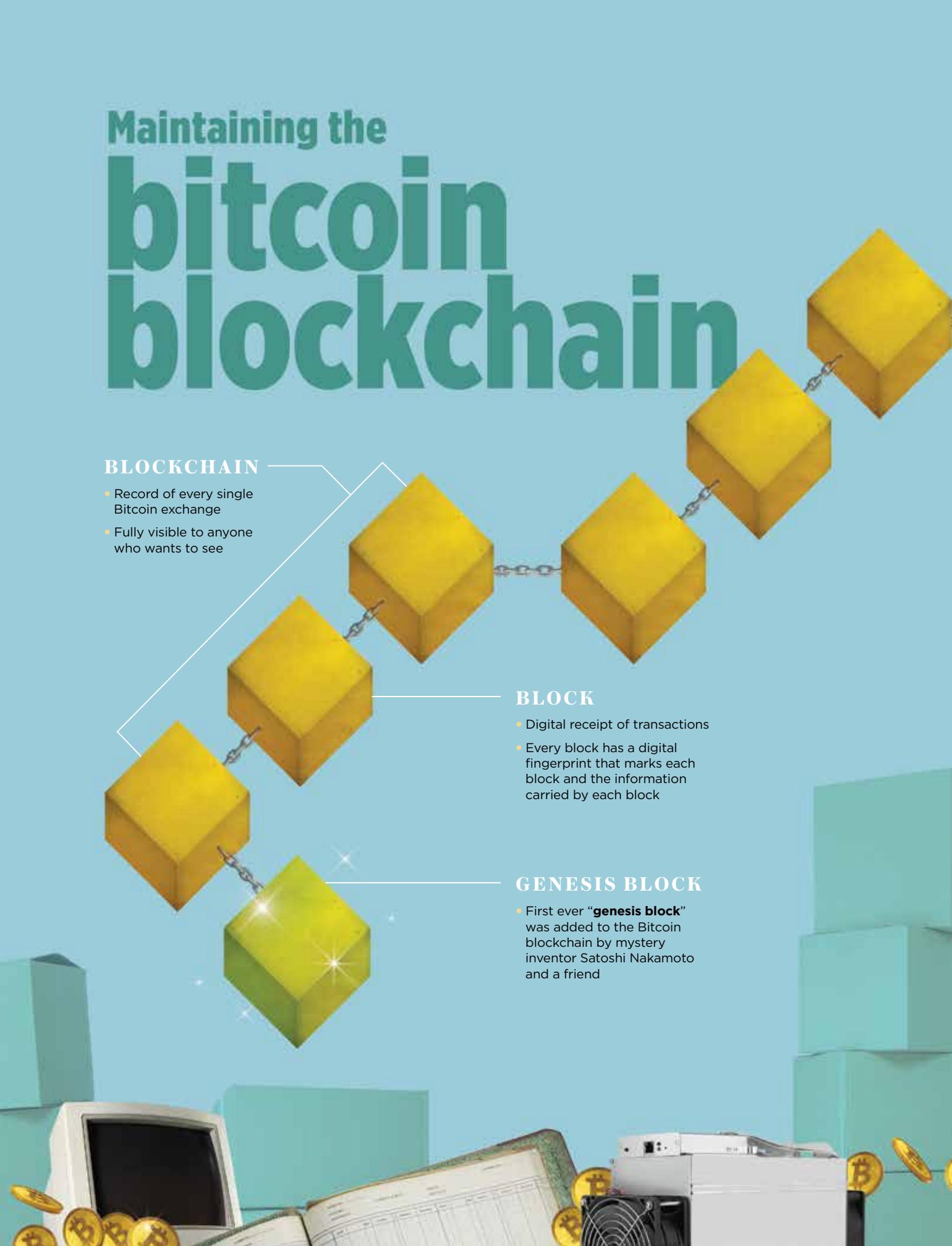
Instead, relies on math and computer code



- Blockchains could be used for applications other than money exchange
 - ex: Smart legal contracts
 - ex: Recording the provenance of diamonds
 - ex: Tracking food and other products quickly, easily, and reliably through the supply chain



Maintaining the bitcoin blockchain



BLOCKCHAIN

- Record of every single Bitcoin exchange
- Fully visible to anyone who wants to see

BLOCK

- Digital receipt of transactions
- Every block has a digital fingerprint that marks each block and the information carried by each block

GENESIS BLOCK

- First ever “**genesis block**” was added to the Bitcoin blockchain by mystery inventor Satoshi Nakamoto and a friend

1

2

3

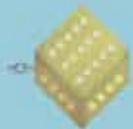


NEW BLOCK

- New transactions initiated
- New transactions grouped into a block
- New block is broadcast to the entire mining network for validation

- Bitcoin miners compete to validate each new block using brute computational force in a race to solve the very difficult math associated with the block's digital fingerprint
- The fastest miner adds the next block to the chain
- Slower miners lose the race and do not add their blocks

- Solving the math and validating the block earns a bitcoin reward
- Each validated block is broadcast to everyone in the network
- The mining network continues building on the updated blockchain
- All miners always build on the longest chain, which carries the most up-to-date validated blocks
- All updates are fully transparent



- These blocks did not get validated quickly enough

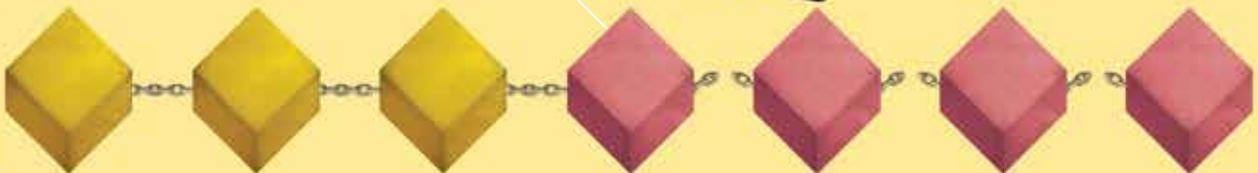


- These blocks and their chains die



The blockchain resists fraud.

If a hacker tampers with the transaction record in one block, every subsequent block breaks



- Built into the Bitcoin blockchain design are incentives that keep miners honest.
- Miners get bitcoin payouts for accurately validating new blocks.
- Attempts to hack a long blockchain take too much time and computer power to be worthwhile.

- Long chains are extremely secure and hack resistant to date.
- The more blocks in the chain, the more work it takes to fake transactions.

- Easy for other miners in the network to spot the broken blocks.
- Easy to reject a broken blockchain.

As different camps started to put Bitcoin and other cryptocurrencies to good use, the corporate world did, too. Companies such as Microsoft, Overstock, Expedia, Dell, and Lamborghini have at various points accepted Bitcoin, partly because of its low-to-no transaction fees. In countries where rules restrict women from opening bank accounts, those women can turn to cryptocurrency, which requires no approval and no credit history.

Asheesh Birla (B.S. 2002), an LSA alumnus in economics and computer science, saw the promise of Bitcoin and of blockchain – the technology that makes cryptocurrencies work – to improve the process of sending money internationally. His parents emigrated from India to the Detroit area in the 1960s. “Sending money back home to our family was the most archaic process,” he says, “and it never got better.”

Birla’s parents could go to an Indian grocery store or use Western Union, but sending money through those routes took days and charged exorbitant fees. “If you sent \$1,000, you’d get a fraction of it at the end of the day – maybe the equivalent of \$800 over in India.”

Birla saw the same thing with his friends at U-M while he was a student. “With the diversity at Michigan, I realized when talking to international students how hard it was to get money into the United States.

“We take all this for granted. I have a couple of credit cards, but what about a new student who comes to the United States and Ann Arbor for the first time?” Birla says. “There are very low credit card penetration rates in India, Bangladesh, and a lot of Asia – it’s a big problem to move money.”

At U-M, Birla took all the computer science classes he could. He founded a company and sold it to Thomson Reuters after graduating, then struck out solo to explore opportunities in Bitcoin



“At the end of the day, the worth of Bitcoin depends on the value people ascribe to it.”

New Value

Nach Dakwale, an LSA senior studying economics, first encountered Bitcoin when he was in high school in 2014, running a business as an online merchant of virtual goods. “Nobody was going to pay a \$25 bank wire fee to buy a \$5 virtual sword in a game,” he says. Unlike a bank, Bitcoin demanded nearly no fees for transactions, and Dakwale took advantage.

At U-M as an undergrad, Dakwale grew curious about the blockchain technology underlying cryptocurrencies and took a course offered remotely by Berkeley. “I started thinking that we needed to find a way to spread that knowledge across our campus,” he says. Last year, Dakwale and four other U-M students started a group called Blockchain at Michigan.

“The strength of any public university is the sheer quantity of brilliant, motivated students who are looking to make an impact in the world,” says Dakwale. “The mission of Blockchain at Michigan is to build Michigan leaders in the blockchain space through education, research and development, and consulting. We’re focused on getting U-M students to actually build things, and eventually to place students in careers.”

and blockchain in their early stages.

“They’re at the intersection of computer science and economics,” he marvels. “If I didn’t have the tech background from U-M, it would’ve been hard back in 2013 to realize why this was going to be such a radical new technology.”

Birla’s background led him to join the founding team of a company called Ripple, whose mission is to modernize global payments. Ripple creates products that help remove friction from cross-border payments, making international transfers reliable, fast, and inexpensive.

Now, with the growth of international businesses like Uber, Airbnb, and Amazon, which routinely transfer small payments, Ripple is well-positioned to help. “There’s no way to efficiently send a \$200 payout for drivers when your fees are \$40, no way to trace it, and it takes several days,” Birla says. “Those are problems that we really wanted to solve.”

Birla believes in the value of cryptocurrencies and blockchain technology so much, he says, “I’ve been in it for five years, and I’m planning on staying in it for the rest of my career.”

Dakwale places a high value on blockchain technology. He's writing a thesis about it and plans to build a career on it, too. He spent last summer in Chicago at an internship that helped him develop the skills he needs to keep innovating with related technologies.

"Everybody working with blockchain is passionate," Dakwale says. "That's something I find very unique about this space. Everyone is super energetic, and they all want to see it grow."

What's in Your Wallet?

Ideas about theoretical currencies are all well and good, but when it comes to money — digital or otherwise — most of us want to know one thing: what it's worth. Should we hoard Bitcoin or ignore it? Are these cryptocurrencies *really* worth anything?

Well, is *anything* really worth anything?

"A lot of people believe the dollar is backed by gold, but that hasn't been true for a long time," Shaw says. "In fact, former President Richard Nixon announced in 1971 that U.S. dollars could no longer be redeemed for gold. When was the last time you could walk into a store and pay using a block of gold, anyway?"

"I'd argue that to succeed as money," says Shaw, "cryptocurrency has to become like a U.S. dollar or designer handbag, where people take its worth for granted — the point at which, collectively, we start to automatically treat its perceived value as reality."

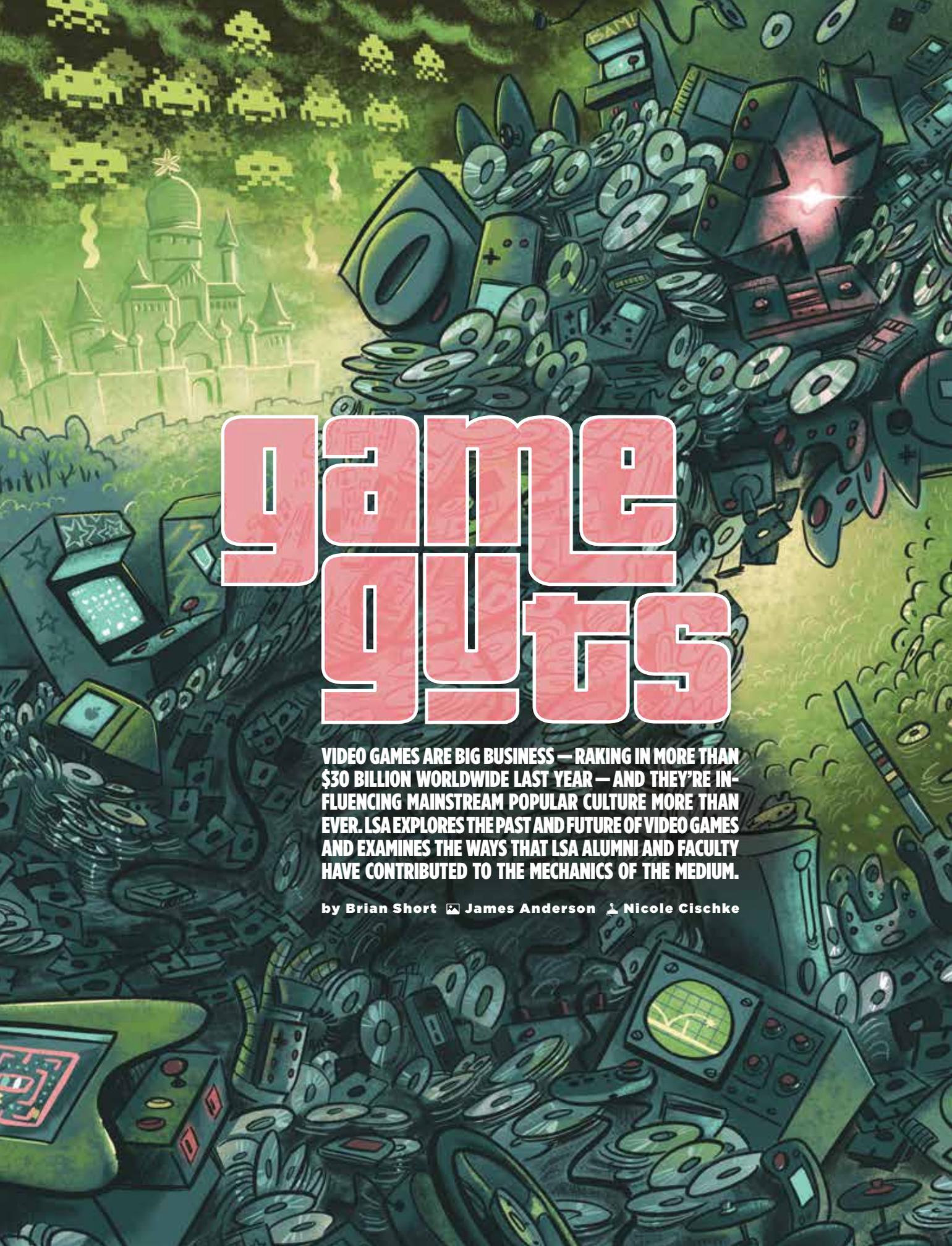
She admits that it's tough to predict the future of Bitcoin and other cryptocurrencies. Bitcoin could become a routine currency; or fail as money but survive as blockchain technology; or boast the dubious legacy of a huge, expensive folly.

But cryptocurrencies already have demonstrated some kind of value, especially compared to the creaky payment infrastructure first built in the 1960s and '70s. That system involves bureaucracy and hefty fees to track and approve payments, but the global community nonetheless continues to use it. People don't hype Bitcoin and other cryptocurrencies because the digital coins have some inherent

value; cryptocurrencies have value because people have found that they're useful.

