Building a Tiny Break-Dancing Robot p. 11 ... From Boycotts to Protest to Progress p. 24 ... Causes and Consequences of Dirty Air p. 38 ... Celebrating Tap Dance p. 44 ... Data Journalism Goes Global p. 60

"Native science can help provide a holistic path toward a sustainable planet." p. 7

# Northwestern

# **A New Horizon**

GiGi Lucas is on a mission to change surfing culture. p. 32 **Fragile Figurines** In January the Wirtz Center for the Performing Arts presented a re-imagining of Tennessee Williams' 1937 play *The Glass Menagerie*, told through the lens of a Chinese American family in St. Louis. Alvin Chan, a student in the Master of Fine Arts in Directing program, directed the production, which was originally created for the stage but was adapted into an audio drama because of the COVID-19 pandemic. The recorded production featured images of the set and costumes that were designed and constructed by MFA design students.

TAT AT



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**People Power** 

By Clare Milliken

In a time of upheaval in

our nation and our world,

Northwestern faculty discuss

social movements and how they work — or don't.



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Building an Aquatic Robot A tiny device could be the future of medicine and environmental cleanup.

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Airpocalypse Now Dangerously polluted air isn't just a problem in places like Beijing and Mexico City. It's a problem in Chicago, across the U.S. and around the world. We need to act fast, say faculty and alumni. By Amanda Morris







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#### ← "I took a surf lesson, and the minute I stepped on the board, I thought, 'This is it. This is what I've been missing.' I knew it instinctively."

— GiGi Lucas '01, founder and executive director of SurfearNEGRA, a nonprofit whose mission is to bring cultural and gender diversity to surfing

Cover: Photograph by Stefanie Keeler



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Wildcat Cocktails Make your own with help from Twisted Alchemy's Kim Oster-Holstein '90 MS.



Addressing Global Challenges

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Doctoral candidate Roberto Rosado-Ramirez is investigating the regeneration of settlements in northern Yucatán, Mexico, as one of Northwestern's Global Impacts Graduate Fellows.

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### **Talk Back**



TALK BACK

#### FREE TO PLAY

Awesome article about Kathrvn Hahn ["Free to Play," winter 2021]! I knew Kathryn in high school and am not at all surprised at her success. She was as amazing back then as she is today! Miechelle Luna Javitch Westerville, Ohio

I had no idea Kathrvn Hahn went to Northwestern! My husband and I — both alums - adore her work and are huge fans. She is genius in WandaVision! Kelly Zimmerman '11 MS Chicago

What a delightful read! I felt as if I was back on campus myself through Kathryn's recollections of that time. Thank you! Leila Malekzadeh Walnut Creek, Calif.

#### STRETCHING THE IMAGINATION

Before reading this article, I didn't know anything about John Rogers' incredible career ["Stretching the Imagination," winter 2021]. I'm heartened to know there are people like

Dr. Rogers who are committed to using their brilliance to help our world! Elise Clerkin '03 Oxford, Ohio

What a tremendous presentation about a truly amazing and inspirational person. It is great to know that there are awesome pioneers among us! Greg Messina '76 DDS Rockford, Ill.



Fabulous piece. I have an 8-year-old granddaughter in Texas who tells us she wants to be a scientist. I cannot wait to share this with her and her family. Van King '73 MS Greensboro, N.C.

#### THE RECKONING

Timely, relevant, readable - the mag held my interest from cover to The Other Cover. As an immigrant, I was especially grabbed by the Adrienne Samuels Gibbs article on teaching the full context of American history ["The Reckoning Is Here," winter 2021]. As I was sorting out the events of the attempted putsch in January, I kept thinking back on the unpleasant parts of U.S. history, self-taught in my case, because they had been omitted or skimmed over when I was a student. George A. Baum '55 Naples, Fla.

It's also about time high school and college English and American literature classes desegregated their reading lists. I remember one of my African American students saying that a benefit of the segregated school system was that its students knew the names of African American leaders and writers. It's time that all students knew these men and women and their contributions to history, literature, science and the arts.

Patricia Endress '54, '60 MS Sherman, Conn.

Thank you for the article about the important topic of African American history at Northwestern. I would like to also bring attention to Northwestern's long history of teaching and research on Africa, as Northwestern instituted one of the first programs of African studies in 1948. A deeper knowledge of Africa can only improve one's understanding of Black history in our country and the world.

Kathleen Sheldon '74 Santa Monica, Calif.

Former President Trump's "1776 Commission Report" calls for a return to teaching "patriotic education," which apparently has been written by patriotic Americans. But as vou note, the report excludes most events that occurred from 1619 to the present that provide context for those words.

One response to this attempted erasure, I suggest, is community-based learning for younger students. For example, help students discover who or what their county, town, school or street was named after. and when. What they learn can be engaging enough to encourage more interest in local history, which can lead to broader and deeper historical awareness. Patrick Story '63 MA, '68 PhD Portland, Ore.

#### SCIENCE AND FAITH IN STRANGE TIMES

What a breath of fresh air to read the article "Science and Faith in Strange Times' [Voices, winter 2021]. In today's world, the news media tends to only run negative press on people of faith. Gerald Gabrielse clearly is extremely intelligent and asks many great questions of fellow Christians (I ask

many of the same questions). Thank you, Dr. Gabrielse, for being engaged in our world

"It's about time high school and **college English** and American literature classes desegregated their reading lists."

- Patricia Endress

and holding to your Christian worldview. Marie A. Limjoco '06 MA

Skokie, Ill. Personal faith is personal. not public. Faith is a part of one's family and personal

religious rituals; that is where it should remain. The Northwestern

alumni magazine is not a Christian publication and does not solicit personal religious testimonials. It is offensive to be involuntarily and unwillingly subjected to someone else's religious proselytizing when innocently reading an alumni magazine.

Gabrielse could have made his point of publicly denouncing right-wing lies without interjecting his personal beliefs. I, too, denounce the deliberate falsehoods, propaganda and conspiracy theories perpetuated by Republican congressional leaders. right-wing cable networks and delusional social media forums.

Sarah Maxwell '81 MMus Archbold, Ohio

From the Editor: Thank you for writing. In the "Voices" section of the magazine we

invite people from across the Northwestern community to share their perspectives. We welcome opinions of all kinds.

Kudos to you for publishing the recent article by Gerald Gabrielse. You deserve the gratitude of many of us for continuing to represent Christian faith as a part of the diversity of Northwestern University. It was a strong, timely and courageous article.

John C. Wakefield '91 MMus Johnson City, Tenn.

I applaud what Professor Gabrielse wrote about the universe of "truth" in 2020-21. I retired as a professor of physics in 2015 - the world was quite different then — but I regret that I did not then make more effort to clearly state that physics and my Christian faith were allies.

I applaud his courage to claim, again, that truth and faith, and hope and love, matter more than anything. The same pursuit of truth in both physics and in the pursuit of God is central to understanding and doing right — "To know Him better." Tom Nordlund Birmingham, Ala.

#### UNDERSTANDING INCIVILITY

The current polarization ["Understanding Incivility," Sound Off, Voices, winter 2021] has twin causes. The ideologies of the right and the left became more extreme, enabled by filter bubbles and the abolishing of the fairness doctrine. Often news sources social media, conventional sources, communities do not understand their roles to be constrained by facts and evidence. If you cannot agree on the facts, it is very difficult to resolve conflicts. At the same time. political leaders resort to oversimplification or pandering to their supporters because of the public attention deficit, the common lack of interdisciplinary thinking and a celebrityobsessed culture's desire to be entertained. R. R. Dav Bridgeport, Conn.

#### **BIG CITIES STILL MATTER**

I believe that proptech will ensure that big cities are efficient conduits for talent ["Big Cities Still Matter," Discovery, winter 2021]. Having options around





mobility and workplace and office safety will keep the advantages of large cities and their dynamism popular with employers who seek the best talent.

Mark Arizmendi '06 CERT Charlotte

#### **ALUMNI LEADER**

Thank you, MaryAnn Ihejirika Marsh [Alumni Leader, "Q&A with MaryAnn Marsh," Class Notes, winter 2021], for all you do for the Northwestern University Black Alumni Association and the Northwestern University Leadership Circle and for sharing your inspiring success story of faith, resilience and hard work.

Professor Peter Dietz's exemplary demonstration of goodwill is what makes the world a better place. I experienced the Biafran-Nigerian War as a toddler and quite understand the grace of God demonstrated toward your family through Professor Dietz, who saw a need and stepped out to save your family. I truly applaud him for his kindness to my brothers and sisters. Maureen Okoli '19 MS Aurora, Ill.

We want to hear from you:

#### **KICKIN' IT**

Kayla Sharples [Class Notes, page 65, winter 2021] is an outstanding example of a Northwestern studentathlete — high achieving on the field as well as in the classroom. More important, she is a strong individual who incorporates her values into her life, a distinctive trait of so many Wildcat athletes. With a little more experience at the professional level, this young athlete will be a top-notch professional. NU is proud of you, Kayla. David McCreery '74 Prospect Heights, Ill.

#### ROBOT OB

The Seeker is fantastic ["Five Ouestions with Igor Karlicic and Bhargav Maganti," Creation, winter 2021]! Every team needs one. As a former college football player, I think this would also work for defensive back training, kick returners and kick coverage. More catches equals better performance. Great workout as well.

Dave Lumley '77 MS, '95 MBA Santa Barbara, Calif.



CORRECTIONS

In our obit on James Thompson '59 JD, '79 H





There isn't another actor working today who fits into any setting, any era, any genre as seamlessly as Kathryn Hahn. It's not just that she's an incredibly versatile performer, it's that she tonally gets the frequency and the vibe of every movie/show she's in. One of our best. – @eddie\_mouradian 🎔

I worked with her briefly but she made a definite impression because she's just an

incredible human being on top of being a fantastic actress. Love genuinely being able to speak highly of someone in this town. – @thecalebowski 🎔

I was @NorthwesternU Class of '95 when she performed a monologue from Out of Africa. ... Amazing! We all knew she was going to do great things. — @reneejlux 🧿

#### The Reckoning Is Here

Northwestern was way ahead of its time in this regard. Back in the late '70s I took American History (required at Northwestern), which was taught entirely from the viewpoints of Black Americans, Native Americans and immigrants. So we read all original texts from those sources and none from a white perspective. – Barbara Mallon in

#### **My Northwestern Direction**

Loved this story of a woman pursuing her passions for podcasting, pageantry & science during the pandemic in my @NorthwesternU alumni mag #WomenInScience — @social\_melanie 🄰

[Olivia Pura's] toughness will carry her through the doctorate, and her empathy will affect the world. We wish her well. – Jeffrey Testa in

#### **Five Ouestions**

A robot quarterback that fires footballs at you. I wish I had one even though I don't know how to catch footballs or have a football field. – @malcolmmaciver 🎔

[In Memoriam, winter 2021], we incorrectly stated that he won the governorship in a special election. The 1976 election was a regularly scheduled election. The term, per the 1970 state constitution, was for two years, a one-time event to separate statewide

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office elections from the presidential cycle.

In a Class Note on Medill Hall of Achievement inductee Helene Elliott '77 [Class Notes, page 52], we misspelled her last name. In addition, the induction ceremony was postponed because of COVID concerns. We regret the errors.

#### Voices

#### FACULTY OPINION

#### The World **Needs Native Scientists Now**

#### **By Josiah Hester**

sabella Aiona Abbott (1919-2010) was the first Native Hawaiian woman to earn a PhD in science. A preeminent marine botanist, she • was the first woman to become a full professor in Stanford University's biology department.

I owe much to Abbott and other Indigenous trailblazers in science.

Unfortunately, she and I are rarities. I am one of the few Native Hawaiians in my field (computer engineering) on the faculty of a top U.S. research institution. Overall, Indigenous people in science, technology, engineering and mathematics are scarce. When I graduated with my PhD from Clemson University in 2017, I was one of only two Indigenous people out of 1,834 computer science doctoral degree recipients in the U.S. that year. From pre-K through college, U.S. classrooms and curricula fail to include or celebrate Native people and Native science. As a result, an incredible wealth of knowledge is going untapped. Especially now, as human-caused climate change ravages our planet, the world urgently needs Indigenous scientists who can draw on the sustainability practices and knowledge of their ancestors. The world needs Native science to become the coequal partner of Western methods. Combined with modern instrumentation and data analyses, Native science can help provide a holistic path toward a sustainable planet.