"In the everyday course of living," Shaw says, "we forget that the value of such things is created and reproduced through our own actions and understandings." ■





game guts

VIDEO GAMES ARE BIG BUSINESS — RAKING IN MORE THAN \$30 BILLION WORLDWIDE LAST YEAR — AND THEY’RE INFLUENCING MAINSTREAM POPULAR CULTURE MORE THAN EVER. LSA EXPLORES THE PAST AND FUTURE OF VIDEO GAMES AND EXAMINES THE WAYS THAT LSA ALUMNI AND FACULTY HAVE CONTRIBUTED TO THE MECHANICS OF THE MEDIUM.

by Brian Short  James Anderson  Nicole Cischke



PRESS
START

LEVEL UP





LUSIA HOSEBIBB
FROM *SPIGOT
SISTERS 3:
SINKS FOR THE
MEMORIES*

THERE ISN'T JUST ONE PLACE AND TIME, THERE ISN'T JUST ONE GAME, WHERE VIDEO GAMES STARTED. SOME PEOPLE SAY IT BEGAN WITH DR. WILLIAM HIGINBOTHAM WHO, IN 1958, MADE A COMPUTER GAME CALLED *TENNIS FOR TWO* THAT RAN ON AN OSCILLOSCOPE, WITH MOVEMENT DETERMINED BY THE MEANS OF TWO SIMPLE, BOX-SHAPED CONTROLLERS.

Others say that *Spacewar!*, a space combat game developed in 1962 in New England, was the beginning. *Spacewar!* became popular with students at MIT, where it was first developed, and was quickly installed on computers in other parts of the country.

Others might point to the *Rolling Stone* article from 1972 about *Spacewar!* as the real beginning—the moment when video games stopped being a secret and became a much larger part of the popular imagination.

There are all kinds of firsts out there where you could begin this story. The first in-home video game console. The first million-unit seller. The first gigabyte game. The first CD-ROM.

But whenever and wherever you start the story, the end is still far, far away. Video games have developed a level of sophistication in conception, execution, and analysis to rival any other popular art form. And they have developed a complicated set of elemental genres, mechanics, and constraints—a set of ideas that have become the DNA of contemporary video games—that are worth exploring.

And in every major era and at every significant turning point in the history of video games, there have been LSA alumni, students, and faculty making, selling, writing, and thinking about games, finding success by paying close attention to what it feels like to play a game and by taking the people who play games—and the games themselves—seriously.



LUSIA
STEELTOES
FROM *STREET
KICKER*



LUSIA STARDUST
FROM *MARTIAN
SPIDER FIGHTER*



LUSIA CAVEGIRL
FROM *L.C.'S
QUEST FOR FIRE*

PRESS PLAY



LUSIANA
"JACKIE"
SPEED FROM
UNMAPPED:
THE FIFTH
CARTOGRAPHER

LADY LUSIA
FROM GATEWAY
TO SHAIPA

MEET LUSIA!

Our video game avatar comes in many forms and styles over the course of these pages — and that variety can be seen vividly on the two pages here — but her main costume is that of a hoplite, a member of a heavy infantry unit from ancient Greece. The hoplite armor is a nod to the Hellenic origins of the liberal arts. (Also, the name "Lusia" includes the letters L, S, and A... but you probably already noticed that!)



TO PROCEED IN THE GAME, LUSIA HAS TO GET PAST TENTAQLOR, BEAST OF THE BAJADA. BUT BECAUSE IT'S AN OPEN-WORLD GAME, SHE CAN DECIDE HOW TO ACCOMPLISH THAT GOAL HERSELF. SHE CAN KILL THE MONSTER TO GET THE EXPERIENCE POINTS OR TALK TO THE MONSTER TO UP HER CHARISMA/CHARM SKILL. HERE, LUSIA IS USING RED-OUT TO HELP TANTAQLOR'S ITCHY EYE PROBLEM, GARNERING A BATCH OF TREASURES FOR HER EFFORTS.

It's 1987. *Three Men and a Baby* is blowing up the box office. "Walk Like an Egyptian" is on your radio. And if you're at all into video games, *Sid Meier's Pirates!* is on your computer.

By the mid-1980s, legendary game designer Sid Meier (B.S. 1975) had transitioned from tinkerer to part-time game builder to hugely successful full-time game developer. He and his longtime business partner, "Wild" Bill Stealey, produced a series of fun games throughout the era that had sold increasingly well: *Spitfire Ace*, *Floyd of the Jungle*, *F-15 Strike Eagle*, and more. *Silent Service*, a submarine game released for the personal computer in 1985, sold more than 400,000 copies.

Meier's company brought on specialized staff, and they gradually expanded the time they spent on each game. *Sid Meier's Pirates!* took a whopping nine months to make, which was a lot for Meier's company MicroProse at the time, and the result—a sprawling, open-world game of intrigue, trading, buccaneering, and exploration—was one of the must-play games of 1987.

One of the ways that *Pirates!* differentiated itself from its predecessors and competitors was in the scope of the world and what players could do in it. Players could ask themselves: *What kind of pirate do I want to be? What do I, as a pirate, care about?* You could maximize your gold, letting greed guide you as you stuffed your pockets. Or you could be an explorer, sailing to the edges of the map and landing at every port you could find. Or you could embrace your role as swashbuckler, chasing down buried treasure and engaging in all manner of saber fights and naval battles. This open-world sandbox lets players invent some of their own story within the larger constraints of the game, and pursue that narrative vigorously.

Meier and his team followed *Pirates!* with the similarly epic *Railroad Tycoon*, and followed that with the even more ambitious *Civilization*. That initial entry spawned a number of sequels and spinoffs, most recently 2016's *Civilization VI*, which sold millions of copies around the world and continues to set the standard for the eon-spanning, globe-exploring, society-building strategy game.

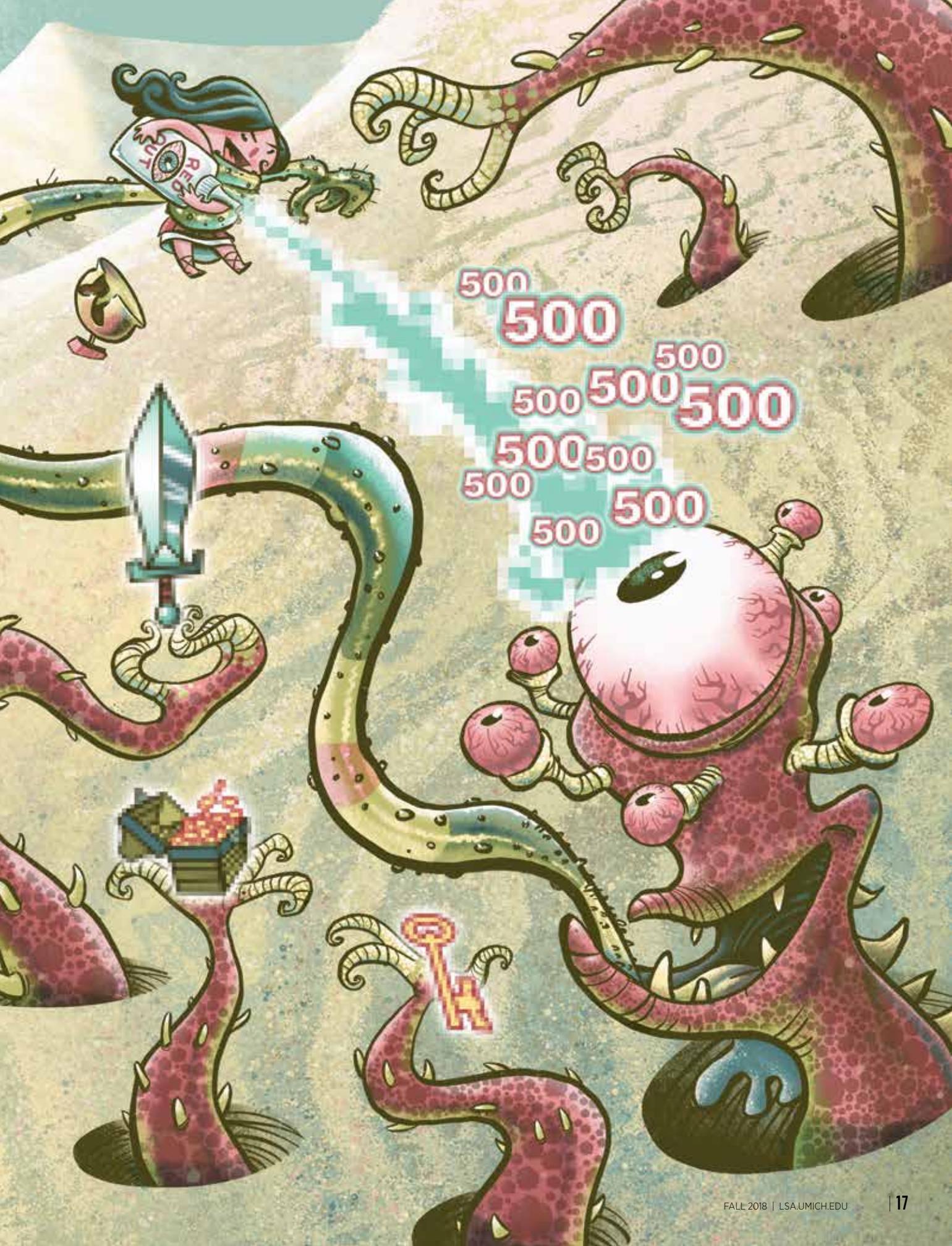
PANDORA'S BOX

Open-world or "sandbox" games encourage exploration and discovery by allowing players the freedom to choose how and when and where they go in a massive game world with minimal constraints. This means that players determine the sequence in which most events happen in a way that's largely independent of any larger story that's going on—and sometimes there isn't any story at all.

It is often described as both a genre and a mechanic that includes sword-and-sorcery titles such as *Ultima* and *Skyrim*, action games such as *Shenmue*, retrofuturistic apocalyptic role-playing games such as *Fallout*, and more.

Of course, we should note that there is legitimate disagreement over what fundamental elements constitute an open-world game—How nonlinear does the 'plot' have to be? How big does the world have to be, seem, or feel?—and that means that any list of examples—even this one—is going to be controversial.

the sand-box





CHAINS GET SHORTER
AND FARTHER APART AS
LUSIA GETS CLOSER TO
THE EXIT.

For even a simple video game, the variety of challenges and the pleasure of succeeding — the joy of making a series of perfectly timed leaps over open-mouthed alligators, say, or of an exploding turtle shell missile delivered just ahead of the finish line — can keep players interested from level to level and for years after the first time they play.

These games — in fact, all of the games ever made — are built around something called the **core game loop**. A core game loop is a set of tasks that players do over and over and over again in the course of a game. In a platformer, for example, the core loop likely involves running, jumping, and smashing blocks or shooting at enemies.

The challenges usually start out small and get progressively harder as the levels continue. For a platformer, an early level might include springs to bounce on and slow-moving elevators. Later levels might include more complicated and fast-moving challenges, such as disappearing blocks, frictionless platforms, narrow landing areas, and swarms of tough-to-

kill bad guys. As players proceed, they are hopefully mastering the actions and sequences of actions in the core game loop, meaning that as they face harder and harder challenges, they have already developed the required skills to eventually overcome those obstacles.

And LSA alumni have had plenty of global hits built on strong, compelling fundamentals. In *Crash Bandicoot*, directed by **Jason Rubin** (A.B. 1993), the core loop involves jumping, doling out smash attacks, and collecting items. In *The Sims*, whose development was overseen by **Lucy Bradshaw** (A.B. 1985), the characters' basic actions are quotidian tasks like eating, sleeping, talking, throwing trash in the trash can, and other stuff that you do every day in your real life. For the pulp-and-anime-inspired competitive shooter *Overwatch* — created by Activision Blizzard, which is run by CEO **Bobby Kotick** (LSA 1982) — the core game loop relies on a combination of competitive and cooperative actions, which, along with stellar gameplay mechanics and over-the-top visuals, combined to make *Overwatch* a smash hit when it came out in 2016.

the loop

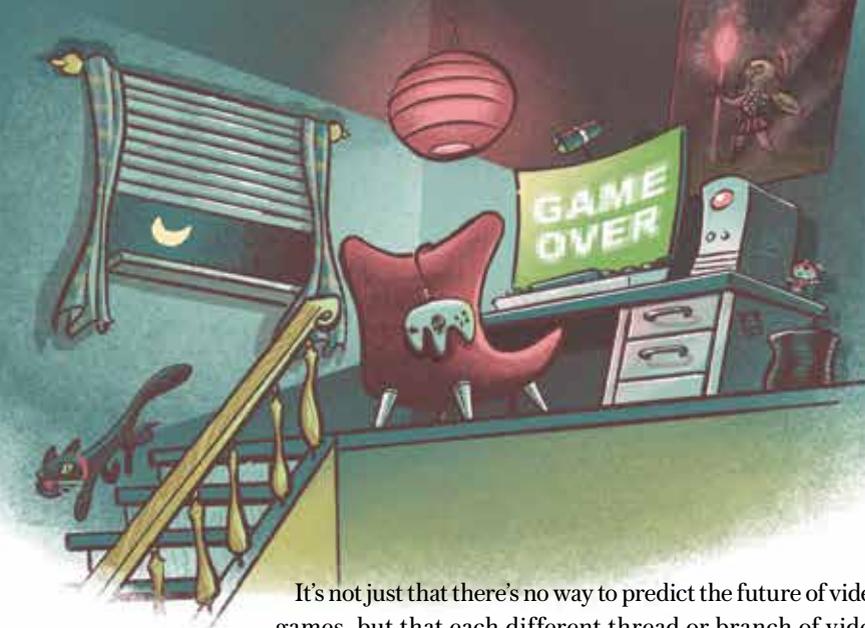


MONSTERS GET SMARTER AND FASTER AS THE LEVELS PROCEED.

WINGHEARTS APPEAR IN MORE AND MORE DIFFICULT-TO-REACH SPOTS AS LUSIA GETS FARTHER FROM THE ENTRANCE.

ENDLESS VARIATIONS

A core game loop determines certain fundamental aspects of the game, but doesn't necessarily determine the game's feel or aesthetic. The *Super Mario Bros.* core loop bears some similarities to that of *Mirror's Edge*, for example. Both games are platformers, and being successful in both means getting good at making complicated jumps and sticking difficult landings. But the latter game takes place in a dystopian future filled with greedy megacorporations and a malicious government surveillance state while the former has you bouncing around on the tops of frowny mushrooms while you listen to music that sounds an awful lot like "The Sailor's Hornpipe." So, pretty different.



It's not just that there's no way to predict the future of video games, but that each different thread or branch of video game culture – from DIY game makers to AAA franchise companies to mobile match-and-flash puzzle game developers – might have its *own* future. The video game industry is massive enough now that while individual platforms and genres might speak to each other, it's harder to argue that any one game in a given year is speaking to all current gamers – or that everyone even agrees what “gamer” means anymore.

But as the medium's economic and cultural power grows, there are places and people working to preserve its history. At places like the Video Game History Foundation and the International Center for the History of Electronic Games, on podcasts like *Retronauts* and in the pages of *Retro Gamer* magazine, the mission of capturing, collecting, and communicating the history of video

games is taken seriously.

Pieces of that history from the dawn of Atari to the most recent PlayStation 4 release can be experienced at U-M's Computer and Video Game Archive (CVGA) on North Campus by anyone – just bring a picture ID.

The archive allows people to experience and re-experience video games for research of all kinds. Valerie Waldron, the archive manager for the CVGA, says that she has come up with lists of games revolving around a number of themes for LSA classes, including games featuring organized crime, Japanese samurai, and even transhumanity. LSA courses that take advantage of the games in the video game archive include “Film, Television, and Media 368: Video Games as Culture/Form” and “Communication Studies 404: Video Games Culture and Industry” from winter 2018.

The archive also gets used for social gaming – its most popular games are the FIFA soccer series – but, in collecting, protecting, and archiving these games, the CVGA is serving a larger purpose that ties into the work of other preservationist institutions.