1 Josiah Hester

Indigenous people's representation in STEM fields must grow by leaps and bounds. Greater representation starts with recognition and respect for Indigenous history, including many painful episodes that are rarely, if ever, taught in schools. For example, the U.S.-supported overthrow of the Hawaiian Kingdom in 1893 caused a wound that has yet to heal. When a mentor of mine at Clemson sat and listened to me talk about this littleknown history, I felt heard. That act of listening kept me working toward my PhD when all signs said I did not belong.

Reciprocity between Indigenous and non-Indigenous people — the twoway exchange of knowledge, data and methods — is also essential. Isabella Abbott's life story offers a model. She grew up collecting limu (edible seaweed) on the shores of Maui with her mother, who taught her how to speak Hawaiian and cook traditional Native Hawaiian seaweed dishes. Years later, Professor Abbott would share her deep expertise in the Hawaiian names for seaweeds and their uses with her Stanford colleagues and students, diversifying the department's teaching of marine botany.

Finally, the issues Indigenous people care deeply about — such as environmental degradation and climate change — must be seen as relevant to everyone. The Anishinaabe people of the Great Lakes region have seen their wild rice harvests reduced year after year, due to climate change and industrialization. Likewise, Hawaiians are confronting the devastating effects of ocean warming on reef ecosystems and fish populations.

The need to solve these challenges is why I became a scientist. Applied to practical aims, STEM can be a powerful complement to the Native science toolkit — and vice versa. I am using computer engineering to preserve and protect the 'āina (land) and the people it sustains.

It is time to value the unique way Indigenous people experience the world. It is time to acknowledge how that experience yields many pathways to scientific knowledge. It is time for Indigenous representation in STEM to grow — not for its own sake, but to increase humanity's chance at saving the planet that sustains us all.

Josiah Hester, assistant professor of computer engineering, is director of Ka Moamoa, a Northwestern research lab that builds tiny sustainable computing devices.

#### SOUND OFF

#### **COVID-19** Vaccine Mandate

Should people be required to receive a COVID-19 vaccine?

#### Tina Tan, professor of pediatrics at the Feinberg School of Medicine

"Our goal right now is to get as many people vaccinated as possible so that we can control this pandemic. But if you try to mandate vaccines everywhere, you're going to have a backlash because you infringe on people's autonomy. Of course, everyone who wants the vaccine should be able to get it."

Mercedes Carnethon, Mary Harris Thompson Professor, professor of medicine and preventive medicine, and vice chair of preventive medicine at the Feinberg School of Medicine

"A national vaccine mandate should be in place, but it will never work, in part because we don't have a national



health care system to track who has been vaccinated. But from the scientific and public health perspectives, it would be the right thing to do to mandate things that keep the entire society safe. We have

people who are dying as a result of contracting COVID and people who have long-term complications that are interfering with their quality of life. We could stop that if we present a unified front."

Juliet Sorensen, clinical professor of law and director and founder of the Northwestern Access to Health Project at the Pritzker School of Law

> "It does appear that state and local jurisdictions have a constitutional basis to mandate vaccines. "But there's a distinction between 'can' and 'should.' And as a general matter, Americans — who are

fond of individual liberties — are resistant to the notion that collective behavior should be ordered by a government authority.

"I think there's a broad consensus among public health officials and policymakers that persuasion, public health messaging and, ultimately, having people voluntarily seeking the vaccine is a far better approach than ordering them to get it."

**Kelly Michelson** '04 GME, Julia and David Uihlein **Professor of** Bioethics and Medical Humanities, professor of pediatrics and director of the Center for Bioethics and Medical Humanities at the Feinberg School of Medicine

"I don't think there's any value in pushing it down people's throats right now; that runs the risk of creating a backlash. If we can't even get people to wear a mask, which carries exactly zero risk, I think we have to tread lightly. The message has to emphasize the value of vaccines — and their safety and efficacy.

"I think there has to be a push to get people to vaccinate, but we also have to understand why people are choosing not to vaccinate and then educate them about whatever their concerns are."

#### SOCIAL FEEDS

Residential colleges are a unique part of so many Northwestern alumni stories. We asked former residents of Chapin Hall to share their memories of the Humanities Residential College.

#### "Chapin was absolute magic. My fellow Chapinos were among the most inspiring people I've ever met."

Nora McCord



"I lived in Chapin for three years. That's me in the front row, fifth from right. Chapin was one of a kind, full of brilliant, unique people. Best part of my Northwestern vears."

#### Kay Boychuk Fischer 🛅

"Chapin became my home away from home. Whether I was studying in the war room or taking seminars with the fellows, my Northwestern experience was shaped by the RC system. For Chapin Glorv!"

Mark Ficken in



#### MY NORTHWESTERN DIRECTION

#### **Physics Education Fuels Passion to Help and Teach**

hen I arrived at Northwestern in 1990 from my family's home in Malaysia, I was driven by two

passions: to learn science at the most fundamental level and to use that knowledge to help people. My goal was to become a physician.

On the first day of my organic chemistry class, I learned that electrons orbit their nuclei only in certain predefined configurations and that these configurations form the basis of all atomic and molecular interactions. I was fascinated by this concept, which forms the foundation of not only chemistry but also molecular biology, genetics and medicine. It is the action of individual atoms and molecules that drives biological processes at the cellular level.

To better understand this concept, I majored in physics in addition to my premedicine program. After being accepted to the Feinberg School of Medicine in 1993, I decided to take a threeyear deferral to study nuclear and elemental particle physics at the California Institute of Technology. I obtained a master's degree and then returned to Feinberg to earn my medical degree. I now run a private medical practice in Niles, Ill. I am a physician, but I am also an educator. In 2014 I began collaborating with Professor Vicky Kalogera, director of Northwestern's Center for Interdisciplinary Exploration and Research in Astrophysics (CIERA), to bring science, technology, engineering and math education to schools in the Chicago area. Shortly after her team contributed

#### By K. Chris Oh '93, '00 MD, '04 GME

An internist at Advocate Health Care and NorthShore University HealthSystem who lives in Wilmette, III., with his wife and their two children

66 I was driven by two passions: to learn science at the most fundamental level and to use that knowledge to help people. My goal was to become a physician." to the discovery of gravitational waves in 2016, we organized a presentation on the topic to students at Wilmette's Highcrest Middle School. We also collaborated on curriculum development for Science Olympiad classes in Wilmette School District 39.

The educational path I took at Northwestern also provided me with resources to teach physics concepts to the interns, residents and patients with whom I interact on a daily basis. In April 2020 I installed a negative airflow system in my clinic after learning that the novel coronavirus can stay airborne for many hours as aerosolized particles. I used this as an opportunity to educate every patient in our office about how a negative airflow system works. We ran a computer simulation in the waiting room so patients could visualize how aerosolized particles, without any propulsion system of their own, move by simply obeying laws of physics. Patients found it easy to understand the importance of directional airflow.

I also used my understanding of quantitative principles to teach patients about the efficacy of personal protective equipment. During the early days of the pandemic, when some people wanted to better protect themselves by wearing an N95 mask, I pointed out that they could achieve even better protection through a series of independent activities: wearing a regular face mask, washing hands frequently, physical distancing and avoiding large gatherings. Although each activity on its own carries a much lower rate of protection than the 95% achieved with an N95 mask, combining all the activities results in higher protection.

My training at Northwestern and my ongoing relationships with faculty and staff have provided me with tools not only to practice medicine but also to continue to educate patients and teach science. Looking back, Northwestern encouraged me to examine and develop all my interests, and that has led me to these opportunities.

#### FACULTY TITLES

#### **The Book Nook**

From memoir to history to cultural critique, here are a few selected new books from Northwestern faculty.



#### **Golem Girl:** A Memoir **RIVA LEHRER** Born with spina bifida in the 1950s, when most children with the condition were not

expected to survive. Lehrer endured surgery after surgery and grew up to be a visual artist, writer, activist and teacher. The first part of her intricate memoir is about

enduring numerous surgeries while helping her mother deal with her own disabilities; the second focuses on how Lehrer's view of herself and others evolved as she began creating portraits of other artists with disabilities. The book includes images from her work, which explores themes of gender, sexuality and disability.

Named by Kirkus Reviews as one of the best books of 2020, Golem Girl was also a finalist for the National Book Critics Circle Award for autobiography. Lehrer teaches drawing in Northwestern's medical humanities program.

Stranger in the Shogun's City: A Japanese Woman and Her World **AMY STANLEY** 

Associate professor of history Amy Stanley pulled from a trove of family letters and records for her biography of an intrepid 19th-century Japanese woman. The book has been shortlisted for the National Book Critics Circle Award and the PEN Biography Prize.

#### Having and **Being Had EULA BISS**

In her latest book, English department artist-in-residence Eula Biss sheds light on the ways in which capitalism is entrenched in our lives. The book grew out of a diary she kept after buying a home in 2014.

**Memorial Drive: A** Daughter's Memoir NATASHA TRETHEWEY Board of Trustees Professor of English Natasha Trethewey explores grief, memory and identity in the wake of her former stepfather's murder of her mother. In this deeply

personal narrative,

mother's life in the

segregated South,

Trethewey traces her

MEMORIAL DRIVE

STRANGER IN THE SHOGUN'S CITY

her own childhood in Mississippi, and their experiences with domestic abuse and racism.

Veblen: The Making of an Economist Who **Unmade Economics CHARLES CAMIC** Charles Camic, the Lorraine H. Morton Professor of Sociology, explores the formation of capitalism critic Thorstein Veblen's

Naturha Tretheway

ANY STANLEY -

Nicky A Memoir By Dominic Missimi

Having and Being Had Eula Biss ~

THE HISPANIC REPUBLICAN

THE SHAFING OF AN AMERICAN POLITICAL IGENTITY, FROM NIXON TO TRUMP

CHARLES CAMIC VEBLE

ideas about the social institutions that enable wealthy Americans to amass vast fortunes.

The Hispanic **Republican: The** Shaping of an **American Political** Identity, from Nixon to Trump **GERALDO CADAVA** Associate professor of history Geraldo Cadava examines the roles

Hispanic Republicans

have played in U.S. elections. Though **Hispanic Americans** tend to vote for Democrats, Cadava shows how the post–World War II Republican Party has had a long-standing relationship with Hispanic voters, especially during times of political conflict.

Nicky: A Memoir DOMINIC MISSIMI This collection of essays and autobiographical scenes by theater professor emeritus Dominic Missimi recounts his journey from 1950s boyhood to his career as a professor and director.

During his 32 years at

Northwestern, Missimi

founded and directed

the University's music

theater program and

directed 17 Waa-Mu

Shows.

tiny break-dancing A robot could be the future of medicine. manufacturing and environmental cleanup. Developed in the labs of

Samuel I. Stupp '77 PhD and Monica Olvera de la Cruz, the centimeter-sized robot can walk at human speed, pick up and transport cargo to a new location, climb up and down hills and then perform a spinning break dance to release the cargo.

Resembling a four-legged octopus, the robot functions inside a water-filled tank, making it ideal for use

NAMS

# Aquatic Robot

Powered by light and rotating magnetic fields, tiny robots can walk, roll and transport cargo.

Graduate fellows make global impact p. 13

Veronica **Burton steals** the show p. 14

New tech allows for shelf-stable vaccines p. 16

Alva creates custom jewelry p. 19



↑ Samuel Stupp, left, and Monica Olvera de la Cruz

in aquatic environments. Researchers imagine customizing the robot's movements and locomotion to precisely deliver biotherapeutics or catalyze chemical reactions to yield products. It also could be designed to recognize and remove unwanted microplastics from the environment or blood clots from delicate tissues.

"Conventional robots are typically heavy machines with lots of hardware and electronics that are unable to interact safely with soft structures, including humans," says Stupp, the Board of Trustees Professor of Materials Science and

#### "We'd like to make armies of microrobots."

- Samuel Stupp

#### Biomedical Engineering. "We have designed soft materials with molecular intelligence to enable them to behave like robots of any size and perform useful functions in tiny spaces, underwater or underground."