“I think there's a nostalgic factor related to video games that people played in their childhood,” Waldron says. “There's also more attention being paid by game collectors and preservationists related to games on physical media that are quickly aging and disintegrating. So there's been a lot of talk about preserving the original play experience as games come and go in popularity.” ■

INFINITE LEVELS





RESEARCH BY SUSAN HUTTON

Make Up Your Mind

From the Cognitive Evolution Group Lab in East Hall to the trees of Cayo Santiago, LSA's Alexandra Rosati is trying to learn how evolution shaped the way humans think.

FOR CENTURIES, HUMANS have put a lot of stock in thinking we're special. From Aristotle touting our rational minds and deliberative imaginations to Descartes dismissing animals as mere machines, we have a long history of thinking we're unique. As proof, we've pointed to our language, our culture, and our ability to use tools, though these theories seem less certain as time goes on.

More recently, scientists postulated that only humans can think about others' minds. Maybe animals are really good at reading behaviors, the theory goes, but they don't infer how another feels. "Now we have quite a lot of evidence that suggests this theory is not supported either," says Alexandra Rosati, assistant professor of psychology and anthropology.

"The big questions that motivate me are: What is it about humans that allows us to think the way we do?" Rosati says. "How is it that other animals are in some ways very smart, but don't have the kinds of lives we have? They're not going to school or living in buildings. When you study animals and see how intelligent they are, this gap looms even larger."

Rosati's lab investigates primates from a variety of approaches: the complexity of their social groups, what kinds of foods they eat, how they make decisions, how they solve problems. They're trying to find the link between the biological function of cognitive abilities and, ultimately, to understand what made humans capable of such amazing feats of cognition.



“WE STUDY A VARIETY OF DIFFERENT PRIMATE SPECIES THAT DIFFER IN ASPECTS OF THEIR NATURAL LIVES TO TRY TO UNDERSTAND WHAT PROMOTES COMPLEX PROBLEM SOLVING SKILLS,” ROSATI SAYS.

A MATTER OF TIME

Visiting the Galapagos in 1835, Darwin first encountered the 14 species of birds that became known as Darwin's finches. "The finches are all closely related, but they have different beaks that allow them to eat different kinds of foods," Rosati explains.

Some evolutionary biologists propose that such subtle differences in traits are caused by small tweaks to the timing of certain genes during development. The concept, known as heterochrony, explains the slight changes between the finches' beaks and similarities in other closely related species. Rosati wonders if the concept might extend beyond physical differences and help explain differences in cognition, too.

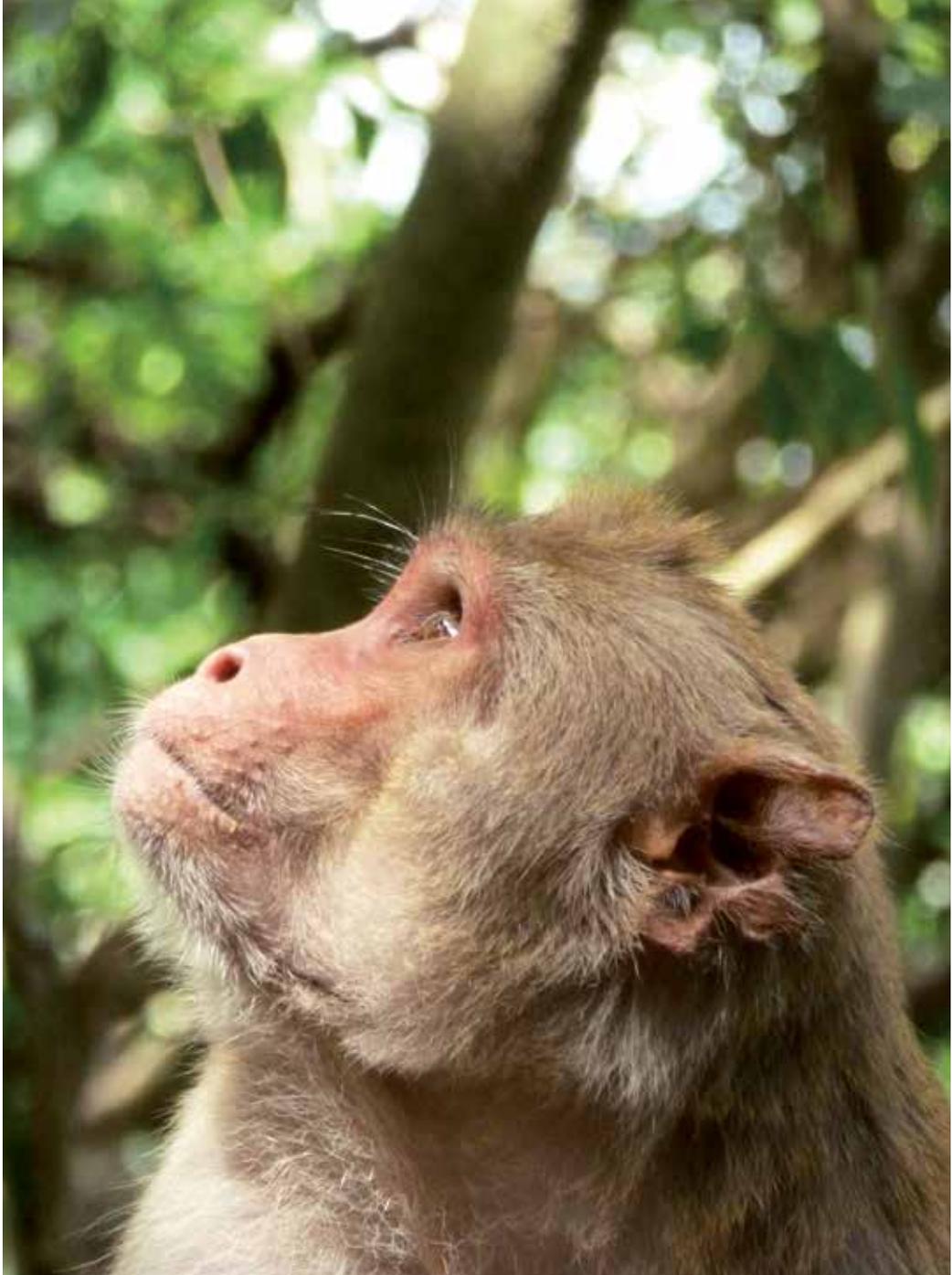
There has been some research in this area, but it's been limited in terms of the ages and numbers of the animal subjects, Rosati explains. Her lab is approaching this research from a broader angle. "We've been trying to work at sites that have larger samples of individuals that range in age so we can compare how a baby monkey solves a problem compared to an adult monkey, when a skill comes online, and how it compares to what we know about how this skill develops in humans."

THE SAME, JUST DIFFERENT

Anyone who's spent even a little time around primates can see our similarities: the likeness of our shoulders, hands, and feet, or the way we express emotions through facial expressions. Primate juveniles chase each other around like little kids on a playground. Many primates even smile. Rosati wondered about the extent to which we share more nuanced behaviors, such as the ability to follow another's gaze.

If you see someone staring at the ceiling, you'll probably lean back and look up, too. Babies begin to follow gaze in their first year, and it presages other developmental changes. "It's thought to scaffold other skills like language," Rosati says. "Knowing what others are looking at lets you know what they're talking about.

"It also scaffolds more complex social skills, such as reasoning what's going on in another person's mind," she continues.



“GAZE FOLLOWING IS A SORT OF CO-ORIENTATION RESPONSE THAT ALLOWS US TO REALLY KEY IN TO WHAT OTHERS ARE SEEING,” ROSATI SAYS. “WHERE YOU’RE LOOKING GIVES ME A STRONG CUE OF WHAT YOU’RE THINKING ABOUT.”

“We know that a lot of other primates follow gaze in some way—other species like tortoises do, too—but it’s less clear if they do so in the same way as humans.”

Rosati and her team investigated gaze following in 480 rhesus macaque monkeys, ranging in age from two weeks to 28 years. Like humans, the monkeys follow gaze early, from around five months. Younger monkeys were most sensitive to gaze following, Rosati found, which is consistent with human development. For little kids learning about the context of their social world, gaze is an important cue.

Though young monkeys did appear to follow gaze like young human children, that didn’t necessarily mean they were experiencing the same thing developmentally. Maybe in monkeys, for example, gaze following is only a reflexive

response, which Rosati and her team tested by examining if the monkeys would control their behavior and refrain from gaze following if they saw someone look repeatedly at the same spot. “The monkeys realized this crazy lady kept looking up for no reason,” she recalled, “and they stopped responding once they realized there was nothing there to see.”

Like kids, the monkeys also tried to triangulate what the researchers were seeing with their gaze. “Children will actually check back: Am I really looking at the right spot? Is this what she’s trying to see?” Rosati explains. “The monkeys seemed to show patterns surprisingly like a human even though, in many ways, their social life is different.”

For Rosati, then, the question is: Why do monkeys have this early emerging skill if it doesn’t bootstrap language? This is

one possible point of insight into where the biology of cognitive function in primates diverged, and Rosati is working with her lab to understand it.

ON THE ISLAND

When Hurricane Maria slammed into Puerto Rico last fall, the small fishing village of Punta Santiago was annihilated. Buildings were destroyed, and its pier became little more than a skeleton. The force of the storm had pried off its planks and strewn them around town.

Collecting the pier's detritus was one problem, but the bigger issue was the loss it had created for the town's two industries: fishing and looking after the colony of rhesus monkeys that live on a small island a half-mile from shore, one of the most studied groups of primates anywhere in the world. This is where Rosati has conducted most of her lab's gaze-following research.

Commonly known as Monkey Island, the 38-acre landmass has been home to a colony of rhesus monkeys since 1938, when the founding population of 400 monkeys was first brought to the island from India. The monkeys have thrived — they now number 1,700 — and they have been a resource for generations of students and researchers who have investigated, among many other things, the monkeys' cognition, parenting, diet, social groups, and genetics.

The monkeys are free-ranging on the island: They breed naturally and form social groups without interference from the people who study them, but they rely on the caretakers living in Punta Santiago for their survival. Aside from rain, there is no source of fresh water on the island, and the monkeys subsist on the food the caretakers bring to the island every day.

"This isn't their wild habitat," says Rosati. "There aren't any freshwater sources, and the hurricane blew all the rainwater cisterns away. It also destroyed all of the scientific infrastructure on the island. To collect genetic data, for example, you need a research lab. That was all blown away."

Like many, Rosati's first field experience took place on Cayo when she was an undergrad. Now she's come full circle, conducting research with students of her own. "It's really like no other place in the world," Rosati marvels. "There's no other place in the world where you could know 1,700 monkeys individually, know all of these different aspects of their life, and have these records going back this amount of time."

IN CRISIS

The hurricane created a devastating crisis for a scientific resource, and its timing was terrible, too. Each fall Cayo Santiago's staff identify and record all of the new babies born on the island, and because the babies tend to stay with their



PATERNITY INFORMATION IS A GAP IN WILD PRIMATE DATA. ON CAYO SANTIAGO, PATERNITY DATA WERE COMPLETE FROM THE 1990S UNTIL HURRICANE MARIA. TO RESUME COLLECTING GENETIC DATA, YOU NEED A LAB. THE HURRICANE BLEW THEIR AWAY.

mothers during their first year of life, researchers can record the mother-baby relationship, too. Last fall the hurricane hit as researchers were gearing up to identify the new babies, which means they've missed a generation of monkeys. "If we don't ID them this year, there will be a bunch of three-year-olds and two-year-olds and one-year-olds," Rosati says, "and we will not know exactly who they are or who their family is without genetic testing."

Rosati is concerned about the monkeys and the continuity of the research she and hundreds of other researchers have contributed to this population of macaques, and she's very concerned about the people who take care of them, too. "A lot of the people living in the local community use the same dock, or are supported by family members that have worked on this island for years. The things we need to do to help the monkeys are the same things we need to do to help everyone in the community, too," she says. "It's not a trade-off."

Rosati believes scientists cannot conduct primate research without also keeping the environments and communities in which the animals exist clearly in mind. Many primate species, including some that Rosati studies, are in jeopardy. Cayo Santiago is in peril, but the rhesus monkeys that live there are not endangered like the chimpanzees, barbary macaques, and lemurs that Rosati also studies. She partners with other researchers through organizations such as the Pan African Sanctuary Alliance to create sanctuaries for animals that have been confiscated from illegal trade, and to create the highest quality environment possible for them. Many of the projects in which Rosati is involved promote education and conservation of the animals while they're researching them.

Rosati is interested in what she and other researchers can learn from primate research, but she's equally concerned about their welfare.

"You can't just study these endangered species and ignore the fact that they're not going to be alive in the wild anymore unless we act fast," she says. ■



THE RECORDS ON CAYO SANTIAGO CONTAIN A LEVEL OF DETAIL THAT IS NOT FEASIBLE IN WILD POPULATIONS. THEIR MATRILINEAL DATA GOES BACK TO 1938. THERE IS NOWHERE ELSE IN THE WORLD WITH DEMOGRAPHIC RECORDS LIKE THAT.

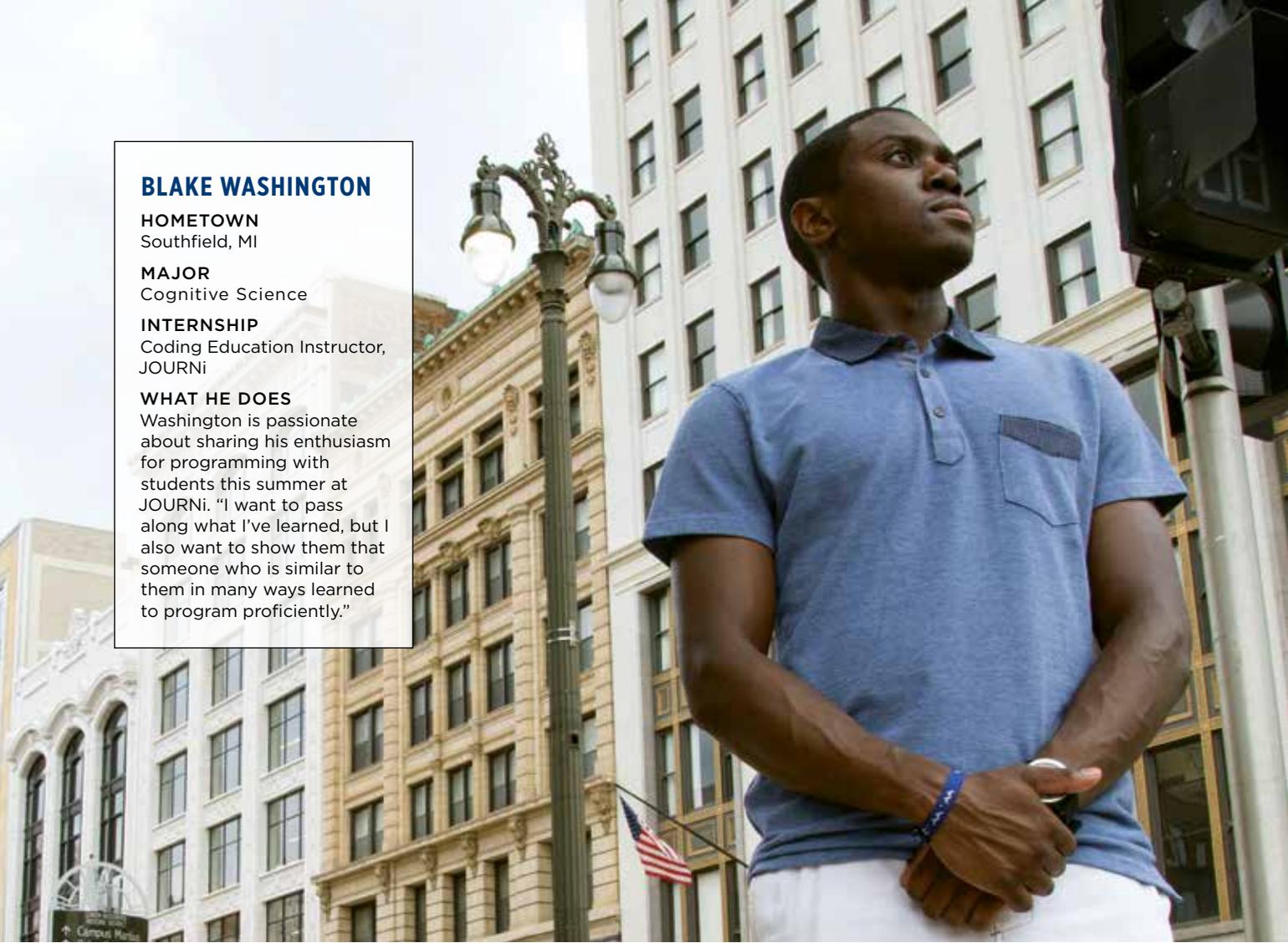
BLAKE WASHINGTON

HOMETOWN
Southfield, MI

MAJOR
Cognitive Science

INTERNSHIP
Coding Education Instructor,
JOURNi

WHAT HE DOES
Washington is passionate about sharing his enthusiasm for programming with students this summer at JOURNi. "I want to pass along what I've learned, but I also want to show them that someone who is similar to them in many ways learned to program proficiently."