Engineering, Chemistry and

Nearly 90% water by weight, the aquatic robot is made from a first-of-its-kind. soft, lifelike material, invented in Stupp's lab. Its sea creaturelike movements come not from complex hardware, hydraulics or electricity. It is activated by light and walks in the direction of an external rotating magnetic field.

Within its water-filled structure is an embedded skeleton made of aligned, ferromagnetic nickel filaments. The resulting robot is a molecularly designed network, with parts that allow it to respond to light, hold or expel water and have just the right stiffness to respond

rapidly to magnetic fields. "By combining walking and steering motions together, we can program specific sequences of magnetic fields. which remotely operate the robot and direct it to follow paths on flat or inclined surfaces," says Olvera de la Cruz, the Lawyer Taylor Professor of Materials Science and Engineering, Chemistry and Chemical and Biological Engineering. "This feature allows us to direct the robot through narrow passages with complex routes."

The Northwestern team used chemical synthesis to program the molecules within the hydrogel to respond to light. When exposed to light, the robot's molecules become hydrophobic (repelling water), causing the water molecules to escape. This conversion causes the robot to "come alive" by bending from a flat position to "standing." The researchers discovered that this bending enables the material to respond rapidly to rotating magnetic fields, activating its ability to walk fast.

"Eventually, we'd like to make armies of microrobots that could perform a complicated task in a coordinated way," Stupp says. "We can tweak them molecularly to interact with one another to imitate the swarming of birds and bacteria in nature or schools of fish in the ocean. The molecular versatility of the platform could lead to applications that have not been conceived at this point."

**ROBERTO ROSADO-**RAMIREZ Mexico

**Roberto Rosado-**Ramirez, an archaeologist and doctoral candidate in anthropology. is conducting his dissertation research project at the ancient Maya site of Ake in northern Yucatán, Mexico. Rosado-Ramirez's work investigates how humans can regenerate settlements amid ruined cities in the aftermath of sociopolitical collapse. The ancient Mava lived in this location from 300 BCE to about 1550 CE. The site was the seat of a plantation starting in the middle of the 17th century, and today Ake is a small rural community.

#### **INTERNATIONAL RESEARCH**

#### **Global Impacts Fellows**

#### **ALÍCIA HERNÀNDEZ GRANDE** Spain

In fall 2017 Alícia Hernàndez Grande was on the streets of Barcelona as thousands of demonstrators marched in support of the Catalan independence referendum. She studies the development of Catalan cultural identity and independence politics through theater, spectacle and public protest as part Northwestern's Interdisciplinary PhD in Theatre and Drama. Her work explores how theater offers a channel for Catalans to voice their frustration with the Spanish government.



#### **LIVIA GAROFALO** Argentina

The product of a year and a half of ethnographic fieldwork in the intensive care units of Buenos Aires. Livia Garofalo's dissertation examines the relationship between intensive care, trauma and economic crisis in public hospitals in Argentina's capital. Garofalo is a doctoral candidate in anthropology and is also earning a master's degree in public health from the Feinberg School of Medicine.



The Ticker



**Robin R. Means Coleman** is Northwestern's new vice president and associate provost for diversity and inclusion and chief diversity officer. An award-winning scholar of communication and African American studies, Coleman will direct the Office of Institutional Diversity and Inclusion and join the University's effort to promote equity.



Geoscientist Patricia Beddows was named to the Women Divers Hall of Fame for exploring caves and karst landscapes, particularly in the flooded cave systems of the Yucatán Peninsula where she developed a system to track groundwater. She is director of Northwestern's Program in Environmental Sciences.



#### FOROOGH FARHANG

Lebanon and Syria

Foroogh Farhang explores the political, economic and ethical dimensions of Syrians' quests for a proper burial following the 2011 mass migration of Syrians to Lebanon. She looks at the ways in which the scarcity of burial spaces in Lebanon, in conjunction with increasing restrictions on crossing the Lebanon-Syria border, has mobilized legal and illegal networks of Syrians' traveling dead within Lebanor and on the route from Lebanon to Syria. After 18 months of fieldwork in Lebanon, she hopes to complete her dissertation by the end of the year.



#### **RAHARDHIKA UTAMA** Indonesia and Malaysia

Rahardhika Utama, a doctoral candidate in sociology. studies diverging development trajectories in the Asian rubber belt. He conducted extensive archival research at 20 libraries and archive centers across the globe and 12 months of ethnographic fieldwork in multiple rubber communities in Southeast Asia. Utama's research examines the historical factors that transform and sustain traditionally agrarian societies like Indonesia and Malaysia. A draft of this research won an honorable mention from the American Sociological Association.

A few weeks after Northwestern's 35-19 win over Auburn at the 2021 Citrus Bowl, the University extended its contract with head football coach **Pat Fitzgerald** through 2030. Fitzgerald '97, the winningest coach in the school's history, earned his 100th career victory in the 2020 season opener.



#### WILDCAT ATHLETICS

#### **Family Ties**

Defensive standout and star guard continues the Burton legacy at Northwestern.

eronica Burton is a leader of the women's basketball team's vaunted "blizzard" defense. The two-time Big Ten Defensive Player of the Year averaged better than four steals per game this season, tops in the nation.

And while the junior guard has continued her record-breaking defensive play — she was named one of four finalists for the Naismith Defensive Player of the Year Award in March — Burton also has elevated her offensive game, averaging 16 points per contest.

Burton says that the COVID restrictions allowed her time to focus on scoring. "During quarantine, one of the only things I could do was go to the gym," she says. "That gave me a sense of normalcy. I used the extra time to do conditioning and get more shots up."

Burton says playing in a pandemic has been an adjustment, but it's made her team stronger. "We have really emphasized being dedicated

to each other and trying to maintain our bubble," she says. "We're trying to tune everything out and just play the sport we love."

It's something special for Burton to play the sport she loves for the University that has been home to her family for generations. Her grandfather, the late Ron Burton '60, was an All-American running back for the football team. Her father, Steve Burton '85, '88 MS, played quarterback for the Wildcats, and her mother, Ginni Vath Burton '85, was an All-American swimmer for Northwestern. Three of her uncles also played football at Northwestern.

"Being able to wear the same jersey, the same colors that my parents did — it's surreal," Burton says. "I'm just so blessed to have that opportunity, and Northwestern is the only place that could provide that."



#### **MILESTONES**

#### The Medill School of Journalism, Media, **Integrated Marketing Communications**

kicked off its centennial celebration in February. Founded in 1921, Medill now provides instruction on five campuses and has more than 18,000 alumni. To commemorate the milestone, Medill will host in-person events when possible through spring 2022. Learn more at 100.medill.northwestern.edu.



#### **'CAT TALES A Music** Theater **Pioneer**

Kelsey L. Pharr Jr. attended the **School of Speech** (now the School of **Communication**) in the late 1930s and was one of Northwestern's first African American music theater alumni. He performed in several campus productions, including the 1937 and 1939 Waa-Mu Shows. After leaving the University. Pharr performed in Porgy and Bess and three other Broadway shows before joining the Delta Rhythm **Boys vocal group** (pictured above). The School of Communication created the new Kelsey Pharr Jr. **Speaker Series**, which hosts artists and scholars who represent diversity and inclusion in the performing and media arts. This year the series featured director, actor and educator Lili-Anne Brown '95, director Jess McLeod '14 MFA, and actor, playwright and composer Brian Quijada.



#### **GIVING BACK**

Graduate student Jeron Dorsey donated his paycheck to help fire victims.

ust two days before Christmas, a devastating fire gutted an Evanston family's apartment and destroyed most of their possessions.

Jeron Dorsey, a graduate student in the sports administration program, heard about the Jackson family's plight and decided to lend a hand. Initially he donated cash and helped collect gift cards in collaboration with the Black Male Alliance, an



↑ Northwestern graduate student Jeron Dorsey carries supplies at a food and toy drive in Evanston.

#### **Genuine Generosity**

Evanston anti-violence organization. But that outreach wasn't enough. So Dorsey, a program director at Evanston's Fleetwood-Jourdain Community Center, donated an entire two-week paycheck to the family and helped the Jacksons move donated furniture into their new home. He has continued to connect with the family.

"I've committed to them that I'll always be a part of their lives," says Dorsey, who has two young children.

Giving back to his hometown community is important to the Evanston native. Growing up, he remembers thinking that Northwestern was unattainable. His goal today is to change that mindset.

"Northwestern was like a foreign country," he recalls. "Part of going to Northwestern for my master's was to show the kids growing up here that we have a tremendous university — and opportunity - in our backyard."

#### Discovery

#### MEDICINE

16

#### **Developing Shelf-Stable Vaccines**

New manufacturing platform could help avoid waste and expand access.

ore than 50% of all vaccines are wasted due to errors in transportation or storage, according to the World Health Organization. A research team led by Northwestern and Cornell universities has developed a new manufacturing platform that can quickly produce vaccines at the point of care, ensuring they will not go to waste and expanding access to potentially lifesaving medications.

The new method uses cell-free components that are freeze-dried, remaining shelf-stable for six months or longer. Once the cellfree systems reach their destination and are ready for use, health care workers can rehydrate them with a single drop of water to make the vaccine on demand.

The researchers used the platform to make conjugate vaccines that protect against bacterial infections. They were able to produce a single dose in one hour, costing about \$5 per dose. The team immunized mice and exposed them to *Francisella tularensis*, a pathogenic bacteria that is deadly without treatment. All vaccinated mice survived.

"We could extend the platform to other medicines, including viral vaccines or insulin," says Northwestern's Michael Jewett, who co-led the study. "Our cell-free approach, which alleviates cold-chain requirements, will provide a way to rapidly respond to pathogen outbreaks and emerging threats in the future."

By eliminating the need for complicated supply chains and extreme refrigeration, the platform also will be powerful for low-resource settings, which often do not have access to expensive facilities and refrigerated storage. "These issues limit the overall access to medicines," Jewett says.

"Our cell-free approach will provide a way to rapidly respond to pathogen outbreaks and emerging threats in the future."

Jewett is a professor of chemical and biological engineering at the McCormick School of Engineering and director of Northwestern's Center for Synthetic Biology. He co-led the work with Matthew DeLisa, the William L. Lewis Professor at Cornell's Robert Frederick Smith School of Chemical and **Biomolecular Engineering** and the director of the Cornell Institute of Biotechnology. Jessica Stark '19 PhD, a former doctoral student in Jewett's laboratory, was a co-first author of the paper.

The secret behind the new manufacturing platform - called in vitro conjugate vaccine expression (iVAX) is cell-free synthetic biology. To make a cell-free system. researchers remove a cell wall and collect the cell's molecular machinery. They then put this machinery into a test tube and freeze-dry it. Adding water sets off a chemical reaction that activates the cell-free system, turning it into a catalyst for making a usable medicine. "It's like taking an engine

out of a car and repurposing that engine," Jewett says. "Or adding water to activate dried yeast when making bread."

Conjugate vaccines attach a sugar — that is unique to a pathogen — to a carrier protein that stimulates the immune system. The sugar is like a fingerprint of the pathogen. By learning to recognize that protein as a foreign substance, your body knows how to mount an immune response to attack it when encountered again.

Unfortunately, conjugate vaccines are difficult and expensive to manufacture. "The technology we created sidesteps a lot of these issues," DeLisa says. "We're taking a multistep process and compressing it down into a single reaction step."

Although viruses are top of mind, Jewett and his team are focused on conjugate vaccines as a response to the emerging threat of antibiotic-resistant bacteria.

"The rise of antibioticresistant microbes is something that the entire planet will need to address in the coming years," he says. "Antibiotic resistance is a slow-moving pandemic."

#### RESEARCH

#### A Mummy Gets an X-Ray, Fall Colors Might Fade



#### X-RAYS REVEAL A MUMMY'S SECRETS

In 2017 scientists at **Argonne National** Laboratory used powerful X-ray beams to examine the bones and objects underneath layers of resin and liner on a 1,900-year-old mummy. The project marked the first time X-ray diffraction techniques were used to examine an intact mummy. In 2020 the researchers, including Northwestern research professor Stuart Stock, reported their findings, confirming that the body belonged to a young child who was buried with a scarab amulet of calcite.



#### **ANCIENT ERUPTION**

About 120 million years ago the Earth experienced an extreme environmental disruption, known as oceanic anoxic event 1a (OAE1a), that choked oxygen from the oceans and led to a minor mass extinction. Northwestern scientists concluded that OAE1a was directly triggered by the eruption of a large igneous province that released tons of carbon dioxide into the atmosphere. "We go back in time to study greenhouse periods because Earth is headed toward another greenhouse period now," says doctoral student Jiuyuan Wang.



FAREWELL, FALL COLORS

Visiting professor Yingying Xie regularly observed deciduous tree canopies to better understand seasonal change. Using her observations and other datasets. Xie and her colleagues developed models to describe how phenological dates responded to environmental factors "In response to more frequent and intensive extreme stressors, such as drought or high temperatures, trees will change the timing of leaf coloration," Xie says. "Leaf colors do not turn bright yellow or bright red. They just turn brown and then drop."

SPRING 2021 NORTHWESTERN

#### **ENTERTAINMENT**

#### **Building a Fan Base**

Northwestern arts entrepreneurship team helps musician Ben Rector adapt to pandemic.

ive music performances might not be possible because of the COVID-19 pandemic, but for Kellogg School of Management adjunct lecturer Gregg Latterman '96 MBA and School of Education and Social Policy senior Olivia Hernandez, the show must go on.

The two are part of singersongwriter Ben Rector's management team. Together, they're finding innovative ways to adapt to a virtual entertainment industry. Latterman who founded

Ben Rector

Aware Records in 1993, has worked with artists including Brandi Carlile, Train, John Mayer and the Fray. He began working with Rector in April 2020, and Hernandez joined the team in the fall. Latterman teaches the NUvention: Arts course, which gives students like Hernandez the foundational skills to build a creative arts company. At Northwestern,

Hernandez has immersed herself in the study of music, audio engineering and entrepreneurship by joining The Garage and founding its artist-in-residence program, an incubator designed to foster a strong artist community and teach students how to transform their passions into a business.

As lockdowns began, Latterman asked. "How do we still connect Ben with his fans and allow him to be creative?"



**↑** Olivia Hernandez

In response, the team focused on Rector's design and branding, especially on social media. Hernandez pitched a Thanksgiving e-card to promote holiday music and helped create visuals for songs on Rector's holiday album. Rector has played music for fans via livestream on Instagram Live and other platforms.

Latterman, who is Rector's manager, sees this time as an opportunity to learn how to use digital platforms to connect with fans and continue building on those connections, even when

**Connor Regan** '16 pursued 11 internships during his time at

skills and relationships to land in Google's rotational program

Northwestern. Those experiences gave him the knowledge,

after graduation. His story is part of *How I Got Here*, a new

podcast from The Garage that traces the journeys of young

professionals, including the lessons they learned and how

entrepreneurship helped them land their dream jobs.

in-person concerts return. For Hernandez, her experiences at Northwestern have given her the training she needs to enter the music industry, even amid the changing landscape brought on by the pandemic.

"I've been taught to read my environment, understand who my customer is and go from there," says Hernandez, who plans to pursue a career in arts and entrepreneurship in Nashville. "[My professors] really helped me build that skill set and helped me understand that everything I do is leading to the next thing."

#### **INVENTION**

#### Alva

A few years ago, Kinsey Hart received a promotion and wanted to mark the milestone with a new piece of jewelry. She had a simple design in mind — a necklace with emeralds to mark her Irish heritage — but could not find her dream piece. That's when she hatched the idea for Alva, an online personal jeweler that allows buyers to customize a base design or create their own unique piece from scratch. "In talking with women about this concept, I found that a significant number had a strong vision of what they wanted in a piece of jewelry





PODCAST

**HOW I** GOT HERE a podcast by: Northwestern | The Garage

and wanted to be able to create it," says Hart, a second-year student in the dual-degree MMM program, which combines an MBA from the Kellogg School of Management and a master's degree in design innovation from the Segal Design Institute at the McCormick School of Engineering. Hart and colleagues tested the idea in Rick Desai's New Venture Development course in winter 2020, and then the Alva team including Northwestern junior Riva Akolawala — participated last summer in The Garage's 10week accelerator, now called Jumpstart.

#### MADE FOR YOU

Customers can craft a piece to match their vision. Alva's website features base designs for earrings. rings and necklaces, which customers can personalize by selecting the type and color of the metal and adding gemstones - lab grown or mined. They can also see how those options affect the price. In the future, customers will be able to customize the number and size of the gemstones

#### **CUSTOM DESIGN**

If Alva does not have a specific design, Kinsey Hart and her team offer an interactive customization process that allows buyers to collaborate on creating the exact piece. Alva offers "the ability to personalize online in a way that is not mainstream," says Hart.

#### **LOCALLY CRAFTED**

Alva's pieces are made by a local Chicago jeweler. To bring the designs to life, Alva and partners digitize the designs into a 3D computer-aided design file, create the molds, cast the pieces and set the stones by hand.

#### **SLEEK, SIMPLE INTERFACE**

Alva's website is driven by logic mapping on the back end that combines pricing matrices and hundreds of different image combinations to show customers the right stone and the right price.



#### CAMPUS

#### **Computer Science Enhances Interdisciplinary Learning**

Northwestern's CS Transformation Initiative is preparing faculty and students to lead in a data-driven world.

nterest in computer science has skyrocketed over the past few years, fueled by a surge of available data, enhanced computing power and advances in artificial intelligence and machine learning. At Northwestern the number of undergraduate students majoring in the field has tripled, and course enrollments have doubled even non-majors are taking advanced classes.

With an eye on the future, the McCormick School of Engineering launched

the Computer Science Transformation Initiative in 2016 and announced plans to hire 20 new faculty members: 10 in computer science and 10 with joint appointments across the University (referred to as CS+X). To date, 11 new faculty have been hired, plus a department chair. And with the support of visionary philanthropists, the program is revolutionizing learning across disciplines at Northwestern.

The University has long had an outstanding reputation among its peers for interdisciplinary collaboration. Computer science faculty have held joint appointments in journalism, music and education - fields in which the University is a global leader. CS+X builds on this tradition by using computer science and computational thinking to push the boundaries of discovery in areas such as

→ Samir Khuller, the Peter and Adrienne Barris Chair of **Computer Science** 

medicine, economics, law and international affairs, while potentially creating new branches of learning.

Leading the initiative and the computer science department is Samir Khuller, the Peter and Adrienne Barris Chair of Computer Science, who joined the Northwestern Engineering faculty in 2019 from the University of Maryland, where he helped build one of the top computer science departments in the nation.



#### ← Computer science students in Mudd Hall after its renovation and reopening in 2018

"I am delighted to see the tremendous progress that has already been made in the department and look forward to continued success," says University Trustee and McCormick Advisory Council member Peter Barris '74, who, along with his wife, made a gift to endow the chair.

CS+X brings together disciplines that may seem like they have little in common with each other. For example, the CS + Humanities Postdoctoral Fellows program funded by McCormick Advisory Council member Bob Shaw '70, '81 MBA and Weinberg College Board of Advisors member Charlene Shaw '70 provides for two emerging scholars who are harnessing the power of computer science to offer insights into human behavior and written language. One fellow is building machine learning systems to predict high-risk mental health behaviors, while the other is on a team that's converting 60,000 books printed between 1473 and 1700 into searchable text optimized for data visualization.

To support the CS Transformation Initiative, Northwestern Engineering embarked on a project to re-imagine the third floor of Seeley G. Mudd Hall. Opened in 2018, the 22,600-squarefoot facility unites Northwestern Engineering's computer science faculty all in one place and is located on Evanston's North Campus. The space promotes purposeful and spontaneous collaborations between engineers, entrepreneurs, management experts and computer scientists in one innovation ecosystem.

Data is everywhere, and it is being created at a scale beyond the capacity of human understanding. Researchers are pushing the boundaries of artificial intelligence to help harness and use this data to help solve the world's most pressing problems. At Northwestern, where interdisciplinary collaboration is a goal, faculty are exploring the use of AI in fields such as drug discovery, equality and social justice. material and process design, social media analysis and astronomy.

One of the University's leading AI scholars is Kristian Hammond, who is working on the cutting edge of language and narrative generation, among other specialties within the field. Hammond, along with fellow professor of computer science Larry Birnbaum, founded Narrative Science, a company that converts raw data into stories that feature natural language. Companies and organizations use Narrative Science to quickly create customer communications, reports and other content. Narrative Science grew

schools

#### The Future of **Artificial Intelligence**



↑ Artificial intelligence research explores the nature of intelligence and the ways in which computation can be used to explain and engineer it.

out of a collaboration between Hammond. Birnbaum and students from the Medill School of Journalism, Media, Integrated Marketing Communications.

In recognition of his scholarship and teaching. Hammond was named the inaugural Bill and Cathy Osborn Professor of Computer Science in 2018. The endowed professorship is one of two established by the Northwestern University Board of Trustees to honor the service and generosity of William A. Osborn '69, '73 MBA, '18 H and Cathleen Osborn '72 on the

occasion of Bill's retirement as board chair. "We are delighted that our family will be associated with Northwestern's quest to transform the next generation of computer scientists," Bill Osborn said.

As AI and computer science evolve together, they are expected to play an even greater role in our lives — the Osborn Chair helps ensure that the University's prominence in these fields will continue well into the future.

"There is no better time than today to be in computer science," Hammond says.

#### Northwestern: Actively Engaged in Al

faculty

educational programs



#### RESEARCH

#### **Grant Supports Landmark Parkinson's Study**

Northwestern Medicine's partnership with The Michael J. Fox Foundation is advancing critical research on the disease.

ore than 6 million people worldwide are affected by Parkinson's disease — a lifelong movement disorder with symptoms that slowly worsen over time. Thanks to a new multimilliondollar, multiyear grant from The Michael J. Fox Foundation for Parkinson's Research. Northwestern Medicine will continue to participate in the MJFF-sponsored Parkinson's Progression Markers Initiative (PPMI), which aims to identify biomarkers for the progression of Parkinson's disease for use in clinical trials for novel therapies. Northwestern is one of 50 international sites participating in the observational study.

Over the last decade, the Parkinson's Progression Markers Initiative has created a longitudinal clinical and biomarker dataset involving more than 1,400 participants worldwide. The project also has compiled standardized protocols for acquisition, transfer and analysis of clinical, imaging, genetic and biospecimen data that is available for use by the Parkinson's disease research community.

Northwestern Medicine's Tanya Simuni, the Arthur C. Nielsen Jr. Research Professor of Parkinson's Disease and Movement Disorders and director of the Parkinson's Disease and Movement Disorders Center at Feinberg School of Medicine, received the award to continue her PPMI work in August 2020.

The latest grant from The Michael J. Fox Foundation will support Simuni and her team's efforts in recruiting and following study volunteers from diverse cohorts to gather valuable clinical and imaging data and biological samples.

More than 6 million people worldwide are affected by Parkinson's disease. ← Tanya Simuni, right, director of the Parkinson's Disease and Movement Disorders Center at Northwestern University Feinberg School of Medicine, with colleagues Danielle Larson and Neil Shetty

"While a number of diseases routinely use biomarkers in research and clinical practice, Parkinson's disease still does not have such objective measures," says Simuni, who also is chief of movement disorders in the Ken and Ruth Davee Department of Neurology. "PPMI data are essential to developing better tools to advance and accelerate novel therapies for this increasingly common disease of aging."

In early 2020 Simuni and colleagues published research findings for PPMI that revealed people who carry genetic mutations associated with an increased risk for Parkinson's disease may exhibit minor symptoms before the disease progresses and affects a patient's daily life.

PPMI now plans to enroll 4,000 participants — including individuals who recently were diagnosed with Parkinson's disease, carry Parkinson'sassociated genetic mutations or have clinical risk factors. These individuals will be observed by investigators for a period of five to eight years. As a member of the

Parkinson's Progression Markers Initiative leadership team, Simuni will be involved with data analysis and operational management of the study globally and for Northwestern's study.

"PPMI is an incredibly complicated study, and I really have to thank multiple centers and programs at Northwestern for making it happen at our site," she says.

#### **GLOBAL HEALTH**

#### **Preventing the Next Pandemic**

The Flanagan Foundation's recent philanthropy focuses on critical infectious disease research.

or more than 40 years, the late John R. Flanagan '58 MBA generously supported Northwestern through major gifts for medical research at the University. A recent gift from the John R. Flanagan Charitable Foundation seeks to prevent the spread of infectious diseases, like COVID-19, around the world.