MICHIGAN BY ALIA ORRA

Detroit Works

The new Applebaum Internship Program through the LSA Opportunity Hub connects talented LSA students with cultural and nonprofit institutions in Detroit, developing the future leaders who will preserve and transform places and programs that are vital to the city's history and growth.

PERFORMING IN FRONT of an audience is familiar territory for Blake Washington. As a track athlete, he's sprinted past throngs of sports fans at stadiums across the country. As a student, he's performed slam poetry for crowds of his peers.

But on the first day of his internship, standing in front of 20 teenagers in a classroom in metro Detroit, Washington felt a twinge of anxiety. With all of the computer programming knowledge he'd absorbed in his LSA classes, he thought he was prepared to be a coding teacher for the Detroit tech empowerment nonprofit JOURNi. But it's a little more complicated than just downloading information from your head into someone else's—and a little scarier.

"I was thinking to myself, 'Am I really going to be able to establish a teacher-student dynamic with these students, some of whom are not much younger than me?'" Washington, a senior majoring in cognitive science, says. "But I loved the challenge. And I love the idea of passing on what I know about coding to the next generation."

Washington was one of 16 students who spent the summer interning at Detroit nonprofits and arts organizations as inaugural fellows in the Applebaum Internship Program through



THE APPLEBAUM FOUNDATION

The Eugene & Marcia Applebaum Family Foundation, built upon the enduring vision and leadership example of Mr. Eugene Applebaum, is committed to enhancing the overall strength and vibrancy of the metropolitan Detroit community. A fundamental focus of Applebaum philanthropy is to provide unique opportunities that will inspire leadership, entrepreneurship, and independence for the next generation.

“I am so pleased these students were the first cohort of the Applebaum Program and took advantage of the opportunity to experience the nonprofit arena for future career opportunities,” says Pamela Applebaum, the president of the foundation. “It opens the lines of communication and provides a relationship, both for the student and the organization. We are proud to support the LSA Applebaum Program for Non-Profit Internships, for our future workforce and community leaders.”

the LSA Opportunity Hub. His two months in the city helped him discover a personal connection with nonprofit missions.

“These kids were facing all kinds of locked doors,” Washington says, “but we’re giving each and every one of them the means to open up doors to new opportunities.”

CITY CONNECTOR

The transformative premise of the Applebaum Internship Program, created in the fall of 2017, is to connect talented liberal arts students to core Detroit nonprofit and arts institutions in order to inspire the next generation of leaders to take on the challenges of building, revamping, and sustaining the city’s vibrant, diverse nonprofit and cultural infrastructure.

The Eugene & Marcia Applebaum Family Foundation gave a generous donation that made the program possible, partnering with the LSA Opportunity Hub to provide students with crucial funding support that is often the deciding factor between taking a nonprofit internship or doing something else. The LSA Opportunity Hub, which helps the college’s nearly 18,000 students identify and fulfill their professional aspirations, was the perfect partner to bring the initiative to life.

In addition to funding support, the program provides a shared experience for a cohort of students, supporting them in their preparation, exploration, and learning. The program also aims to entice University of Michigan graduates to stay in the state by getting them excited about the ways that they can contribute to the city and southeast Michigan.

“We want to show students what’s possible within the city of Detroit and within nonprofits,” says Kelly Day, the Hub’s Applebaum Internship Program manager. “So many of the students were at the beginning of their academic career and gaining experience for the first time when they joined us. Now they’ve seen what they are capable of and what type of impact they can make on a city, and the people they worked for saw it, too.”

The program includes internships at many of the city’s most enduring cultural institutions, such as the Detroit Institute of Arts and the Detroit Symphony Orchestra, as well as smaller nonprofits where LSA students taught coding, advocated for the environment, and served as mentors to younger students. The fellows came together for a program kickoff event in July at the Detroit Historical Museum, an event which featured

“DETROIT HAS SHAPED WHAT I’VE WANTED TO DO MORE THAN THE OTHER WAY AROUND,” SAYS OLIVIA STILLMAN. “PEOPLE DOING COMMUNITY WORK HERE ARE SO INTENTIONAL. IF YOU’RE IN DETROIT, YOU’RE HERE FOR A REASON.”



THE FIRST APPLEBAUM FELLOWS COHORT, SOME OF WHICH ARE PICTURED HERE, INCLUDES 16 STUDENTS WHO SPENT THE SUMMER WORKING AND DEVELOPING CONNECTIONS AND LEADERSHIP SKILLS AT NONPROFITS THROUGHOUT SOUTHEAST MICHIGAN.



remarks from leaders in LSA and the Opportunity Hub and from Pamela Applebaum, the president of the Applebaum Family Foundation.

The fellowship provides a series of professional and leadership development events that give Applebaum fellows an insider’s understanding of various facets of the city, from philanthropy to education. The seminars also provided connections to key industry professionals that students would otherwise not have access to, including time with leaders from the Detroit Symphony Orchestra, Wayne State University, and the Ralph Wilson Foundation.

Each fellow was also paired with a mentor for the summer – an LSA alum working in the region – and invited to kick off their experience at an overnight orientation in Detroit guided by Hub staff.

The deeper goal of the program is to demolish stereotypes about nonprofit work by showing opportunities and experiences that are as satisfying and challenging as those found in for-profit positions.

“Sometimes it’s seen as, ‘Oh, you work in a nonprofit, you’re such a good person for giving up the salary you could get elsewhere,’” Day says. “But there are professional people who work in that sector who care not just about the community but about their own careers. There are a lot of different entities categorized as nonprofits – hospitals, universities, museums – where there are a lot of opportunities.”



OLIVIA STILLMAN

HOMETOWN
Bloomfield Hills, MI

MAJORS
Sociology and Program
in the Environment

INTERNSHIP
Community Outreach
Intern, Zero Waste Detroit

WHAT SHE DOES
Stillman canvases neighborhoods throughout the city, sharing info on recycling resources with Detroiters. "It's a really different way of experiencing the city," Stillman says. "You are getting intimate, going face to face with residents."



LENAE JEFFERSON

HOMETOWN
Belleville, MI

MAJOR
History of Art

INTERNSHIP
Program Intern,
Motown Museum

WHAT SHE DOES
Jefferson's work is centered around community involvement, helping the museum facilitate its summer music camps and programs for kids. "Motown is such a pivotal part of Detroit history and culture, and I don't want to see it washed away."



“WITH THE CITY IN A RESURGENCE RIGHT NOW, IT FEELS IMPORTANT TO STAY HERE,” SAYS LENA JEFFERSON. “THIS IS MY HOME. I’M MOST PASSIONATE ABOUT WORKING HERE.”

IN THE D

The program’s setting—Detroit—is at the center of the initiative. The Applebaums, along with the LSA Opportunity Hub, want to provide a platform that encourages students to embrace Detroit’s complexity and engage with its embedded, long-standing community.

“Many people think that there’s nothing going on outside the city’s center, but there is vibrancy in neighborhoods outside of that area,” Day says. “It was important to us that the students really develop an authentic connection with and understanding of Detroit.”

“The Applebaums are leveraging their incredible connections in the city to create something special for U-M students,” says Paula Wishart, LSA’s assistant dean for student development and career initiatives who heads the LSA Opportunity Hub. “They are very dedicated to the area’s philanthropic organizations and to encouraging students to see this line of work as not only viable but vital.”

For the students, many of whom had spent time in Detroit growing up, it was an opportunity to understand and experience the city in a more intentional way.

“I’ve always loved the city, but I’ve wondered why it feels like I’m in a different place when I’m in a different part of Detroit,” Washington says. “I’ve really wanted to do something for those parts of the city that are not getting as much attention. I’m really excited to establish a solid tech ecosystem in Detroit.” ■



FACULTY BY SUSAN HUTTON

The Picture of Health

Today we get nearly as much health information from public service announcements, movies, and TV as we do from our doctors. It changes the way we discuss illness and suffering in public, and it might also offer insights that will help us address health disparities.

TO DIAGNOSE AN illness, you have to compare a patient's symptoms to the symptoms that characterize different kinds of disease. A headache could mean stress, the flu, or a sinus infection. A swollen finger could be arthritis or an injury. Of course, an accurate diagnosis relies on other factors, too: a patient's medical history, their experience, and the ways they behave.

But once a patient receives a diagnosis, we also expect them to have certain behaviors that conform to what we think is the "right" way to manage their disease. As an example Beza Merid, a Collegiate Fellow in the Department of Communication Studies, offers people who have been diagnosed with cancer.

"If you have cancer, you are often expected to act cheerfully, think positively, and invest your energy in being a good, responsible patient," he says.

"But what if I am a cancer patient who doesn't want to be optimistic or cheerful?" he continues.

ONCE A PATIENT RECEIVES A DIAGNOSIS, WE ALSO EXPECT THEM TO SHOW OTHER BEHAVIORS ASSOCIATED WITH THEIR ILLNESS THAT HAVE NO BIOLOGICAL CONNECTION TO THE DISEASE.

“Does that make me a bad patient? Does it make me a bad person?”

These questions are at the core of Merid’s research, which looks at the ways that patients, caregivers, health institutions, and the media define what it means to be sick — and the ways this definition has changed over time. Until the early twentieth century, Merid says, health was characterized as something you *had*. Today, he says, health has become something you *do*.

KNOW YOUR NUMBERS

“To be a responsible patient, you’re supposed to know and understand and to act on your risk of disease,” Merid explains. “This means you wear a Fitbit, you go on diets, you exercise, and you know your cholesterol and your blood pressure.”

But it’s not enough to manage to do all of these things, Merid says. You have to know and monitor your personal risks and also be prepared to act on them. “We’re being asked to be responsible patients at earlier and earlier stages,” he says. “And there’s this kind of moral imperative that is attached to that.”

This moral imperative is one component of our evolving notion of health that Merid sees as largely fueled by media. Media has clearly shaped and influenced pharmaceutical ads, and when celebrity voices end up on public service announcements — Anthony Anderson, LeAnn Rimes, Felicity Huffman, and Martin Short are all currently participating in such campaigns — it’s no surprise that the star power helps the messages to reach even more people.

It may come as something of a surprise, however, to learn that health organizations also partner with the entertainment industry to deliver health information through storylines and characters, such as

those in *Homeland*, *Grey’s Anatomy*, and *Breaking Bad*. “Research shows people rely on entertainment media for health information,” Merid says, “and so there’s an effort to ensure they get accurate information from these media.”

But he says it’s important to know that people are also told what appropriate emotional responses to managing health conditions look like. “These messages pervade our everyday lives,” Merid says, “and so it’s better, I argue, to be aware and critical of how we consume them.”

DO AS I SAY AND SAY AS I DO

Health institutions have long used the media to encourage people to think and feel particular ways about their risk of disease. Sometimes they want people to act; other times they want to prevent them from being so fearful that they don’t act at all. If people imitate the health institutions’ emotional models, the thinking goes, then people are more likely to follow their advice, too.

While good patients are busy consuming health information, many are also producing it in cancer blogs or videos that divulge intimate, detailed accounts of what it’s like to live with particular diseases.

“They often blur the line between what was once considered private and public,” Merid says. “In some cases, people really want to have control. Other times, when you see videos on YouTube, people are recording whatever is happening with abandon.” Online campaigns such as #hospitalglam put patients — and not clinicians — at the center of the information exchanged. Merid thinks these unrefined records of personal experience might hold a key piece to reforming health care.

In the classroom, Merid wants his students to learn to imagine what it’s like to embody an ill person’s experience. What is it like to live with an invisible illness that prevents others from recognizing your role as a patient? What is it like to live with a chronic disease, or to face crushing medical debt?

“I think it’s important to understand that, aside from the partisan politics that surround health care reform or health activism, there are personal, urgent, and immediate stakes,” Merid says. “I want my students to think about what it’s like on a day-to-day level to live with and negotiate this kind of illness experience. It’s all about getting students to recognize that this information is out there and is part of the media we consume. These are real lived experiences that shape people’s lives.”

In the end, he says, it’s important to realize we actively participate in the health media landscape.