In 2020 the Flanagan Foundation made a commitment to establish the Dr. Robert L. Murphy Professorship in Emerging Infectious Disease, in honor of the current executive director of the Institute for Global Health at Feinberg School of Medicine — a longtime friend of Flanagan's. This position will fund the research priorities of a faculty member in the institute's Center for Global Communicable and Emerging Infectious Diseases. "The John R. Flanagan

Charitable Foundation is privileged to make this gift in celebration of John's life, his commitment to Northwestern Medicine and his personal relationship



with Dr. Murphy," says John Boyle '11 MD, a member of the foundation's board.

Prior to the creation of the foundation following his death, Flanagan himself made a gift in 2018 to establish the Neil J. Stone, MD, Professorship — named in honor of Neil J. Stone '66, '68 MD, '74 GME, '75 GME and currently held by Sanjiv J. Shah — in the cardiology division at Feinberg. The professorship was supported in part by the Ryan Family Chair Challenge.

The Flanagan Foundation also supports future generations of Northwesterneducated leaders in medicine. The recently established John R. Flanagan Charitable Foundation Medical Scholarship will go to a fourth-year medical student who has matched to a residency program. The Flanagan Fellowship Fund in the department of physiology at Feinberg helps advance educational programs for trainees focused on Parkinson's disease research.

The foundation expanded its support of Northwestern

"One of the Institute for Global Health's core missions is to prevent the next pandemic. That's why we are very fortunate and so grateful to receive funding from the Flanagan Foundation for a full-time position in molecular epidemiology. The person ultimately filling this role will help us study how viruses like COVID-19 transmit and how to stop them." – Robert L. Murphy

earlier this year when it
committed to providing
need-based scholarships for
underrepresented students
or those pursuing a degree
in finance at the Kellogg
School of Management.
A 1958 Kellogg graduate,
Flanagan was a partner at

Stein Roe & Farnham before becoming founder and president of Fundamental Equities International. Prior to his passing in 2019, he said, "When I think about philanthropy, I always remember where I started. My family had limited means. I worked four jobs at once in college. Now that I have some modest wealth, and I know I can't take it with me, I want to do something good with it."

↓ Northwestern's global health outreach programs aid underserved populations.





# How Do People Make Change?

Social movements mean street protests — and so much more. Northwestern experts share the keys to an effective movement.

BY CLARE MILLIKEN

B

eyond the pandemic, social unrest defined 2020. It started on the very first day of the year in Hong Kong, where protesters filled the streets in opposition to China's

proposed extradition

law. Throughout the year — across the U.S. and around the world — protesters filled the streets to call for racial justice, challenge Big Tech, oppose COVID-19 lockdowns and fight for democracy.

But to consider protests the whole story would be missing the point. "It's easy to focus on the sudden, dramatic moments of activism," says anthropology associate professor Ana Aparicio. "However, sometimes activism isn't overt or in big public spaces."

From boycotts and marches to teaching and community building, social movements are multifaceted, organized activities that can bring people together to change the world.

Aparicio and her Northwestern colleagues have studied social movements past and present, across contexts and continents, and their work shows what makes a movement powerful and effective. It takes organization, infrastructure, partnership and, ultimately, passionate activists to sustain a movement.

"The regular people are really the engine," says sociology professor Aldon Morris. "Ordinary people can do extraordinary things in the context of social movements."

#### ORGANIZING FOR CHANGE

Morris has dedicated his life and career to social movements. The Leon Forrest Professor of Sociology and African American Studies at Northwestern has been arrested while protesting South African apartheid, risked his academic career by opposing segregation in higher education and helped labor unions organize across the United States.

"Movements do not arise spontaneously," he explains. "The oppressed must organize the movement, must provide it with leadership, must



provide it with resources. That's what gives power to a movement."

This was true of the U.S. civil rights movement of the 1950s and '60s, which was "funded largely by the Black community. The leadership, the strategy and the genius of the movement came from the Black community," says Morris, author of the 1984 book *The Origins of the Civil Rights Movement: Black Communities Organizing for Change*.

A clear infrastructure is also key to sustaining any movement beyond its genesis, says Kellogg School of Management professor Brayden King, who studies how social movements influence corporations and legislative policymaking. He says infrastructure enables a movement to "ride waves of relevance in the media and in broader public culture. And there's always a core group of people working to seize upon the next opportunity."

A sustained movement may depend on what Morris calls "indigenous resources." In the civil rights era, he explains, Black churches and already-established Black-led organizations were willing to invest in and support the activists.

"That was extremely sustainable because churches aren't going anywhere," says King, the Max McGraw Chair of Management and the Environment and a professor of management and organizations. "I'm not saying that all activists need churches to sustain them, but you need some kind of infrastructure that is enduring to ensure the movement doesn't wither away as soon as it faces a challenge."

Even with a sound infrastructure, a movement can lose momentum due to the limits of public attention. King cites the recent protests in Hong Kong as an example.

"The protesters were trying to create enough of a scene to get the international community to put pressure on China to change its relationship with Hong Kong," King says. "And in some ways it was working: The protests were creating negative media attention for China and causing China's allies to distance themselves from the country. But then COVID happened."

The issues in Hong Kong were eclipsed — but far from eliminated — when the public's attention shifted to the pandemic.

King's research shows that concurrent movements can compete with each other, diluting their potential impact. "Well-meaning and in many ways ideologically aligned social movements can cancel each other out," he says, "because they're all fighting for a very limited amount of attention."

#### FROM PROTEST TO POLICY

A movement, King says, should be multifaceted. Ideally it would be "a broad, diverse coalition of people and organizations promoting change" whose strategies are similarly varied. Movements must put pressure on as many institutional levers





**Chloe Thurston studies** 

the role of movements in

shaping policy.

Aldon Morris examines social movements, civil rights and social inequality.

#### **PEOPLE POWER ONLINE**

Online action can be used to effect change in powerful ways, says computer science associate professor Brent Hecht. Hecht researches "data leverage," a new way for people to take collective action against tech giants like Amazon, Facebook and Google to force them to change their practices regarding privacy, misinformation and other issues.

Data poisoning is a form of data leverage whereby online users intentionally provide false data by posting fake reviews, clicking links unrelated to a search term or tagging people in photos incorrectly. Another form is a data strike, in which people stop contributing to an online platform altogether. For instance, users could, en masse, stop searching for and reviewing products on Amazon, thereby starving the company of critical data on consumer browsing and buying habits.

Hecht and his team are now building tools to make it easier to pull off a data strike. For example, so that users are spared the work of researching Amazon's vast network of subsidiary companies and brands, Hecht's tools would warn consumers before they click on any Amazon-affiliated links — or hide the links altogether.

Because tech companies' algorithms depend on consumer data, when large numbers of people stop sharing their info through clicks and searches, the algorithms become less accurate and targeted. Ultimately, they don't work as well.

Hecht says his work, and data leverage itself, can be a boon to consumers and tech firms alike.

"The goal is to allow more democratic input into the decisions that are made about technology," Hecht says. "The tech companies can then focus on what they're good at, which is building technology, and the public can contribute to decisions about how that technology impacts society." - C.M.



**Brayden King** explores how social movements influence corporations.



Ana Aparicio studies how Latinx communities develop local politics.

as possible, including the legal system, corporate practices, policymaking and public consciousness.

Political science assistant professor Chloe Thurston, who studies the role of social movements and organizations in shaping policy, says movements can spotlight individual grievances, increase their visibility and then connect them to a broader context.

Thurston says that the case of credit discrimination illustrates this tactic. Until the 1970s it was standard practice in the U.S. to deny women access to various forms of credit. But then groups like the National Organization for Women and the Women's Equity Action League began to connect women's individual experiences of being denied credit to show a broader pattern. They also upended the assumptions about why women couldn't get loans or bank cards, making clear that the restrictions were baseless, discriminatory and unfair.

"NOW and other groups raised the issue to national public consciousness, and it was legislated on as a result," Thurston says, referring to the Equal Credit Opportunity Act of 1974, which prohibited lending discrimination based on sex, race, religion and other factors. She adds that racial and social equality movements — Black Lives Matter and #MeToo included — commonly connect experience to policy.

Raising public awareness alone is likely not enough to effect change, Thurston says, "but it's certainly part of keeping these issues on the agenda."

According to Morris, disruption is a key strategy for advancing a cause. "Social movements are not successful because they are polite," he says. "They are successful because they shake up the status quo."

Black leaders and organizers in Birmingham, Ala., had long fought to change the system of Jim Crow in the city, Morris says, "and each time they made very little progress. And so the civil rights movement said, 'OK, we're going to have to disrupt those institutions that segregate us.'" When the movement initiated boycotts of Birmingham businesses, organized daily street marches, staged sit-ins at restaurants and department stores and filled up all the jails, the city was paralyzed. Only then, he says, did Birmingham's white leaders say, "'We can't go on like this. We're going to have to meet with the leaders of the movement and make some concessions.'"

#### **PROGRESS AND PARTNERSHIP**

Boycotts are a proven tactic of social movements. King says roughly 25% of boycotts that receive national media attention lead to some form of concession.

"Boycotts create buzz for the movement and pose a reputational threat to the targeted company or group," says King, who co-edited *Protestors and Their Targets*. Buzz increases the chances that a targeted entity will engage with activists and subsequently change their practices, he adds; that engagement can help enlist "movement allies" who work inside the targeted entity. Allies could be police officers who support Black Lives Matter or ExxonMobil scientists who support legislation to combat climate change.

Thurston points out that, in the 1970s, a group of more than 100 economists, including some from the U.S. Council of Economic Advisers, signed a statement disavowing the use of sex or race in lending decisions. She says their statement "helped lend credibility to the claims of the women's organizations and also helped bolster the argument for concrete regulatory change."

Activists need organization insiders on their side, King says, to "open the door for further engagement and deeper conversations about how to implement processes that could lead to meaningful change. Activists need those insiders to help adapt and translate their ideals within an organization."

#### THE IMPACT OF AESTHETICS

When it comes to motivating people to support a cause, aesthetic choices — the type of language that is spoken, the style of dress that is worn, the symbols that are used and the overall vibe surrounding the cause — play a big role. They help define a movement's identity for its members, who in turn can use aesthetics against the opposition.

Anthropology professor Jessica Winegar was in Egypt's Tahrir Square in February 2011 when citizens took to the streets to demand the ouster of the country's authoritarian president, Hosni Mubarak. Winegar observed how aesthetics were deployed to further the movement.

"The revolutionaries used vulgar insults against the military and state security officials," she says. "They portrayed them as people who had no morals, who were greedy and corrupt."

Secular-oriented revolutionaries also leveled insults against the Muslim Brotherhood, criticizing its adherents as dirty, vulgar, unbathed and uncivilized. At the same time, the state forces portrayed all revolutionaries as immoral, bad Muslims, uncouth, dirty and uncivilized.

"Aesthetics play a role in galvanizing people to join a social movement as well as creating the movement's opponent," Winegar says. "In a way, what people can see, hear, smell, taste and feel at a very deep level can be much more powerful than a political platform." — C.M.



Those potential allies, however, tend to reject a movement that is expressing hostility. King cites research showing that many finance industry workers supported the goals of the Occupy Wall Street movement (begun in September 2011) but were unwilling to become real allies.

"They felt it was an angry movement and bringing that anger into the workplace would make them a target among their co-workers and the people they depended on for career advancement," King says. "That anger turned them off from becoming real allies."

#### THE PERSONAL IS POLITICAL

When it comes to social movements, communitybuilding activities can help create a foundation for engagement around particular issues. Ana Aparicio studies how Latinx communities develop local

politics, and some of her recent work focuses on a community garden in a Long Island, N.Y., suburb. Since it was planted in an abandoned lot a decade ago, the garden has grown into much more: It is the site of monthly community meetings and has inspired community events and even a radio show. Through their involvement in the garden, community members share resources and discuss issues they're facing.

"It's not a movement of overt dissent but one where people create a political and social community," Aparicio says of the garden. "The daily *convivencia* — everyday practices — bring people together, engendering a sense of care and hope that is critical for people and critical for a movement to be sustained over a longer period."

And because places like the suburbs of Long Island were originally designed to exclude Latinx and Black communities, Aparicio says, sustaining the garden is a political act unto itself.

"Claiming public space by having a Latinx festival, for example, is fun," Aparicio says, "but there's also another point to it. It's not necessarily to organize for or against something. Coming together is in and of itself as critical as anything that comes out of it."

#### THE WORK CONTINUES

Just as there are many ways to define and propel a movement, there are innumerable ways to assess its role and impact.

"Should success be defined as policy? Should it be defined as changing the way people talk about issues or whether certain things people used to overlook are now considered problematic?" Thurston asks.

#### **Movements at** Northwestern

Northwestern students have often made their voices heard in support of causes they care about. Here's a look at a few examples of campus activism over the years.



After the University opened so-called international houses for minority women and men in 1947 and 1949, Northwestern's first multiracial civil rights organization, the Quibblers, wrote in a letter to the Daily Northwestern that such a move was not a solution but "in itself an act of segregation." Other student groups called for an end to discrimination across the University during this time as well. (Full integration of University-owned housing occurred in 1953.)

1968 🗸



1970 ↑

After four Kent State University student protesters were killed on their campus by National Guardsmen, thousands of Northwestern students took part in a peaceful strike – the largest political gathering in University history – that included blocking Sheridan Road and causing classes to be canceled for days. Ten days after the Kent State killings, two students were killed by police at Jackson State University. All six students were eventually memorialized on Northwestern's Deering Meadow.

#### **1924**

#### **POSTWAR PACIFISM**

Following World War I, a group of 38 students gathered at a student conference and voted against U.S. participation in another war. The students were mocked by the alumni association president as "spineless, pusillanimous pacifists" at a campus patriotism rally and denounced in a Daily Northwestern editorial.

#### **BURSAR'S OFFICE TAKEOVER**

1947 ^

More than 100 students peacefully occupied the Bursar's Office for 38 hours to protest the Black student experience at Northwestern. The takeover ended with the May 4th Agreement, a resolution in which the administration agreed to respond to a list of student demands.





in 2016.

Additionally, a movement that seems to have failed may contribute to changes that come a decade later. Occupy Wall Street, she says, is a good example.

"Many people thought Occupy failed after just a few years," Thurston says, "but when we look at the 2020 Democratic presidential primaries, issues of inequality were really high on the list of things that most candidates were willing to talk about."

"For many movements, the No. 1 goal is to change the conversation — to grab the attention of the public and get them to think differently about a certain issue," King says. "If you're able to get politicians to talk and think differently, that's a big change."

Clare Milliken is senior writer and producer in the Office of Global Marketing and Communications.

#### **RACIAL JUSTICE**

Following the police killings of George Floyd and Breonna Taylor, students joined protests occurring across the country in support of Black Lives Matter and racial justice.



#### 2020 \*

#### **HUNGER STRIKE**

In their push for the creation of an Asian American studies program, students on the Asian American Advisory Board helped organize a hunger strike that lasted more than three weeks and garnered national attention. Asian American studies was established as a Weinberg College of Arts and Sciences minor in 1999 and a major



Gwenna "GiGi" Gainer Lucas ditched the corporate rat race and took up surfing. Now she wants to make the lineup more accessible for the next generation of surfers of color.

BY ELLIOTT SMITH

Photograph by Russell Brownley

# 33 BREAKING NEW WAVES



he crash of the waves is a clarion call. For Gwenna "GiGi" Gainer Lucas, the pull of the sea is a low-thrumming signal that reverberates through her being. The surf brings reflection and rebirth. "I am very aware of the joy and peace that surfing brings to me," says Lucas '01 from her oceanside home in Jacksonville Beach, Fla.

It wasn't always this way. For a while, she stepped away from the water that helped shape her childhood. She never even considered dipping her toes into Lake Michigan when she was a student at Northwestern. And the sea was the furthest thing from her mind when she worked in retail development for Nike and Kate Spade in New York City.

"There was a long period when I lost my identity," Lucas says. "I was building this facade of 'I have to have the VP title and make X amount of money to be successful.' But I knew at my core that something needed to change."

The epiphany occurred in 2012 at the wedding of her college roommate Crystal Clark '01 in Costa Rica. (Clark is now an associate professor at the Feinberg School of Medicine.)

"I took a surf lesson," Lucas recalls, "and the minute I stepped on the board, I thought, "This is it. This is what I've been missing.' I knew it instinctively."

She spent the next 15 months figuring out how to get back on the board. She quit her job and returned to Costa Rica, where she spent a year doing contract

"I took a surf lesson, and the minute I stepped on the board, I thought, 'This is it. This is what I've been missing.' I knew it instinctively." – GiGi Lucas '01 consulting work when not riding the tides and swells. Eventually, she felt called to get more young girls of color into the sport — one that, in the United States at least, has been historically dominated by white men.

Lucas is the founder and executive director of SurfearNEGRA (which roughly translates to "Black female surfer" in Spanish), a nonprofit whose mission is to bring cultural and gender diversity to surfing. The organization helps pay for girls who live near the water to attend surf camps and, for those landlocked or uncomfortable swimming, opportunities to learn the fundamentals of the sport on terra firma. It's all part of her effort to diversify the "lineup," the place in the water where surfers sit on their boards to ensure the best access to breaking waves.

Lucas is also a founding member of Textured Waves, a collective of Black women who want to increase the visibility of diverse surfers. In 2020 the collective created the short film *Sea Us Now*, which re-imagines classic surfing scenes of the 1960s with Black women surfers.

"This initiative created beautiful imagery of women of color who thrive in their aquatic lifestyle — imagery that was nonexistent in mainstream media," says Lucas.

#### **OVERCOMING HISTORY**

Lucas grew up on the Gulf Coast in Tampa, Fla., where the water was a natural part of her life. Her parents, Alfred and Marion Gainer, took part in catamaran races, but they were often the only Black family at the regattas.

Lucas acknowledges that African Americans have a complicated relationship with water. According to the International Swimming Hall of Fame, before the slave trade, West Africans were known as some of the best swimmers in the world. Enslavers, however, saw swimming as a means of escape and prevented enslaved people from learning to swim. During the Jim Crow era, Black people were barred from most swimming pools and beaches, particularly in the South.

The long-term effects of those actions resulted in a cultural divide when it comes to watersports in the U.S. And statistics reveal that more than half of African American children don't know how to swim. A 2017 study found that more than 65% of African American children couldn't swim safely in the deep end of a pool. Only 36% of white children lacked the same skill. Black surfers and Black women surfers are not as rare in other parts of the world, Lucas notes. But representation of people of color in surf media and sponsorship remains a global issue. And there are no Black surfers among the leaders in the women's or men's professional rankings.

"The ocean is the largest natural resource on the planet," Lucas says. "For a whole people in our nation to have developed a complex or fear around water is very unnatural. We know what has led to this point. To be able to deconstruct that narrative and be on the water helps us reconnect with who we are."

The summer of 2020 was filled with upheaval. In the aftermath of the killings of George Floyd and Breonna Taylor, Lucas' efforts to change her sport came into sharper focus.

"Not only are [Black people] capable of being anywhere we want to be — we don't need permission," she says. "Sometimes we have to build the opportunities for success ourselves."

Lucas has formed strategic partnerships with brands to help spread her mission and raise money to send girls to surf camps. SurfearNEGRA partnered with Jacksonville, Fla.-based textile manufacturer Anact to create a Black Lives Matter tote bag, which features an image of Lucas (by photographer Malcolm Jackson) on American Beach in Amelia Island, Fla., one of the few beaches in the South where Black people could swim during Jim Crow.

Lucas' organization also teamed up with accessory designer Raven + Lily to curate a collection of jewelry inspired by the

#### "She's creating a model that can be replicated throughout all sports to foster inclusivity and positive outcomes with diverse youth." – Ethelbert Williams '01

spirit of surfing. Such collaborations with forward-thinking, women-owned businesses are intentional.

She's received inquiries from "quite a few organizations in the surf industry who have been guilty of repeating monolithic aesthetics about the sport," she says. But Lucas is not eager to work with them.

"What I'm conscious of is tokenism. I refuse to lend an image of the girls to a brand without a real investment in the culture."

Lucas' drive to grow SurfearNEGRA has impressed those around her.

"She has worked tirelessly to amplify a platform and represent what is good in this world — especially in this moment," says SurfearNEGRA board member Ethelbert Williams '01, director of e-commerce for the Boston Beer Company. "As someone working in the private sector, I'm



Left, GiGi Lucas, fourth from left. poses with campers after a day of water safety education and surf instruction at lacksonville Beach Fla. Below, surfers Jaylah and Deyona finish the first day of their weeklong surf camp at Atlantic Beach, Fla. In its first two years, the SurfearNEGRA program has placed 64 girls on the water by partnering with 74 surf camps in 24 states.



inspired by her transition from being a global corporate executive to now building a cause and leading impact throughout local communities."

During its first two years, and despite the pandemic, SurfearNEGRA's ;100 Girls! program has placed 64 girls on the water by partnering with a network of 74 surf camps in 24 states. The nonprofit's ;Surf the Turf! program provides access to the fundamentals of surf for kids who aren't near the water or are afraid to be in the ocean. "Many of them have never seen a surfboard in person and don't know what a tide is or how waves are created," says Lucas. "Some have never been to the beach."

¡Surf The Turf! breaks down the basic movements of surf into physical education activities that are familiar to them, such as standing on a balance board or paddling while laying on a skateboard. "We also replace typical PE terminology with surf phrases and storytelling that brings them into the world of surf — without the need for water," Lucas says.

"She's creating a model that can be replicated throughout all sports to foster inclusivity and positive outcomes with diverse youth," Williams says.

#### **SHOWING GIRLS THAT THEY CAN**

Surfing is an acquired taste, and Lucas knows that not all the participants are going to be converts — but that's not the point.

"I like to keep it real," she says. "There have been mixed responses from the girls, from 'I'm not getting in past my knees' to 'I'm not getting my hair wet' to 'It's the best experience I ever had.' But what makes me happiest is that they tried it. In life, so many times we have in our head what we can and can't do. We're showing girls that they can."

Deyona Burton attended surf camp at the urging of her mother. After her initial hesitation, the 17-year-old from Jacksonville, Fla., found herself starting to enjoy it.

"At first, I didn't like it," Burton says. "But seeing GiGi surf gave me the confidence to keep trying. The next time, I was able to stand up on my board. GiGi was excited for me, and I saw Black women around me, cheering me on. It was really cool."

For Burton, going to surf camp and working with Lucas went beyond trying a new sport. "GiGi continues to stay in touch," she says. "She's like a mentor and a big sister."

Lucas sees the camps as an opportunity for girls to escape the pressures of society and be themselves.

"The girls who took to surfing felt a freedom to be exactly who they are, with their hair, their body, their ability," Lucas says. "For this age range, 7 to 17, that's extremely important. In everyday life, they often feel awkward. But in the water they are completely themselves. And for many, it's the first time



# C

#### **HIT THE WAVES**

We asked GiGi Lucas for some tips to get started in surfing.

#### Learn the basics.

Invest in learning the fundamentals from a reputable surfer or certified coach.

#### Get comfortable being uncomfortable.

Surfing challenges you in ways that would never be possible on land. Practice letting go and being present. Just go with the flow — literally.

#### Laugh at yourself.

For the first 6 to 12 months, you will look like a newborn fawn that hasn't found its legs. So relax and find the humor and joy in doing something new and exciting. You'll build a healthy habit that will migrate into other parts of your life too. in a while that they have been able to disconnect from the pressures of the world and just be present."

#### THE NEXT SET

Lucas recently completed the short film *On the Side of Right* with surfwear maker Seea, and she participated in a civil rights–focused exhibit that runs through May at the Museum of Contemporary Art Jacksonville.

She's also reconnecting with her Northwestern roots, realizing that her experiences on campus have played a role in her current success.

"Northwestern taught me how to consistently navigate unfamiliar spaces," Lucas says. "I developed a 'dive in head first' mentality."

Lucas admits that her Northwestern experience was not always easy, but she's grateful for the challenges. "Northwestern was the first time that I got any grade below a B," she says. "I was actually on academic probation at one point because I didn't know how to apply myself. Once the sting of sitting in the dean's office wore off, I got laserfocused on learning as much as I could. That clearly has translated many times over throughout my life."