“It is made up by us and by health institutions,” Merid says. “It is co-constituted by us, which means it can be changed by us as well.” ■



JOHN GEISSMAN
IN THE FIELD IN
SOUTH AFRICA

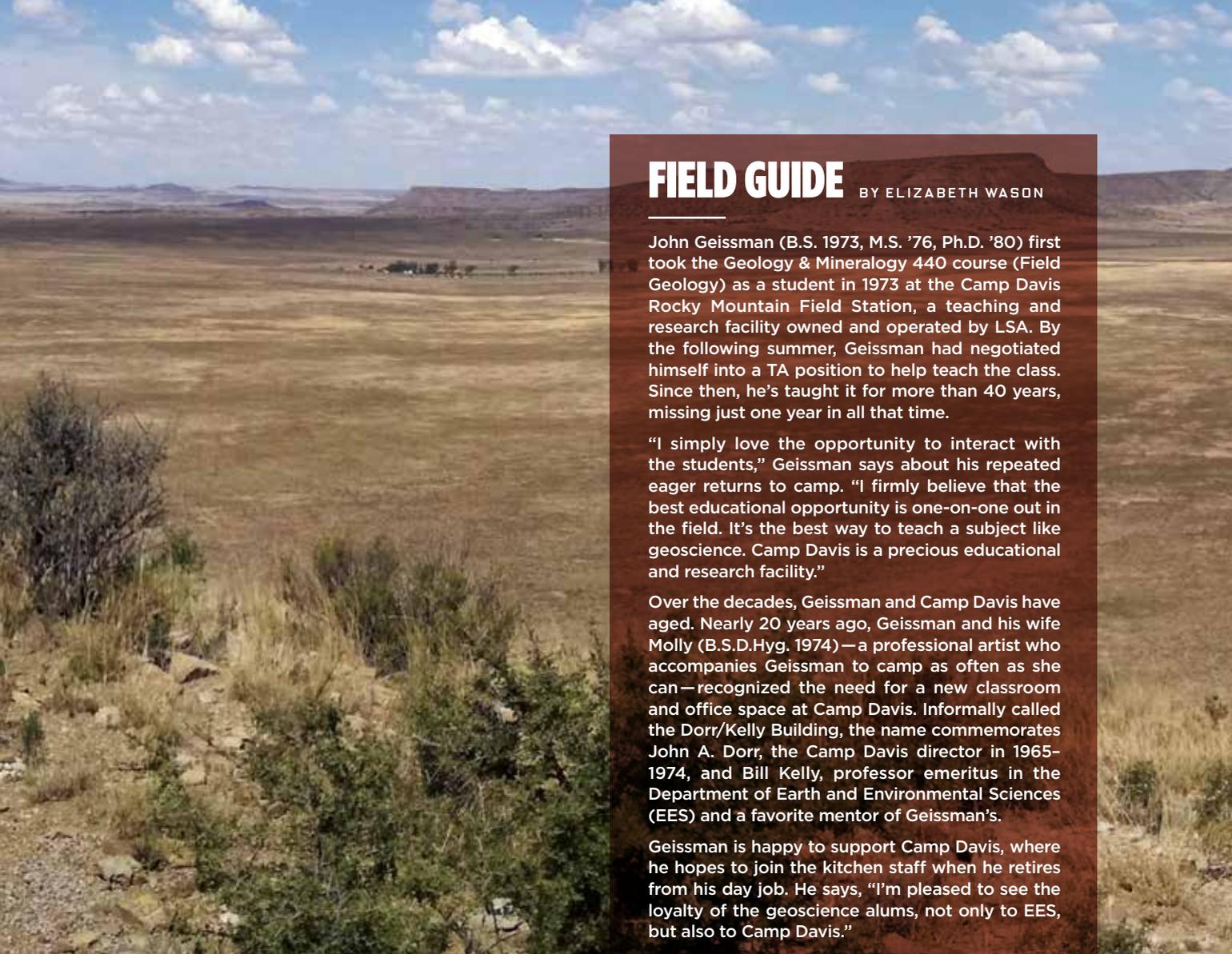
The Gumshoe and the Great Dying

In South Africa's Karoo, geology alumnus John Geissman is trying to crack a very cold case—the unsolved mystery of an ancient mass extinction.

GEOLOGIST JOHN GEISSMAN (B.S. 1973, M.S. '76, Ph.D. '80) has a few tales about dodging life-ending experiences from his decades of working in the field. There was the time he almost got hit by lightning while doing field work near Butte, Montana. And another time, when he woke at three in the morning at a campground in Montana, after sleeping tentless on the ground and listening to the sounds of a grizzly bear attacking someone in a tent 20 feet away. More

recently, he and an assistant got hit by a flash flood while deep inside a ravine in South Africa. Now, deep in South Africa's Karoo Basin, Geissman and his colleagues are sampling ancient rocks, looking for clues that may reveal how Earth's largest mass extinction unfolded.

Geissman is examining what's called the Permian-Triassic (P-T) mass extinction. Also called the "Great Dying," it happened about 252 million years ago and marks the boundary



FIELD GUIDE BY ELIZABETH WASON

John Geissman (B.S. 1973, M.S. '76, Ph.D. '80) first took the Geology & Mineralogy 440 course (Field Geology) as a student in 1973 at the Camp Davis Rocky Mountain Field Station, a teaching and research facility owned and operated by LSA. By the following summer, Geissman had negotiated himself into a TA position to help teach the class. Since then, he's taught it for more than 40 years, missing just one year in all that time.

"I simply love the opportunity to interact with the students," Geissman says about his repeated eager returns to camp. "I firmly believe that the best educational opportunity is one-on-one out in the field. It's the best way to teach a subject like geoscience. Camp Davis is a precious educational and research facility."

Over the decades, Geissman and Camp Davis have aged. Nearly 20 years ago, Geissman and his wife Molly (B.S.D.Hyg. 1974)—a professional artist who accompanies Geissman to camp as often as she can—recognized the need for a new classroom and office space at Camp Davis. Informally called the Dorr/Kelly Building, the name commemorates John A. Dorr, the Camp Davis director in 1965–1974, and Bill Kelly, professor emeritus in the Department of Earth and Environmental Sciences (EES) and a favorite mentor of Geissman's.

Geissman is happy to support Camp Davis, where he hopes to join the kitchen staff when he retires from his day job. He says, "I'm pleased to see the loyalty of the geoscience alums, not only to EES, but also to Camp Davis."

between the Permian and Triassic periods of geologic time. The story, as most geologists currently tell it, goes like this: Roughly 96 percent of all marine life and 70 percent of all land life disappeared forever.

From our perspective of "deep time," the event looks sudden. But death did not arrive quickly. In the oceans, where the marine record is immaculately preserved, the P–T extinction spanned some 60,000 years. Most scientists think that the extinction is linked to major volcanic activity in what is today Siberia, where volcanoes disgorged roughly three million cubic kilometers of lava and emitted greenhouse gases such as carbon dioxide, which warmed the planet enough to help drive massive die-offs in the water. Studying extinction events like this shows that changes to our planet over the past century or so have been happening much more quickly than the global changes we've seen at other points in Earth's history.

But Geissman and his colleagues are interested in what happened on land during that time. They're trying to piece

together how the extinction processes played out on dry turf, where vertebrates and plants also died off in great numbers—but differently.

This is the mystery. Could the "Great Dying" on land have been caused by something else altogether?

SECRETS IN THE STONES

The P–T extinction is one of five major mass extinctions that punctuate history. Many paleontologists think that our human actions are currently driving a new and major mass extinction, with rates of species loss unseen since the extinction of the dinosaurs some 66 million years ago. If so, then the P–T event—also caused by planet-warming climate change—may be our best analogue for how this "sixth extinction" may unfold. Or, it may not turn out to be a good comparison at all, especially if some other extinction trigger is to blame.

At the center of this geologic mystery is a quarter-billion-year-old crime scene: the Karoo Basin. A broad, open,

semi-desert expanse, the Karoo is one of the few places on Earth where rocks provide a record of the extinction on land. In the intervening 250 million years, most of the evidence has been lost to erosion and mountain building, and, unsurprisingly, not every geologist interprets the surviving clues in the same way.

For starters, it is not clear if what geologists have for decades described as the P-T extinction actually includes massive die-offs on land. There is some evidence, published by Geissman and his colleagues on the Karoo team, that the land crisis happened over one million years before the extinctions in the sea. If that is the case, then what caused the massive die-offs on land? At a field site near the small town of Bethulie, Free State, South Africa, this is what Geissman and his colleagues are hoping to find out.

DRILLING DOWN

In South Africa's January summertime, the grass is brown between the wild olive trees that dot the hills and sway in the wind. Nearby, baboons are barking. This is where Geissman and his team work.

Geissman doesn't use a magnifying glass to find clues. Instead, he employs a portable drill powerful enough to bore through even the hardest rock. And rather than Sherlock Holmes's deerstalker hat, Geissman wears industrial-grade earmuffs and a baseball cap with a big block "M" on it. He is ready to drill.

As a graduate student working with Professor Rob Van der Voo years ago in LSA's Department of Earth and Environmental Sciences, Geissman learned to drill into rocks and

measure their magnetic signatures. Out in the field today, Geissman hunches over a drill and handles it as if it's another arm. In one rock face alone, he punches out 63 holes, each several inches deep.

From the cylindrical core samples he punches from rock, Geissman can measure the magnetic orientation of the rocks' magnetic minerals. Every so often, the orientation of Earth's magnetic field flips, and when it does, rocks formed after the "flip" form with a natural magnetism opposite to the prior direction of the magnetic field, and instead align with the new magnetic north. This means the rocks are like ancient compasses frozen in time – if you can see which way their "needle" is pointing, you can say where north was in the past. These geologically ancient magnetizations are quite weak, but readily measurable in the lab.

A global record of these magnetic flip-flops exists in Earth's rocks, and Geissman wants to see if the record from the rocks in the Karoo fit the pattern of flip-flops known to characterize the boundary between the Permian and Triassic periods. If the flips in the Karoo match the global pattern, then the Siberian volcanism that caused the deaths at sea may have been responsible for the land deaths, as well. Researchers, then, could better connect the timing of the land extinction to the timing of the marine extinction.

If the magnetizations in the Karoo stray from the global pattern, though, then something strange is afoot, and the land extinctions may have arisen from something else entirely.

For now, the verdict is still out, and Geissman will continue to peer through his drill and persevere in the laboratory, seeking answers. ■



(RIGHT) Photos by Emma Richter



FACULTY BRIAN SHORT

The New Old-Timey

An LSA professor looks to radio's past to create a contemporary radio drama.

MARY FROM MICHIGAN, an audio drama from creative writing Professor Michael Byers (M.F.A. 1996), contains all of the essential and classic elements of a soap opera. There are secret boyfriends, lecherous villains, sick parents, and even an honest-to-goodness evil twin. The plot moves as fast as the episodes arrived over the summer—one 12-minute entry every day for five weeks. (The podcast is still available for download anytime on iTunes.) The pace allowed listeners to revel in the guilty pleasures of incessant plot twists, near scrapes, and cliffhanger endings. It also made for a frantic production schedule for Byers and the actors.

“In a way, this season was a proof of concept,” Byers says. “We were seeing what works, how it works, what’s feasible. And it’s completely feasible. We’ve recorded four episodes in one day, but

it’s probably more practical to do three one day and then two the next.”

The process works like this. Byers writes the script, then brings the actors together to record the scenes, at which point Byers and the actors together look at what’s written and sort their way through the story.

“The actors and I worked together to take advantage of the nature of the form—quick rehearsals, live recordings—while maintaining a level of quality that we all were happy with. The actors and I learned how to make this work, and soon we were up to speed, doing our best to match the production pace of the old shows. A challenge!” Byers says. “But we got there.”

RADIO DAYS

Byers has long explored ideas through fiction, jumping from short stories to novels, from family dramas to historical fiction to horror. And since 2013, he has taught classes about the world of radio drama, adventuring alongside his students through the worlds of no-nonsense cops like those on *Dragnet*, the pulp-era pugilists of *Green Hornet*, and the moralizing hero-making of *Jack Armstrong, the All-American Boy*.

In addition to writing about radio, his class also puts on a live performance of a radio drama that the students write, create sound effects for, and perform together themselves—a process, Byers says, that is both rewarding and exhausting.

“I’m amazed by the dexterity and skill of the actors, who can pick up at a moment’s notice and go immediately into character,” Byers says. “Meanwhile I’m directing, working up a wicked sweat trying to keep up with them. When we’re done, I need to sit down and have a period-appropriate martini.”

Mary from Michigan builds on what Byers learned in the class. It has a troupe of professional actors that work for a company that Byers founded to make the show, the Empire Podcasting System. Audio drama has seen a resurgence as of late, with standout hit shows like the sci-fi noir *Life After* from GE Podcast Theater and the thriller *Homecoming* from Gimlet Media among many, many others. (Podcast audio dramas even have an industry-ish newsletter, a surefire sign that people are paying attention.)





“IT’S EASY TO ADD TRACK AFTER TRACK OF SOUND EFFECTS, BUT THAT ACTUALLY IS NOT HOW THE MOST SUCCESSFUL RADIO DRAMAS WORKED.”

But Byers and Empire’s take on the form feels different. *Mary from Michigan* resurrects a defunct genre – the radio soap – and remixes it with current concerns and a more naturalistic sense of storytelling while keeping the spirit and style of the original.

“It’s easy to add track after track of sound effects on stuff to make it sound like, ‘Oh, we’re really in a restaurant.’ But that actually is not how the most successful radio dramas worked. What a radio drama allows you to do is get really intimate and personal with the characters that you’re with. It’s a suggestive medium instead of an explicit medium.”

THE PAST INSIDE THE PRESENT

And there are more plans in the works. There will be a second season of *Mary from Michigan*, as well



MICHAEL BYERS’S MOST RECENT NOVEL, *PERCIVAL’S PLANET*, INCLUDES TOPICS AS DIVERSE AS AGRICULTURE, ARCHAEOLOGY, MENTAL ILLNESS, AND ASTROPHYSICS.

as a podcast about the history of the kinds of radio shows like the ones on which *Mary from Michigan* is based.

“The next project is a conversation podcast between me and some of the actors about the history of radio drama and comedy,” Byers says. “We’ll be talking and we’ll use clips, including *Sorry, Wrong Number*, this classic piece from the 1940s, and we’ll talk about how it came about, who did it, and how it sounds to us now.”

The second project revolves around a show that aired on CBS in 1943. In June of that year, racial violence swept through Detroit, one of three so-called “race riots” that would happen that summer across the United States. Three and a half weeks later, Byers says, CBS aired a special called *An Open Letter on Race Hatred*, dramatizing the events that had shaken Detroit.

The script for the show exists – but the recordings are gone. Byers hopes to stage the show live in Detroit alongside two companion pieces about race relations originally created in the ‘30s and ‘40s. “Because this unrest was happening during the war, it was seen as a national security issue and was a source of Axis propaganda,” Byers says. “So it was seen as crucial to national security that these things be addressed, and addressed in a way that is actually a model for ways to address actual social issues today.” ■

Engineering Aha

Eureka moments are usually part ingenuity and part serendipity. LSA’s Jason Owen-Smith is trying to determine if you can design a physical space that makes such breakthroughs happen more often.

HERE’S ONE FOR YOU: What do you get when you put some scientists, laboratories, and equipment in a building together? If you’re a public university committed to research, you hope you get a world-changing discovery. And if you’re Jason Owen-Smith, professor of sociology, research professor, and executive director of the Institute for Research on Innovation and Science (IRIS), you get the chance to investigate ways to make such breakthroughs more likely.

Every discovery is unique, but there’s a general path to aha that feels familiar. There are also moments we don’t normally recognize as part of the process of hypothesis and experimentation. Owen-Smith, working with a cross-disciplinary team, is trying to quantify these moments, too.

“On the one hand, there are the apocryphal stories about innovations that happen because a physicist and a biologist both have kids on the same softball team and spend a lot of Saturdays in the stands,” Owen-Smith says. “On the other hand, there are formal case studies that say something like, for example, Steve Jobs put the bathrooms in the center of the building at Pixar. Pixar is awesome. If we put the bathrooms in the center of our building, then we’ll be awesome, too. That’s the thinking. But of course we don’t actually know that.”

Architects and spatial scientists have spun skeins of theories about ways to encourage innovation, but the theories tend to take place in abstract space. People interact in actual, physical spaces, Owen-Smith says, and they too develop real patterns there.

“If you watch how people move through their houses,” Owen-Smith says, “there are spaces that are rarely entered and spaces that are used a ton. We move from known point to known point without venturing into other spaces too much.”