Lucas has recently started to explore the heritage and legacy of Black students at Northwestern. "It's great seeing places like

the Black House finally get the awareness they deserve," she says. "I am grateful to be a part of the collective evolution of Black Wildcats.

"It's really cool reconnecting with the Northwestern community at my age," she adds. "When I was younger, I didn't feel like I could meaningfully engage unless I had something to show that would impress people. Now I've entered into a season of my life where purpose is pinnacle. And if anyone is blessed to be able to live with purpose and offer that gift to the world, it should absolutely be celebrated."

The roar of the ocean now defines Lucas' perception of success, both personally and professionally, and she couldn't be happier. She reflects on the diverse lineups she's seen abroad and hopes that one day it won't be a big deal for women of color in this country to be part of the sport she loves.

"Ten years from now, I hope we are able to drop the adjectives 'Black' and 'girl," she says. "They can just be known as surfers.

"I don't know if I will be able to change everything. But this is not about being accepted. It's about empowering women of color to do whatever the heck they want."

Elliott Smith '97, a proud alumnus of the Daily Northwestern, is a freelance writer and children's book author. He lives in Falls Church, Va., with his wife and two children. A RPOGALYPSE

Northwestern alumni and faculty from across the University seek to understand the deadly consequences of outdoor air pollution.

BY AMANDA MORRIS

Franz Geiger stood in the middle of Mexico City's Plaza de la Constitución in June 1990, watching the traffic chug around the city's epicenter. It was the first day of the rainy season, but cloud cover was sparse. Then suddenly the skies opened and rain deluged the plaza. The abrupt downpour soaked through Geiger's clothes and turned his crisp, white T-shirt a grimy, streaky black. "During that time, Mexico City was experiencing the worst air pollution in its history," says Geiger, a Northwestern chemistry professor. "It was amazing. I remember the rain feeling sticky on my skin. It was a mixture of rain, road dust, combustion engine exhaust and rubber from tires, all

stuck together."



Air pollution is everywhere. According to a recent study led by Harvard University, 8 million people died in 2018 from fossil fuel air pollution. Other recent studies have found air pollution is also linked to lost pregnancies and mental health crises, as well as increased risk for dementia and sight loss. According to the American Lung Association, nearly half of all Americans live in counties that have unhealthy levels of air pollution.

Northwestern researchers and alumni in various fields are working to better understand how air pollution travels from smokestacks and tailpipes into the atmosphere, how it affects our health and why it impacts some populations more than others. Their ultimate goal is to find solutions that could protect our health and the environment.

#### What Is Air Pollution?

Air pollution is primarily made up of three substances: ozone, fine particulate matter (or soot, dust and smoke) and nitrogen oxides. All three are byproducts of mining operations, electricity generation and agricultural activities, but vehicles with combustion engines are among the worst contributors. "In the U.S., the transportation sector is the No. 1 source of air pollution and greenhouse gas emissions," says Daniel Horton, assistant professor of Earth and planetary sciences.

"Car pollution is particularly threatening for population health because, by definition, cars drive and pollute where people live," adds Hannes Schwandt, assistant professor of human development and social policy. "It's pollution in the middle of society, including dense population centers."

#### "Just informing people about these risks could have a really big impact. It's the consumers themselves who produce this pollution on a daily basis."

— Hannes Schwandt

Vehicles' high-temperature engines burn fossil fuels, generating nitrogen oxides, which are harmful to human health. Nitrogen oxides also can mix with other gases in the atmosphere and — when exposed to sunlight — form ozone. Not to be confused with "good" ozone in the stratosphere — the kind that protects us from the sun's ultraviolet rays - ground-level ozone can damage lungs and constrict airways, making it difficult to breathe. It also worsens respiratory diseases such as asthma.

From a health perspective, ozone is problematic but less life-threatening than other pollutants. "If you're looking for the cause of early mortality, poor lung development in children or exacerbation of chronic obstructive pulmonary disease, by and large that will be particulate matter air pollution, which comes from burning fossil fuels," says Scott Budinger '85, the Ernest S. Bazley Professor of Airway Diseases at the Feinberg School of Medicine.

#### **Clotting Consequences**

Perhaps surprisingly, air pollutionrelated deaths aren't caused by lung damage or respiratory failure alone. Since the 1930s, researchers have linked air pollution to an increased risk of heart

#### **Environmental Evolution**

Although our lungs struggle to clear particulate matter, or soot, from our bodies, they are much more adept at dispelling dust. So while inhaling smoke from a wildfire or bonfire isn't healthy, it's not nearly as dangerous as breathing in car exhaust.

"Humans evolved in dusty environments," Scott Budinger explains. "Our lungs are good at clearing dust from fires, deserts and volcanic eruptions. But when dust particles contain chemical constituents from fossil fuels, those particles do real damage."

The chief pulmonologist at Northwestern Medicine, Budinger uses volcanic dust as a control particle in his laboratory experiments. In studies of the effects of particles on lung health, natural dust doesn't cause the same biological responses as industry-induced particles. – A.M.

attack and stroke. This was most famously demonstrated during the London smog events in the 1950s. Whenever levels of smoke - generated from coal-burning power plants and coal furnaces in homes — increased, mortalities spiked two days later. Subsequent studies found all air pollution-related deaths after a smog event were from heart attacks and strokes. Similarly, when a poisonous haze blanketed Beijing for nearly a week in 2013, hospital admissions surged by 30% during the city's so-called "airpocalypse."

But how does inhaling polluted air affect the heart? Budinger, who studied chemical engineering as an undergrad at Northwestern and is now the chief of pulmonary and critical care at Northwestern Medicine, set out to determine the pathways that particulate matter travels to affect heart health. His team discovered the cascade begins with the alveolar macrophage, or "dust cell," in the lungs. Responsible for cleaning up particles that enter the lungs, these cells activate when they encounter soot. This induces a cascade of signaling that ultimately releases a group of proteins and small molecules that cause clotting.

"Once those molecules get into circulation, you are more prone to clotting," Budinger says. "So we think inflammation in the lung increases the risk of blood clots forming in heart arteries, causing heart attacks and strokes." By understanding this cascade, Budinger and his team were able to pinpoint already-approved medications that could decrease premature deaths.

#### **Pollution in Our Backyard**

These health issues typically strike disadvantaged populations more severely, as their neighborhoods are often disproportionately overburdened with pollutants. "Housing is much cheaper in areas where the land and air are contaminated," says Nancy Loeb, who directs the Environmental Advocacy



Center at the Pritzker School of Law's Bluhm Legal Clinic. Because the hazards of air pollution exposure are tangled with the other issues that face low-income populations — including reduced access to affordable health care and higher levels of stress — it becomes difficult to tease apart how air pollution specifically affects the human body.

"Lower-income communities do experience more health issues and higher instances of certain illnesses," says Loeb, a clinical professor of law. "It's hard to say there's a single contributing factor, but there's a good indication that air pollution contributes."

Human behavior provides another tricky variable. "If you live next to a highway, you might try to keep your windows closed or avoid sitting outside," Schwandt says. "It's difficult to measure how pollution affects people because we might underestimate how much people shield themselves from pollution sources."

To help unravel these complex relationships, researchers look for "natural experiments." For Schwandt, Volkswagen's emissions scandal presented a perfect opportunity.

In 2015 Volkswagen sold cars that could detect when their emissions were being tested. When sensing a test scenario, the car automatically switched on a set of devices to lower its emissions. Once the car was on the road again, the devices switched off, enabling the vehicle to emit nitrogen oxide pollution 40 times higher than the U.S. Environmental Protection Agency's limit.

"Suddenly, pollution increased among economically advantaged population groups in areas with many cheating cars, Schwandt says. "We had this once-ina-lifetime setting to study the effects of air pollution on more advantaged populations that didn't live near highways or power plants." In areas with more of these particular Volkswagen models, Schwandt's team found lower infant birth weights. Wealthier and healthier groups, such as married white mothers with college degrees, particularly felt these effects because "clean diesel" Volkswagen cars were marketed to those groups. "Just informing people about these

risks could have a really big impact," he says. "It's the consumers themselves who produce this pollution on a daily basis. And we care about the impacts we have on our and our neighbors' health."

#### **Tricky Trade-Offs**

In another natural experiment, Franz Geiger and former Kellogg School of Management assistant professor Alberto Salvo, now an associate professor of economics at the National University of Singapore, spotted an opportunity to compare the effects of ethanol versus petroleum-based gasoline on air quality. Vehicles in Brazil can switch between the two fuel types.

"São Paulo is a natural laboratory because it has the largest flex-fuel vehicle fleet," Geiger says. "We looked at the choices consumers made at the pump and how that affected air quality."

#### By the Numbers: **Air Pollution in Chicago**

While overall air quality in the Chicago area has improved, there is still progress to be made, according to the 2020 "Air Quality and Health Report."

15 Yearly average of "unhealthy ozone days" from 2016 to 2018, making Chicago the 16th most polluted city in the U.S. for ozone

40% Reduction since 2000 in fine particulate matter pollution in Chicago, yet concentrations are still among the highest in the nation

Life expectancy gap in years between Chicago's Black and white residents due to chronic disease

**5%** Percentage of premature deaths in Chicago each year that can be attributed to exposure to fine particulate matter

After gathering and reviewing air quality data, the duo was shocked to find ethanol, which is often considered a "green fuel," increased ground-level ozone.

The team dug into air chemistry to explain the process. They found nitrogen oxides actually curb ozone concentrations. When vehicles use ethanol, nitrogen oxide concentrations decrease, leaving ozone unchecked.

"The benefit is reduced nitrogen oxide and ultrafine particulate matter, but that comes at the price of increased ozone," Geiger says. "Ethanol also carries heavy metals because it comes from corn and sugar that are grown using low-quality water. Because the crops aren't going to be fed to humans or animals, wastewater is used and emitted when the ethanol is burned. We think ethanol is sustainable, but there's a complex story behind it."

#### **Canning Combustion**

Although the problems associated with air pollution feel overwhelming, solutions



#### The Benefits of Vehicle Electrification

According to professor Daniel Horton's research, replacing just 25% of gaspowered vehicles with electric vehicles in the U.S. would avoid:

\$16.8 billion annually in climate and public health damages

**252** megatons of carbon dioxide emissions annually

**5355** premature deaths annually, due to reductions in particulate matter and ozone

already exist. According to research from Daniel Horton's group, switching to electric vehicles could massively benefit society, saving billions of dollars and thousands of lives. Horton's group creates high-resolution air-quality simulations based on atmospheric chemistry, emissions data and meteorology.

"If you have an electric vehicle, you're no longer emitting pollutants from the tailpipe," he says. "However, emissions can be generated from the electricity source used to charge the battery."

That said, electric vehicles have a net benefit in the U.S., where electricity is generated from diverse sources, including wind, solar and geothermal. The story is more complicated in China, where electricity is predominantly generated from burning coal.

When looking at the U.S., Horton and former student Daniel Peters '19 combined their climate model with public health data. They found that if electric vehicles replaced 25% of combustion engine vehicles currently on the road, the U.S. would save approximately \$17 billion annually by avoiding damage from climate change and air pollution. In a much more aggressive scenario — replacing 75% of cars with electric vehicles — savings could reach as high as \$70 billion a year.

"Vehicle electrification could prevent hundreds to thousands of premature deaths annually," says Peters, who now works for the Environmental Defense Fund. "It would not only curb greenhouse gas emissions but also reduce the health burden of harmful air pollution."

While electric vehicles might be unaffordable for many Americans, Horton believes that recent commitments by automakers to manufacture more electric models — in conjunction with a renewed push for federal and state governments to offer tax breaks, subsidies and incentives — should make widespread adoption possible. Cities also could encourage adoption by installing more vehicle charging stations and electrifying their public transport systems.

"Because they save on gas and maintenance, modern electric vehicles are simply a better value than internal combustion engine vehicles," Horton says.

Electric vehicles also are much simpler to build, Geiger adds. "They don't need a transmission or complicated valves. They require significantly fewer components on the assembly line."

#### Air Quality in the COVID Era

The novel coronavirus pandemic has demonstrated how electric vehicles could positively affect air quality. As people drove less, U.S. greenhouse gas emissions decreased by 10% in 2020.