Owen-Smith and his colleagues were curious to see if these patterns apply at work, too. He found we mostly go to certain spaces—our desks,

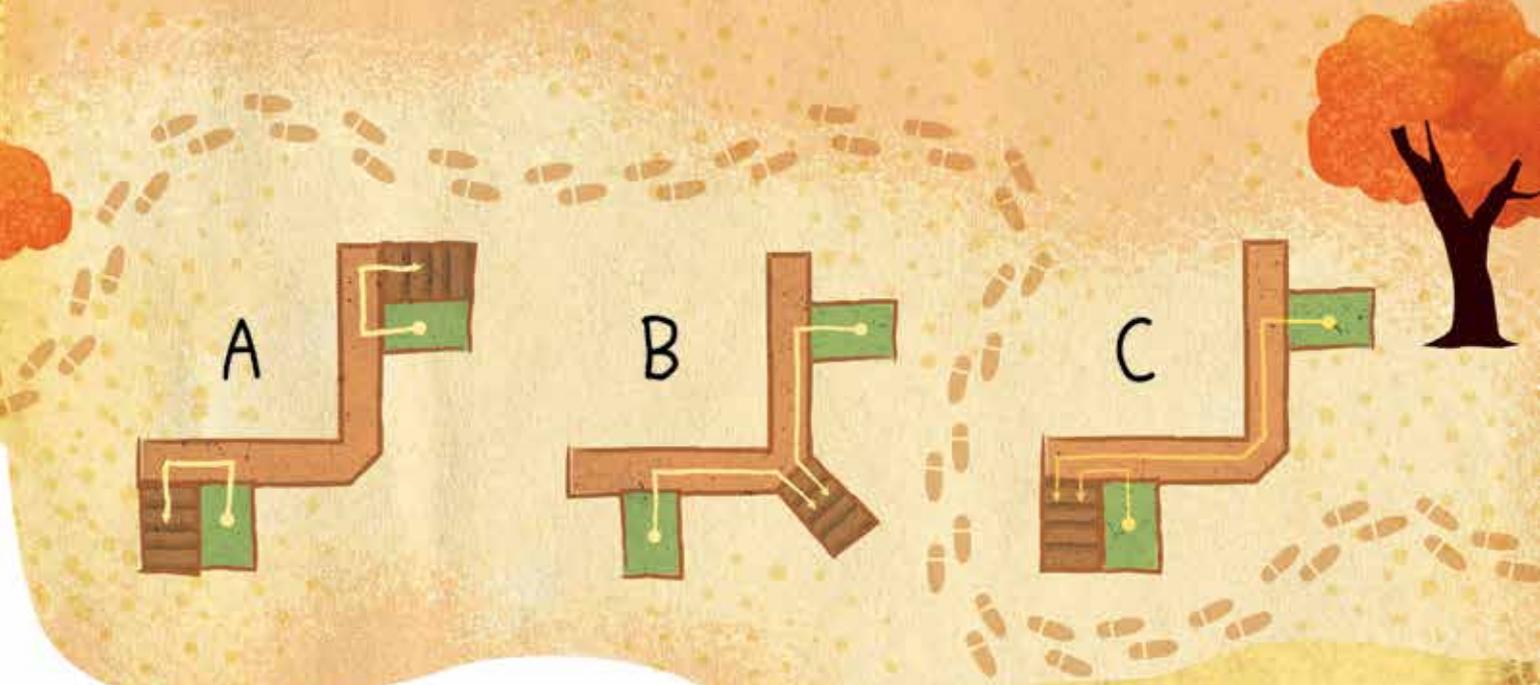
the water cooler, the cafeteria, the bathroom—and travel the same paths between them. Across industries, he found employees’ movements were easily understandable in a certain space while others were harder to decipher.

“We radio-tagged a group of corporate engineers and followed their walking paths in real time,” Owen-Smith recalls. “They kept congregating in one corner of the building and we couldn’t under-

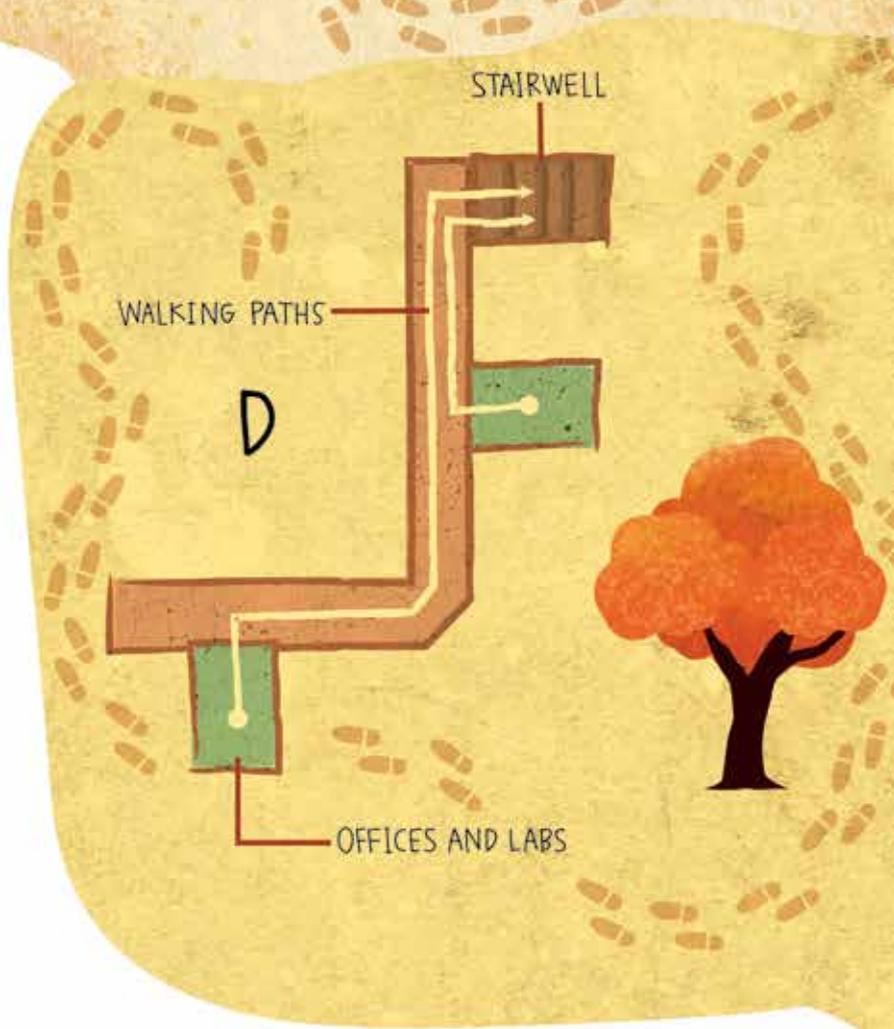
“TEACHING AND LEARNING IS WORK. SCIENCE IS WORK. EVERYONE METAPHORICALLY PICKS UP THEIR LUNCH PAIL AND GOES TO WORK AND FOR MOST OF US WORK IS A PLACE.”

stand why until we sent a graduate student there to observe. It turns out the woman whose cubicle was there tended to bring brownies.”

In their biggest study of this kind, Owen-Smith’s team used data on office and lab spaces and the floor plan of bioscience buildings to estimate the logical walking paths they thought biomedical scientists in the building would take. “We marked where their offices were, where their labs were, and the nearest relevant bathroom,” Owen-Smith says. “We marked the stairways and elevators and then we drew the shortest walking path through the building among all of those spaces. Given



IN EACH OF THE FOUR EXAMPLES PICTURED HERE, A HALLWAY AND TWO OFFICES OCCUPY THE SAME AMOUNT OF PHYSICAL SPACE, BUT THEY DON'T YIELD THE SAME OPPORTUNITIES TO COLLABORATE. THE LIKELIHOOD OF COLLABORATION INCREASES WITH THE AMOUNT OF TIME PEOPLE SPEND IN A SPACE TOGETHER. WHEN THERE'S A STAIRWELL AT EACH END OF THE HALL, AS IN EXAMPLE A, PEOPLE ARE MORE LIKELY TO SIMPLY USE THE STAIRS NEAR THEIR OFFICE RATHER THAN WALK DOWN THE HALL, SO THERE'S VERY LITTLE CHANCE FOR OVERLAP. IN EXAMPLE B, PEOPLE DO USE THE SAME STAIRWELL, BUT THEIR PATHS SEPARATE AS SOON AS THEY EXIT INTO THE HALL, SO THERE'S SLIGHTLY MORE OVERLAP BECAUSE PEOPLE MUST BRIEFLY WALK TOGETHER TO GET TO EITHER OFFICE. IN EXAMPLE C, THE OVERLAP AREA IS INCREASED BECAUSE BOTH OFFICES ARE FARTHER FROM THE STAIRS.



what we understood about people's habits and movements, the scientists were probably at one of those points or on one of those paths most of the time."

Once they marked these paths, they identified areas of overlap between two researchers who followed the same paths every day: You walk around, you wait for the elevator. You start to recognize the people around you. You ask, what do you do? You get that nodding familiarity.

"We found that for every additional 100 feet of overlap in walking paths, there is about a 17 percent increase in the chance they will start a new project together," Owen-Smith explains. The same amount of overlap also increased the collaboration's chance at funding by almost 20 percent.

"The work of science is hard, and it requires a lot of back and forth," Owen-Smith says. "If you're bumping into people routinely, they can say, 'Hey can I grab you for a second? I really need to troubleshoot this assay.' That's much easier and more efficient than sending an email to ask to schedule half an hour to come to the lab."

It's hard to teach people to recognize a breakthrough waiting to happen, Owen-Smith says, and it usually needs to happen face to face.

"Sometimes the search is directed. You know you need someone who's really good at graph theory to help with a particular mathematical network problem and you find them. It's much harder when you don't know what you need. That's where cultivating the chance for serendipity comes in." ■

EXPERIMENTAL DESIGN

If *where* we work affects *how* we work, then why not intentionally design the space to yield great work? That's one major aim of the new Biological Sciences Building (BSB) on campus. The BSB also has been designed so public visitors to the U-M Museum of Natural History (UMMNH)—which will reopen next spring, located right in the middle of the BSB alongside research labs—can stroll past areas of the building where researchers work. It's an environment where science is on display and opportunities for science outreach lie just outside the lab doors.

Here's how researchers hope the BSB's design will encourage connections and cross-pollination among scientists.

Open Labs (1)

"Neighborhoods" house the members and equipment of several different science labs all in the same space. Before moving into the BSB, different labs had been separated by walls and private research gear. Neighborhoods encourage an environment of shared space, shared equipment, and, most important, shared ideas.

Sightlines (4)

"Coffee nooks" in the glass alcoves that connect the towers give researchers a space to relax, encounter colleagues, and wave through windows to friends in the opposite atrium.



TOWER A

Distributed Amenities (2)

Kitchens and other pragmatic spaces in Tower A and Tower C invite mixing with students, scholars, and faculty who work in Tower B, serving as hubs of informal activity.

Science on Display (3)

The general public is welcome to visit the UMMNH, which is nestled right in the middle of the BSB alongside research labs. Visitors can see what science really looks like, and scientists can see opportunities to share their work with the public.

SEE PHOTOS OF THE NEW BIOLOGICAL SCIENCES BUILDING ONLINE AT MYUMI.CH/LSABSPIC.

TO THE DIAG

Visible Labs (6)

The new UMMNH will include two visible laboratories: a paleontology prep lab, where researchers ready fossils and specimens for study or display, and a biodiversity lab, where researchers extract and analyze genetic data. Visitors can observe science in action through the large lab windows and even talk via intercoms with people in the labs.

Planetarium



TOWER B

TOWER C

Circulation (5)

Elevators and bridges carry scientists and museum visitors around the building and among the towers, blurring the boundaries between public and research areas and leading to chance encounters among passengers and pedestrians who might be eager to give an “elevator pitch” about their latest experiment.

Darwin's Café (7)

The BSB offers a place to grab snacks on the first floor of the building and relax in an outdoor seating area. The casual space will draw faculty, students, staff, museum visitors, and passersby together to mix and mingle.

Community (8)

For the first time, all of LSA's biology faculty will share a single building. Close quarters for traditionally siloed fields increases the odds of incidental encounters, casual meetings, overall facetime, and, hopefully, successful collaborative research.

RUTHVEN
BUILDING



RESEARCH BY BRIAN SHORT

The Lost Letters

One LSA professor uncovered a lost trove of correspondence between two artists from the early twentieth century, bringing their love lives and professional careers into sharper focus.

AS ONE OF Thomas Edison's films on the 1900 Exposition Universelle in Paris begins, men in bowler hats and women toting umbrellas move through the streets below the Eiffel Tower. A small group convenes in front of the camera, examining it and its operator. A man who looks a bit like a French Ralph Fiennes steps forward from the crowd and mugs for the camera.

Edison's electric-powered technology is on display in the film – the moving sidewalk, in particular, seems to interest the people of Paris greatly – but it was the Palais de l'Électricité, entirely lit with electric bulbs, that really dazzled the fairgoers in the City of Light. It was into this version of Paris – newly electrified, rushing headlong into modernity – that two young women set out together to make their names and make art.

Eva Palmer and Natalie Clifford Barney had met on vacation at a tiny New England resort in Bar Harbor, Maine, in the 1890s. They began a relationship, and, together, moved to Paris in the early 1900s. Both women were active in the arts, writing plays and poetry, putting on performances, and working with like-minded artists across the city to break down the walls of convention.

These were important years for both women, says Artemis Leontis, chair of the Department of Classical Studies and director and professor of the Modern Greek Program. She has written a book on Eva Palmer, the first woman who later, as Eva Palmer-Sikelianos, directed an international

festival of Greek drama and games in the ancient site of Delphi. (The book is forthcoming from Princeton University Press in March 2019.) Leontis recently discovered a lost trove of letters between the women, illuminating details of their life and work from this vital time.

“These letters cover the most significant years of their intimate relationship,” Leontis says. The letters began as the women were entering their adult lives and working as artists, she says, and their correspondence continues until after Palmer—exhausted by the intrigues and power games of her years with Barney—got married, added a hyphen to become Eva Palmer-Sikelianos, and moved from Paris to Greece with her Greek husband. The women’s intimate correspondence ended when she asked Barney to stop writing to her on New Year’s Day of 1910, a few months after the birth of her son, Glafkos.

They were in their twenties when the century began, together in a new city filled with possibilities. A decade later, they were estranged, separated by a continent, a marriage, a child, a name.

LOST AND FOUND

While she was researching the book on Eva Palmer-Sikelianos, Leontis came upon a 1995 book of letters published in Greek translations of correspondence between the two women. The book mentioned rumors of more letters in a collection of inaccessible papers in the Center for Asia Minor Studies in Athens, but the book’s author and translator, Lia Papadaki, was denied access to them. Leontis heard the story in person when she and Papadaki met. Intrigued, Leontis set out to learn more.

Leontis sought out a historian who worked for the Center for Asia Minor Studies. The historian was sympathetic when Leontis described her project over the phone, and agreed to carry a letter Leontis wrote elucidating her reasons for wanting access to the center’s acting director. The historian delivered the letter, and Leontis was granted entry to the collection the very next day.

Most of the archives at the Center for Asia Minor Studies deal with Asia Minor, the Asian part of Turkey, and with the culture and history of Orthodox Christian communities of the Ottoman Empire that disappeared after the empire’s fall in 1921. But tucked among its books and records was also a cluster of folders unrelated to that subject, a collection that contained 127 letters from Barney to Palmer and 56 letters from Palmer to Barney along with photographs and a lock of Palmer’s red hair. The folders also held several hundred more letters written to Palmer by the writer Colette, the actor Marguerite Moreno, the painter Virginia Yardley, and many others.

“When I opened the dossiers, my jaw dropped,” Leontis



NATALIE CLIFFORD BARNEY



EVA PALMER-SIKELIANOS



SNAPSHOTS OF EVA PALMER-SIKELIANOS, POSING IN A HANDWOVEN TUNIC SHE WORE WHEN SHE FIRST TRAVELED TO GREECE IN LATE JULY OR AUGUST 1906. SHE IS IN KOPANOS, A VILLAGE ON MOUNT HYMETTOS, OUTSIDE ATHENS. IN THE BACKGROUND IS THE HALF-COMPLETED "PALACE OF AGAMEMNON," BUILT BY DANCER ISADORA DUNCAN, HER BROTHER RAYMOND, AND HIS WIFE PENELOPE SIKELIANOS.



**THEY WERE IN THEIR TWENTIES WHEN THE CENTURY BEGAN,
TOGETHER IN A NEW CITY FILLED WITH POSSIBILITIES.
A DECADE LATER, THEY WERE ESTRANGED, SEPARATED BY
A CONTINENT, A MARRIAGE, A CHILD, A NAME.**

says. “Each contained several folders of letters spilling out in loosely bundled stacks, tied together with purple and pink ribbons from the time of their receipt. I found traces of tears and mud on the letters.”

Leontis hopes to share these letters with the world through her forthcoming biography of Eva Palmer-Sikelianos and a book of selected letters. She also wants to create a digital resource of the once secreted bundles, making them available to interested researchers anywhere. Working with the Jacques Doucet Literary Library, where the rest of Barney’s letters are archived, and the University of Michigan, Leontis, two undergraduate interns from LSA’s Modern Greek Program, and photographer Elias Eliadis created a photographic record and digital versions of the materials in the Center for Asia Minor Studies archive as the first stage in this international collaboration.

“My goal is to create a unified, digital archive that brings together the entire collection,” Leontis says. “It can function as

an aid to scholars, artists, groups, and individuals interested in Natalie Clifford Barney, Eva Palmer, and their circle—and anyone who wishes to study and promote their work or analyze the history of sexuality in the twentieth century.”

After their split, Palmer-Sikelianos remained in Greece and became a great supporter of classical Greek thought and art, including financing two major festivals of drama and games at the ancient site of Delphi. Barney held a famous literary salon in Paris for decades. But both women’s motivations are more clearly seen, Leontis says, with the combined letters from that time all taken together.

“Seen together with the letters from both archives,” Leontis says, “the correspondence, in English and French, charts the course of their ideas and activities for about a decade. Their dream is for a new world inclusive of women who love women who form communities of creators. Their view is double: to the future and to the past, where they seek out prototypes for their utopian vision.” ■



Miss Palmer

Lettre à Baby
Baby
Lettre...

Lettre en anglais

Miss Palmer

Colin Haney

as tickled
Kied with a
for you and
time, dear.
all

Frankreich

Miss Eva Palmer

Miss Eva Palmer
11 West 50th Street
New York



ALLIANCE FRANÇAISE
COMITÉ DE NEW YORK

Mlle Eugène Palmer

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France

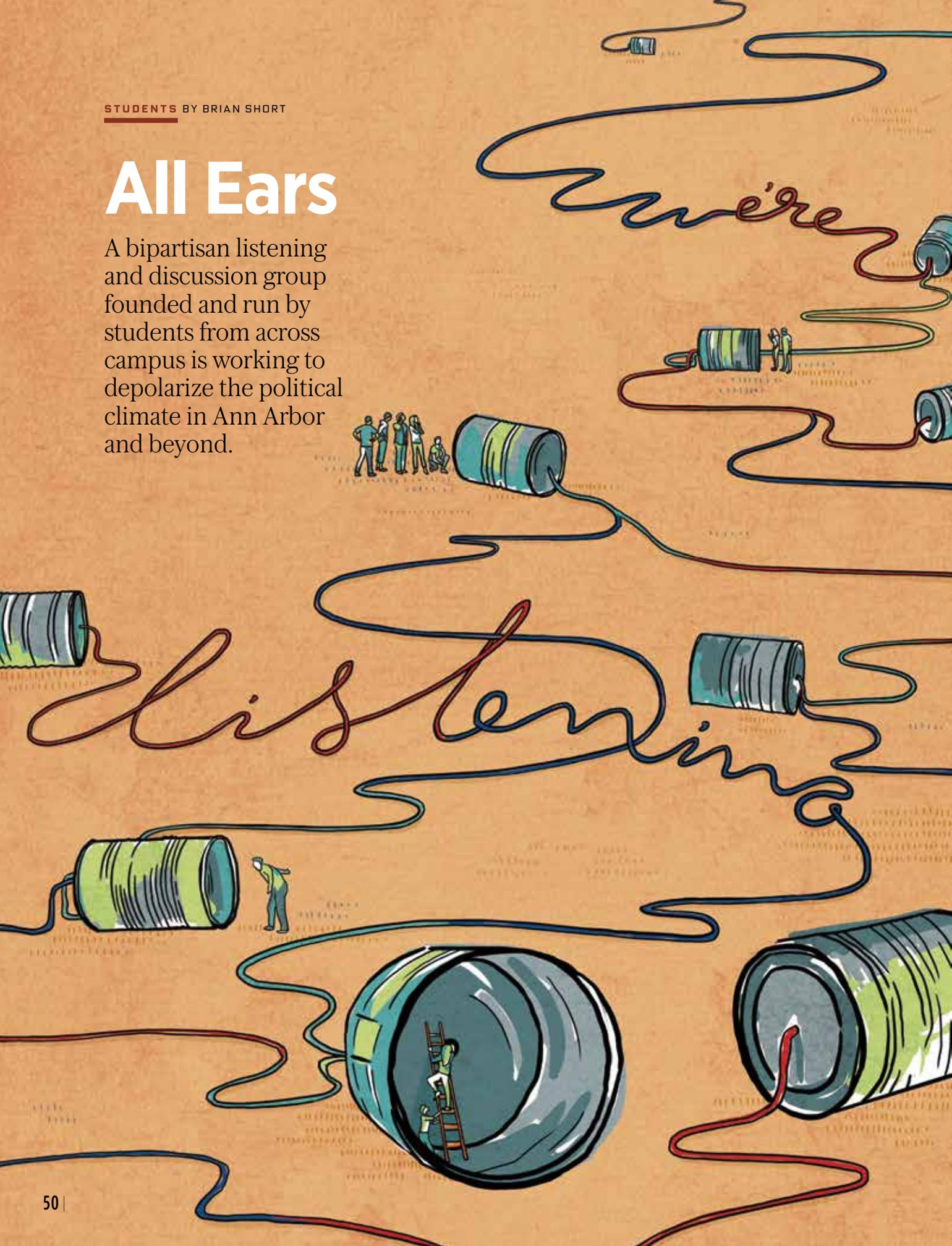
If it be from B
To watch the B
If it be from B to C
Beauty, when dear
Oh then sweet Comp
Has loved a woman
Whose love with
I should see with
you know then, that the
The sweetest gift of life
The wings of high love
when love, they can a
greater reason and be
The high, the happy, holy

MISS PALMER, HOTEL DE
DE FRANCE BIARRITZ

DE PARIS 60319 25 23 2M38.3
L'AMANTON DE TOUT COEUR, FEAR IT IS HOPELESS,
TRY TO FIND OUT REASONS AND ARRANGE INTERVIEW WITH ME = BABY

All Ears

A bipartisan listening and discussion group founded and run by students from across campus is working to depolarize the political climate in Ann Arbor and beyond.



ON OCTOBER 1, 2017, a 64-year-old man named Stephen Paddock opened fire on the Route 91 Harvest Music Festival in Las Vegas, injuring 851 people and killing 58. It was the deadliest mass shooting by an individual in the United States.

The next day, the executive board of the student group WeListen met to figure out what to do about their upcoming bipartisan discussion event.

The topic for the event: gun control.

“We had a really intense discussion within our board about whether we should keep that as the topic for our discussion,” says Gabriel Lerner (Ford A.B. 2018), co-founder of WeListen. “We wondered if the conservative students, some of whom had grown up around guns, might feel like they couldn’t share their thoughts. On the other hand, we wondered if people who had experience with violence themselves maybe wouldn’t be comfortable sharing their views.”

After discussing it, the group decided to stick with the topic and move forward. Around 80 students showed up and spent 40 minutes talking about gun control, working through ideas about bump stocks and the Second Amendment and addressing personal experiences and public outrage. To the organizers’ surprise, some students with opposing viewpoints wanted to keep talking with each other after the evening was over.

After the 2016 election, it was clear to Lerner and co-founder Sonia Thosar (B.S.E.I.O. 2018) that there was a need for more civil dialogue around the country – and on their own college campus. They hoped that a student-founded, student-run group might be able to help the people around them come together even when it felt like the country was splitting apart.

“That night really set a precedent for us,” says Thosar. “From then on, we really leaned into topics that were uncomfortable or that people were wary of talking about, and that’s made such a difference.”

BUILDING BRIDGES

Here’s how a night at WeListen works. After students walk in, they fill out a form on which they self-identify their political ideology on a 1–7 scale, one being very liberal and seven being very conservative. Then they rate themselves on the specific topic at hand.

After a short presentation, the students are sorted into groups and begin their discussion. They spend 10 minutes getting to know each other – that is to say, talking about anything other than politics – and then spend 40 minutes on that night’s topic. Then, after the conversation is over, everyone comes together to review and debrief.

Since the group began in the fall of 2017, they have asked for feedback at every event and have used that information to seriously iterate, tweaking their content and reshaping their format to better serve the events and students.

Some of the changes included moving from randomly selected discussion groups to groups intentionally created with an eye toward political balance. Another change was an effort to provide more information at the beginning of each discussion, with thorough presentations and fact sheets to give the participants a set of reliable information to work off of in their conversations.

“THAT NIGHT REALLY SET A PRECEDENT FOR US. FROM THEN ON, WE REALLY LEANED INTO TOPICS THAT WERE UNCOMFORTABLE.”





because people can't seem to get past the political divide. But our leadership team is a 50-50 split between self-identified conservatives and self-identified liberals, and we still manage to get things done. And a big part of that is because we can all see that there is common ground underlying the different beliefs that people have."

"We want to ensure that any student can participate," says Jacob Chludzinski, WeListen's vice president of content. "You can be very well-versed in the research and legislation on a given topic or you can come in with no prior background at all. We give students enough so that they have all of the basic facts and definitions that they need to jump in."

WeListen also changed and expanded their internal structure. The group moved from a smaller core team to one that will include 15 to 20 people this fall term, including seven LSA students in leadership positions: Jacob Chludzinski, vice president of content; Chase Howell, vice president of internal; Patrick McLinden, head moderator; Elijah Rachlin, vice president of external collaborations and relations; Taylor Smith, vice president of outreach; Katelyn Westa, vice president of finance; and Evon Yao, vice president of communications.

Alongside students and alumni from the Ford School of Public Policy, the College of Engineering, and other schools and colleges, these LSA students are working to improve campus climate by practicing what they preach – working and collaborating closely with people from across the aisle.

"It's so important when you're making decisions to hear everyone's point of view," says Smith. "We're so used to seeing real legislation fall apart

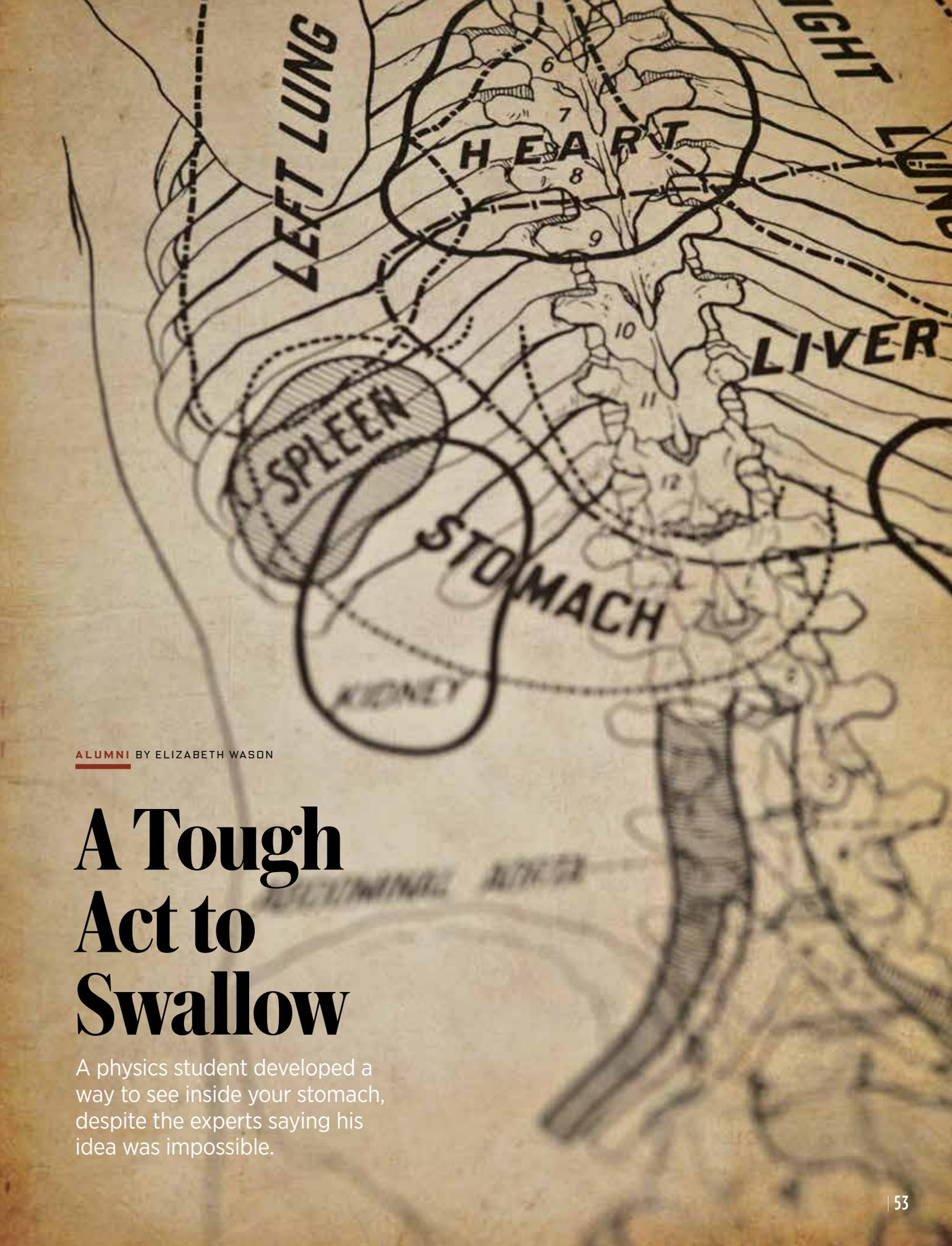
THIS SUMMER, WeListen RAN WORKSHOPS WITH INTERNS WORKING FOR POLITICIANS, GOVERNMENT OFFICES, OR THINK TANKS. THE HOPE IS THAT CONNECTING LIKE-MINDED YOUNG PEOPLE FROM A RANGE OF POLITICAL BACKGROUNDS CAN HELP WeListen START DOING GOOD WORK ALL OVER THE COUNTRY.

LEARNING ON THE JOB

All of the LSA students involved in WeListen leadership see direct ties between the group's efforts and their own studies. Many are studying political science, with some hoping to go into politics in Washington, D.C., after graduation, and others planning to attend law school. For Eli Rachlin, a cognitive science major, WeListen has made him curious about connecting what's happening inside the Capitol Building with what's happening inside of our heads.

"From my perspective, everything that is either a success or a difficulty in our society only comes to be that way as a result of the ways that the human brain can work," Rachlin says. "WeListen has made me think a lot about what it does to and for our brains when we have these strongly held beliefs that we then reflect on and talk about with other people sitting right next to us who are doing the same thing."

"Being in WeListen has really helped me think more deeply about where other people are coming from," Westa says. "It seems like something we should already know how to do, but we get so used to our own echo chambers on Twitter and hanging out with friends who already agree with us. I think sometimes the hardest thing about WeListen is showing up, because once you're there, you see how easy it is to meet other people where they are." ■



ALUMNI BY ELIZABETH WASON

A Tough Act to Swallow

A physics student developed a way to see inside your stomach, despite the experts saying his idea was impossible.