"The COVID emission changes are similar to replacing a large fraction of combustion vehicles with electric vehicles powered by renewable energy," says Jordan Schnell, a former postdoctoral fellow in Horton's laboratory.

Now a research associate at the Cooperative Institute for Research in Environmental Sciences (CIRES), Schnell works to discover how pandemic lockdowns have affected air quality, which could provide a glimpse into the future.

"It's like a real-world experiment showing how places will respond to emissions reductions that will likely occur as we move toward cleaner technologies and introduce more regulations," he says.

To approach the COVID emission question, the CIRES team compared two models: an emissions dataset that reflects reduced traffic during COVID lockdowns and an identical simulation that shows what 2020's emissions would have been without lockdowns. However, the results are not straightforward. With fewer cars on the road, nitrogen oxide decreased across the board. Ground-level ozone also dropped in most parts of the country. But without nitrogen oxide to "eat up" the ozone, ground-level ozone actually increased in some urban areas. Particulate matter also mostly decreased, depending on location and time of year.

#### What Can We Do?

While driving an electric vehicle can decrease one person's greenhouse gas emissions, Geiger, Horton, Schwandt and Loeb all agree that air pollution is an enormous problem that requires local, national and global regulations.

"Government can also subsidize electric cars, public transportation and car sharing," Schwandt says. "There are many ways to respond to this problem."

Loeb maintains that governments should rethink local zoning laws, which often push industrial businesses into lower-income communities that "are unfairly overburdened with pollution."

"We need systemic change," says Horton, who felt optimistic after President Joe Biden's inauguration. Within his first days in office, Biden signed multiple executive actions focused on climate change and air quality. Among these initiatives, Biden committed the federal government to buying only zeroemission vehicles.

"These commitments are nobrainers," Horton says. "Study upon study has demonstrated that the switch to electric vehicles will reduce greenhouse emissions. My group's research also has shown that the switch to electric vehicles will reduce harmful air pollutants, lowering the public health burden attributable to transportation emissions. By embracing electric vehicle technology, the Biden administration gives us hope."

Amanda Morris '14 MA is senior editor of science and engineering in the Office of Global Marketing and Communications.



#### FROM THE ARCHIVES

The student-run Northwestern Community Ensemble performs at the Bursar's Office Takeover Commemoration at Alice Millar Chapel in May 2018. This year the NCE is celebrating the 50th anniversary of its founding in May 1971. ALUMNI

#### Creation

44



ART & SCIENCE

#### **Five Questions with Sterling Harris '18**

The neuroscience grad and rehearsal director for Chicago Tap Theatre talks about the cultural importance of tap dance.

# When did you discover your

love for music and dance? I was born and raised on the South Side of Chicago, and as a kid I played trombone and tap danced. I would often put on full concerts at holiday gatherings. I never seriously considered making a career out of performing. It was just something I loved to do.

the history of the dance. Learning history through tap - the passing down of the movements - feels like its own area of study. The history of tap runs parallel to the history of jazz, and both have had a huge impact on American culture. As we're addressing the erasure of the contributions of Black folks in America, I want my community to know that tap is our art form. Black people created tap dance.

How have you pursued tap at

Northwestern and beyond?

At Northwestern I joined

Tonik Tap. Rehearsing and

performing with Tonik are

among my favorite memories.

After graduating, I began

training and performing with

Chicago Tap Theatre and

M.A.D.D. Rhythms. I have

collaborated with former

directed by Lucky Stiff

Northwestern students on

their projects, including work

'19 MFA that was performed at

the Museum of Contemporary

Art Chicago and the Prop

I co-choreographed with

tap dancer Case Prime

in Something's Afoot, a

showcase presented by

the American Tap Dance

What have you recently

I've developed a desire to

showcase all the possibilities

both a dancer and a musician

that tap can be, thinking as

to fully embody a piece of

I'm also learning about

music.

discovered about tap?

Foundation in New York City.

Thtr. I also debuted a piece

#### What connection do you see between dance and neuroscience?

When I'm dancing at my best, I'm more than just happy -I'm physically connected to the music and emotionally connected to the audience and the people I'm performing with. Studying tap through neuroscience could provide insight into what is happening in our brains when we dance and could lead to discoveries about how to share this experience with others.

#### Why should dance or tap education be considered public health?

I've worked with Northwestern professor Billy Siegenfeld, director of the performing and teaching company Jump Rhythm. His approach to mind-body integration resonated with me. Through training with Billy, I've gained the confidence to embrace how my body wants to move and make music rather than superimposing external standards or rules that determine what "looks good."

Following this approach, we work to listen to our bodies and relate the physical principles we work on to emotional concepts and behaviors. When embraced. those behaviors can lead to communal growth, a better connection with your body and those around you, and an overall improved quality of life - all cornerstones in the field of public health.



ENTREPRENEUR

#### **The Carbon Pawprint**



#### SHOEBOX NEGATIVES

Joan Tortorici Ruppert '94 wasn't sure she could do anything with a box full of film negatives her mother gave her in the 1990s. But when Ruppert scanned the images in spring 2020, she discovered a glimpse into the life of the photographer: her father, Joe Tortorici, who died when Ruppert was 8 years old. The images depict Chicago in the late 1930s and early '40s. between Tortorici's high school graduation and his entry into the Navy. "It's a narrow window into his life," Ruppert says of the more than 300 black-and-white photos. "Even if I don't know all the details, the collection is a snapshot of what mattered to him. I feel like my dad told me a story." A television producer and director in Chicago, Ruppert shares the images at shoeboxnegs.com.

Most of the nation's 90 million dogs are fed a diet of beef, chicken and pork. The production of those foods contributes to greenhouse gas emissions. With a desire to create a food system that works for people, pets, wildlife and the planet, Haley Russell '12 launched a new kind of dog food company. Chippin creates dog foods made from underutilized protein sources, such as insects, overpopulated fish and algae. "There has been a massive shift toward eco- and socially conscious consumer products, but pet food — a \$37 billion U.S. market — was left behind," says Russell, who was one of Forbes' 30 Under 30 Social Entrepreneurs for 2020. Chippin, which initially launched a line of dog treats made from crickets and

spirulina, is introducing a daily dog food made from silver carp, which pose a threat to the biodiversity and water quality of the Great Lakes and its \$7 billion fishing industry.





#### ENTREPRENEUR

#### **Building a Better Cocktail**

Kim Oster-Holstein '90 MS and her husband, Scott, traditionally celebrate their May birthdays with margaritas. One year they noticed how much better their cocktails tasted with fresh-squeezed juice. The two began exploring the idea of creating a line of healthy, cold-pressed juices that would elevate spirits.

Twisted Alchemy was born. With customers that included stadiums, hotels, hospitality groups, bartenders and mixologists, the Wilmette, Ill.-based company was projected to double its revenue in 2020.

But when the pandemic hit in March, the company lost nearly all of its customers in a matter of days. To address the abrupt interruption, Oster-Holstein developed online cocktail classes and mixology sessions. The company also created home mixology sets, with kits delivered to the consumer's door.

"Our kits and virtual experiences help bring people together," says Oster-Holstein. She also teamed up with Erica Keswin '95 MBA to offer a corporate package that includes Keswin's book, Rituals Roadmap: The Human Way to Transform Everyday Routines into Workplace Magic, Twisted Alchemy kits and a virtual conversation with Keswin on entrepreneurship and leadership.

Twisted Alchemy recently partnered with the Northwestern Alumni Association for a happy hour, which featured a Purple Power cocktail and a conversation about the entrepreneurial journey. "My advertising master's program at Medill helped me harness my creativity and build ideas with strong strategy," says Oster-Holstein.

#### **Purple Power**

- 1<sup>1</sup>/<sub>2</sub> ounces Empress 1908 Gin
- 3/4 ounce Twisted Alchemy Eureka Lemon Juice
- <sup>3</sup>/<sub>4</sub> ounce simple syrup
- <sup>3</sup>/<sub>4</sub> ounce egg white

In shaker, combine ingredients without ice and shake for 15 seconds. Add ice and shake for 20 seconds. Strain into coupe glass. Garnish with dried citrus wheel. Cheers!

#### CHILDREN'S LIT

#### **Some Pigtails** by Jonathan Eig

Best-selling author Jonathan Eig '86 has written acclaimed biographies of Muhammad Ali and Jackie Robinson, but his latest subject is 8-year-old Lola Jones, the protagonist of the new children's books Some Pigtails (the first in the series) and Score for Imagination. "I've been trained since my days at Medill to never make anything up," Eig says of his first foray into fiction. "It was fun to start with a blank page and a title and make up a story." Inspired by Eig's own daughter, the books tell the tales of Lola standing up to authority, first leading a rebellion against her elementary school's dress code and then battling for gender equality on the playground. "A lot of my grown-up books have been about rebels, and that's what Lola is," Eig says. "I try to teach my kids that you don't have to always accept an answer. If you disagree with something, you should challenge it." The D.O.G. and Everybody's Home, the third and fourth installments, are set to be published this year.





#### HOSPITALITY

#### **Hotel Alma Mater**

Ben Weprin created Graduate Hotels, a line of locally inspired properties.

In 2014 Ben Weprin '10 MBA launched Graduate Hotels, a hotel collection providing affordable lodging in college towns for alumni, prospective students and other visitors. Weprin, founder and

CEO of AJ Capital Partners

in Nashville, conceived the Graduate Hotels project while he was a student at the Kellogg School of Management. "I started studying universityanchored markets around the country and found that there wasn't anything purposefully

#### ENTERTAINMENT

#### **Gayest Episode Ever**

Glen Lakin '03 never realized how important sitcoms had been in shaping his thinking — and his identity — until he took a radio/TV/film course at Northwestern. Now a screenwriter, Lakin co-hosts the podcast *Gayest Episode Ever* with journalist Drew Mackie. The hosts discuss the rare LGBTQ+-themed episodes of classic sitcoms and how those episodes hold up or fall short years later. The podcast aims to provide commentary on the evolution of queer representation, gay rights and how culture can both affect and be affected by what is portrayed on TV. "So much of my gay identity came of age in this era of sitcoms where the only representation of gay men in my life was on TV," says Lakin. "Whatever joys or fears were triggered through these TV shows had an effect on me, whether that delayed me coming out or helped me identify what about gay culture spoke to me." Lakin says he sees progress. LGBTQ+ characters now appear on screen more often, he says, and their story arcs encompass more than just their identities.

built for these towns," he says. "I love [these] communities — the culture, commerce, creative spirit." He wanted to capture that spirit in his hotels.

Weprin says he got his start in hospitality through Larry Levy '66, '67 MBA, who founded the Larry and Carol Levy Institute for Entrepreneurial Practice at Kellogg. "Larry acquired a hotel operating company, and I helped manage that on his behalf," Weprin says. "[Later,] I went to Kellogg with his encouragement."

By the end of 2020, Weprin had launched 28 hotels in 28 cities across the U.S., including 10 towns that are home to Big Ten institutions.

One might expect Graduate Hotels to be decorated with school pennants and mascots. Instead, the hotels draw inspiration from the surrounding region, featuring local artwork, food and drink. "We're passionate about reflecting

community

spirit

and camaraderie in our neighborhood-driven hotels," says Weprin.

Graduate Tucson, for example, features a restaurant with Southwestern fare and rooms with cactusshaped lamps, while Graduate Nashville features a Dolly Parton–inspired room.

Graduate Evanston, which opened in October 2020, holds a special place in Weprin's heart. Guests can "spend the night like Kevin McCallister" by booking the *Home Alone* room — a replica of the parents' bedroom from the 1990 Christmas classic, which was filmed a few miles from the Evanston campus.

"Our team is so passionate about the details," Weprin says. "We incorporated different pieces of the [*Home Alone*] story, like the escape plan and the black-and-white movie playing on the TV. It's just so much fun!"

This year Weprin will open four more hotels: one on Roosevelt Island near Cornell Tech, one in East Lansing near Michigan State and two in the United Kingdom, near the University of Oxford and the University of Cambridge.





Honoring the Waa-Mu star who went on to an awardwinning TV and film career that spanned seven decades. See our obituary on page 68.

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Reduction in the cost of climate and public health damages if the U.S. replaced 75% of gasoline-powered vehicles with electric vehicles, according to research by Daniel Horton, assistant professor of Earth and planetary sciences. Read more on page 38.