FOR THEIR LUNCHTIME games of bridge, a handful of physics faculty relaxed with playing cards, food, and coffee in the Randall Laboratory basement on central campus. For a young physics student in the 1950s like Larry Curtiss (B.S. 1958), he says all these years later, “It was a wonderful place for an undergraduate to go to ask an occasional question and get quick advice.” Tapping the group at the card game, a student could get several different and useful answers about how to solve an issue in the lab.

Curtiss was trying to build a long, flexible instrument that could snake down through the mouth, throat, and esophagus and project images of the stomach: a gastroscope. Since his sophomore year, Curtiss had worked on a team with his physics advisor, Professor Wilbur Peters, and a resident in the U-M Medical School, Basil Hirschowitz. Their most stubborn problem was that test images looked faded and washed out: Light was leaking out of the hair-thin glass fibers in the fiber-optic bundle that formed the important snaking part of the instrument.

The card-playing professors suggested that Curtiss should insulate each glass fiber with a thin layer of plastic. That way, he could limit the light’s path through each individual fiber. When Curtiss wondered aloud whether glass might work as a better material to insulate the strands, the erudite professors scoffed at his silly idea.

But after getting laughed out of the room and putting the professors’ advice into practice, Curtiss says that his attempts at plastic coatings “began three months of futile effort.”

Then, Curtiss quietly started trying his own solution in the lab while his peers and supervisors were out of town at a conference. “So I wouldn’t be embarrassed if it turned out to be a fiasco.”

He bent over the contraption that he’d built with help from the old Physics Machine Shop. Many of its parts came from odds and ends they’d found around Randall Lab. Curtiss included an empty can of oatmeal to carefully wind thin glass strands around as they cooled coming out of the small, cylindrical furnace that had melted the glass.

He placed a glass tube into the top of his furnace and slipped a glass rod through the tube’s center. Both dripped from the heat, and Curtiss slowly pulled a thread through the bottom of the furnace,



thin as a hair, with an outer glass coating over an inner glass strand.

He was giddy with the great result: “I was walking backward down the hall, and at 40 feet away, I could still see the glow of the furnace through the fiber,” he says.

“That was my moment of joy.”

ADVANCING AT LIGHT SPEED

A century before Curtiss, early experimenters with stomach scopes had to practice with inflexible instruments on cadavers and sword swallowers.

The procedure was dangerous. Early scopes often tore holes in the esophagus, knocked teeth out, and burned organ linings with hot lamps – the only technology available to light inner cavities enough to see. Doctors gave up on trying to make good gastroscopes, likely due to horrible accidents with patients.

When Curtiss landed on his solution, the discovery was profound. Physicians now could look inside the human body

LARRY CURTISS (ABOVE) AND HIS FACULTY ADVISORS PIECED TOGETHER A CONTRAPTION THAT COULD DO WHAT NO ONE THOUGHT WAS POSSIBLE AND ULTIMATELY LED TO MODERN FIBER OPTICS – AT A COST OF ABOUT \$250 FOR THEIR EARLIEST MACHINES.

without cutting it open and without traumatizing the patient. And Curtiss had addressed a tough technical problem and made fiber optics possible: People now could bend light around corners with cheap, flexible glass, and without losing much brightness. In some ways, his insight led to major advancements in telecommunications, helping replace bulky copper wires with sleek fiber optics.

In retrospect, the idea came from simple reasoning in physics.

“If you ever try to move a wagon by pushing it with your leg to get it away from the grass and onto the sidewalk, the wagon always wants to turn and go back on the grass,” says Curtiss. “That’s because it goes a little bit faster on the sidewalk than it does on the grass.”

“Light’s the same way,” he says. “It wants to turn away from where it goes faster and move into the space where it goes slower.”

DOCTORS GAVE UP ON TRYING TO MAKE GOOD GASTROSCOPES, LIKELY DUE TO HORRIBLE ACCIDENTS WITH PATIENTS.

Curtiss had coated his inner strand of high-refractive glass, where light moves more slowly, with a thin layer of low-refractive glass, where light moves more quickly. Light entering one end of the glass fiber would travel through the inner glass, constantly reflecting away from the outer glass that surrounded the inner fiber. With nowhere to go but bounce straight through the inner glass strand, the light could follow that path all the way through to the other end of the fiber without leaking out at all. Physics calls it “total internal reflection.”

With a bundle of these glass fibers, Curtiss, Peters, and Hirschowitz could transmit light, and thus an image, through bends and coils in the flexible bundle—from the stomach into their view through an eyepiece outside the body. They’d been working on the project for just two years. After testing their new fiber-optic gastroscope on Hirschowitz, they soon used the scope on patients with great success.

What made the gastroscope work was physics, of course, but also the collaboration between physicists who understood how light behaves and a doctor who knew how to poke around inside a patient.

TAKING OFF FOR THE SUMMER

The instrument’s use spread so quickly that in ten years, thousands of fiber-optic gastroscopes had sold. By the 1970s, the technology advanced so rapidly that new models quickly became obsolete. The fiber-optic scope became the standard among doctors examining stomachs and soon extended to other organs, and dentists, and microscopes. Even Rolls-Royce could peer inside their airplane engines without dismantling them, thanks to the invention.

Curtiss finished his physics degree at U-M and headed to grad school, working on the side with the company that made the first commercial fiber-optic gastroscope. When the company asked Curtiss to spend the summer helping with the product, he assumed that they’d finish the project in time for fall classes.

“I went down for the summer to New York City,” he says, “and that summer was 22 years long.” He never did get his Ph.D.

Now 82 years old, Curtiss worked in the medical instrument industry for his whole career, “pretty much having a ball, doing a lot of the things I found fun to do,” he says.

He’s modest about his glass insulation technique. But Curtiss has gotten patents for his work, and an early gastroscope he built has been held at the Smithsonian Institution since 1989. ■

CURTISS AND THE TEAM PATENTED THEIR INVENTION IN 1956 AS A “FLEXIBLE LIGHT TRANSMITTING TUBE.” AFTER FIRST TESTING IT ON HIMSELF, HIRSCHOWITZ USED THE NEW GASTROSCOPE TO EXAMINE A PATIENT’S STOMACH IN 1957.



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EXPANDING HORIZONS



LSA students DeLon and DeLorean Slaughter had never been abroad, but they decided they both wanted to do a study abroad trip to Costa Rica—and they wanted to do it together.

The brothers took classes abroad to finish their language requirement, using their new and developing language skills to work through conversations in Spanish with their host families and with Nicaraguan migrant communities that they visited. DeLon and DeLorean agree that the trip was a life-changing experience.

“You learn to be comfortable while being uncomfortable,” DeLon says. “Being in a different country and speaking a different language every day really pushes you to grow as a student and as an individual.”

You can make a difference, too. Your gift to the LSA Fund for Scholarships means that students like DeLon and DeLorean can worry less about money and more about using what they’re learning in class to start making a difference in the world right now.



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Action and Agency

LSA offers support for students, faculty, and staff working to improve—and perfect—American democracy.

If you are a student, faculty member, or staff member who would like to learn more about how to apply for a Democracy in Action Fund grant, visit myumi.ch/ljadiafund. If you would like to learn more about LSA's Diversity, Equity, and Inclusion Strategic Plan, including the Democracy in Action Fund, visit myumi.ch/lsideiplan.

THE DEMOCRACY IN ACTION FUND awards grants to support students, faculty, and staff working toward our nation's highest democratic ideals. Awards range from \$500 to \$2,500, and they're intended to help people do the challenging work of advancing democratic engagement on campus.

Past submissions have included a podcast about diversity; a panel articulating students' agency to implement change; a summit around student power; a voter turnout project; and a teach-in on fascism.

The projects can be initiated by students, faculty, or staff, but the focus is student-centric: All proposals must include students in either leadership or co-leadership positions in the design and execution phases of the project.

"This program helps ensure ongoing, in-depth, and frank discussions on activism, free speech, and diverse ideas and issues," says Fiona Lee, associate dean of diversity, equity, inclusion, and professional development at LSA.

"It's a unique resource to empower faculty, staff, and students to develop and explore new angles and timely topics related to democracy and our campus climate, and I hope they will continue to make the most of what Democracy in Action offers." ■



(THIS PAGE) Mitch Blunt/Getty Images; (RIGHT) Photos by Myra Klarman



MICHIGAN BY SUSAN HUTTON

Make a Fool of Yourself

For 13 years, students in Mark Tucker’s “Art in Public Spaces” course have made enormous papier-mâché puppets that require imagination and many DIY skills—but the real challenge is learning how to work together.



SAY SOMEONE ASKS you to make something—something that you can understand and envision, but that you’ve never actually seen. If it were the 1970s, you’d probably pull out some paper and start drawing. If it’s today, you’d probably go straight to YouTube.

There is a delicious satisfaction in making a tin can lantern or fish wind chime out of spoons after you’ve watched someone on the internet show you how. Creating something by following someone else’s steps avoids any issues and streamlines the process, so does it matter if you didn’t actually come up with the solutions yourself? Maybe, says Mark Tucker, art director for LSA’s Lloyd Hall Scholars Program.

“There’s something about imagination that I’m not going to say is being lost, but it’s definitely being changed by digital natives,” Tucker says. “Before we even imagine the possibilities, we Google the answer instead. What do we lose by cutting out this one little step?”

That little step is often critical to the big leap students make in Tucker’s “Art in Public Spaces” course. In the course, which is intended for non-art majors, students create giant papier-mâché puppets to parade through downtown Ann Arbor as part of an annual event known as FestiFools that takes place near April Fools’ Day.

“I don’t tell the students their pieces have to be a certain size,” Tucker says. “They come into the studio every January and start something, and each project becomes the fish that grows to be as big as the tank.”

The tank in this case is the cavernous, three-story FestiFools studio where enormous arms and asymmetrical faces lay scattered around the floor. A decapitated dragon, an elephant, the Monopoly man, and a giant pink mound that might be ice cream are just a few of the dozens of figures dangling from the rafters and trailing fabric torsos that are gathered into one corner, as if they were one giant curtain.



“It’s like a mausoleum in here because they’re not actually out on the street interacting,” Tucker says of the shapes he has finally come around to calling puppets. “It’s taken me 10 years to say, OK, I guess they are puppets. I always thought of them as kinetic, three-dimensional sculptures. I never saw them as what they really are, which are these painted paper figures on a stick that somehow come to life and connect to people on the street.

“There’s a real Ouija board aspect to being one of the three or four people underneath who think you’re going to carry it down the street, and then it starts to carry you down the street instead.”

That wizardry between puppets and people is something Tucker first encountered in Viareggio, Italy, during the month-long carnival it hosts every February. “They were making raw, irreverent, five-story-tall stuff, and half of Europe came by train to see this giant spectacle in a town





the size of Ann Arbor,” he says. Tucker is elated by that kind of messy, participatory chaos. “When the spectator joins the spectacle, you know you’ve done something worthwhile.”

That effortless assemblage is essential in Tucker’s classroom, too.

“This class is not at all about do-it-yourself. It’s do-it-with-others,” he says, “and that is a tough sell. Asking for help is the last thing in the world students want to do. They hate group work. In here, though, the group work becomes more like, ‘Ummm, oohhh – that thing is falling over!’ And people run over and help. It’s a long arc to appreciate community collaboration every time.” And it’s also the point.

“None of these students are going to go into the world to become giant puppet makers, so why are we doing this? It’s a 15-week course and it’s only that one hour in the street where *it*—whatever it is—finally clicks.”

And here Tucker returns to imagination, which he believes is a teachable skill. “When companies say they want to hire people who are creative, I think that’s really what they’re talking about,” he says. “They’re talking about people who can imagine something that doesn’t exist. We’re helping people learn how to do that.”

No student in Tucker’s class makes a puppet from a prototype. Everything starts from scratch. But if you can do something like this and get a glimpse into creating art, Tucker says, it opens up something inside yourself that says maybe I am a creative person. And that’s empowering.

“They want instant success and want to have their idea instantly realized,” Tucker says. “It’s a hard struggle and it’s unwelcome for the most part. And yet, there is a deadline. And yet, there are 3,000 people on the street waiting to see what you bring. All of this leads to a very powerful day where, when they finally get to go out on the street with their best effort or their not-so-great effort, the public’s response tells them if what they did was good enough. The public can tell whether students have invested themselves in it, and the student feels them genuinely respond. It is honest exploration and presentation and honest feedback. That whole loop feels profound and very authentic.” ■

“THERE IS A CERTAIN SCALE TO THE STREET,” TUCKER SAYS. “YOU CAN SENSE IT. WE HAVE PEOPLE DRIVE IN FROM INDIANA AND NEW YORK, BUT WE NEVER KNOW HOW MANY PUPPETS WE’LL HAVE OR WHAT THE WEATHER WILL BE.”



Q&A

WITH INTERIM DEAN ELIZABETH COLE

On September 1, Professor Elizabeth Cole began work as the interim dean of the College of Literature, Science, and the Arts. An alumna herself — Cole received her Ph.D. from LSA's Department of Psychology in 1993 — Interim Dean Cole had been serving as LSA's associate dean for the social sciences before becoming interim dean. She is a professor in the Departments of Women's Studies, Psychology, and Afroamerican and African Studies and has won some of U-M's most prestigious faculty awards, including the John Dewey Teaching Award and the Harold R. Johnson Diversity Service Award. She is also one of the main drivers and architects of LSA's ambitious, multi-year Diversity, Equity, and Inclusion Plan.

We sat down with Interim Dean Cole to talk about her experience as a professor and her hopes for the coming year.





Levi Stroud

LSA: What are you excited about working on as you start your term as interim dean?

INTERIM DEAN COLE: Most importantly, I'm excited about continuing a lot of the great work that has already been happening at LSA. I want our recent focus and progress on key strategic priorities including the LSA Opportunity Hub, our DEI initiatives, and greater student support to remain strong. I've worked hand in hand with outgoing dean Andrew Martin and my colleagues in the dean's office to implement these efforts, and our momentum on these priorities will continue.

I also intend to champion the value of true dialogue: the ability to speak authentically about what you think and feel while at the same time being able to hear, understand, and respect different perspectives and ideas. LSA has always been committed to this value, and we are doing even more now to develop it in our students, faculty, and staff by augmenting the academic curriculum with outside-the-classroom opportunities.

LSA: What is one important thing that you want students to know about LSA?

INTERIM DEAN COLE: The scope of what you can learn and get involved in at LSA is breathtaking—from research in sparkling new science labs, to courses on film and video production, to performing Shakespeare in the Arboretum. Some students come to LSA with a clear course of study in mind, and some may be undecided. In either case, I want to encourage all students to get out there and take advantage of these amazing opportunities.

LSA: What is the best thing about teaching?

INTERIM DEAN COLE: I love the way you can see the students increase in the depth and sophistication of their knowledge over time. I teach about gender and race and prejudice, so of course these are subjects that everyone comes to class with some knowledge of and opinions about. Over the course of a semester, I love seeing the ways students acquire more complex frameworks for thinking about these topics. ■

MEET INTERIM DEAN COLE

Favorite desk or office decoration:

My collection of photos of my Australian cattle dog, Nellie.



Favorite place in

Ann Arbor: I love the little corridor that cuts through between East Hall and the Diag. It is filled with flowering plants, and in the spring it's a little bit of magic on your way across campus.

Your dream job when

you were five: I was a big reader from the time I was very young—I have great memories of my mom reading to my brother and me. So I wanted to



write novels. In fact, I have the first chapters of a historical novel sitting in my file drawer at home that

I fantasize about getting back to someday.

Any secret talents/skills:

I like to take adult education courses. Last year I tried hip-hop dance. Not a success (so please don't ask to see my moves!), but it was fun to try.

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