Drexel UNIVERSITY

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Drexel MAGAZINE

How to Save the World

A baker's dozen of bright ideas to help the planet avert a tipping point.

PHOTO COURTESY OF ACADEMY OF NATURAL SCIENCES

NATURAL SCIENCES

CLEAN-UP ON AISLE ONE

Ongoing surveys of the mussel population in Pennsylvania's Delaware River Basin have begun to produce results that bode well for the health of the waterway. Researchers from the Patrick Center for Environmental Research in the Academy of Natural Sciences of Drexel University and from the Partnership for the Delaware Estuary, who have monitored local waterways for more than 20 years, found several species of the freshwater bivalves living near Philadelphia. Their discovery was surprising — because mussels were long thought to have disappeared from the area — and extremely welcome, because the creatures have a remarkable capacity to filter contaminants from water.

300
Approximate mussel species in North America

5
Species of freshwater mussels found living near Philadelphia

70
Percentage of species that are threatened or endangered

10-15
Gallons of water each mussel can filter daily

50-100
Years a freshwater mussel can live

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It will take the ingenuity and actions of many individuals to help humanity cope with climate change. Here are 13 ideas to start.

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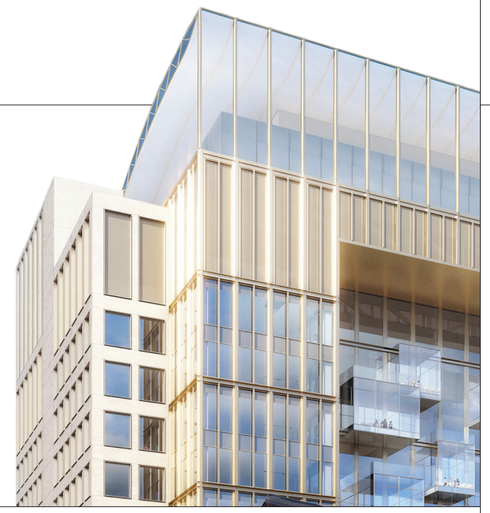
West Philadelphia has the history and momentum to lead the region in a life sciences renaissance, and Drexel is building a home for it all.



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A New Medical Campus
Drexel University College of Medicine at Tower Health opened its doors last summer to its first cohort of medical students, launching a proud new chapter in the college's 174-year history.

DEPARTMENTS

UP FRONT

THE VIEW FROM MAIN

It was wonderful to welcome many of you back to campus for Alumni Weekend last month. I hope the changes you saw made you proud.

This is truly an exciting time to see firsthand the ongoing physical development of our campus, which reflects the ambitious academic expansion we are undertaking, driven by our talented students and faculty.

I see each new building as an opportunity to unite the University's strengths in research, experiential education and industry partnerships under a compelling sense of place. The "innovation district" approach to campus development Drexel has embarked on imagines a day when the Market Street corridor hums with the work of academic scholars and corporate scientists pursuing new commercial discoveries. It promises opportunities for graduates and for the residents of West Philadelphia to explore new careers in their own prosperous backyard. It creates fertile ground for curricular crossovers between the classroom and the workplace, and a space for dialogue between the theoretical and the translational.

When University faculty and professional staff collaborated on the Drexel 2030 strategic plan last year, they saw the urgency of future proofing Drexel against challenging trends in higher education and the workforce. We're doing just that, by creating the means to unlock new partnerships, growing the reputation of key knowledge clusters, developing curricula employers want and need, and enhancing co-op and research options for our students — all while fostering an inclusive, engaged culture. When I see Drexel-acquired land developed into centers of innovation, I truly see Drexel's 2030 strategic plan coming to life.

There are less visible changes, too, though no less important. The Anti-Racism Task Force recently issued more than 200 recommendations to ensure our people are supported, our policies interrogated, and the paths to success are charted equitably for all. Some of those efforts, like hires of interdisciplinary Black scholars, the creation of a Center for Black Culture, and a review of our campus policing, are already in effect.

Interdisciplinary, engaged teaching and research is also key, and so we were pleased to announce this year the launch of the Environmental Collaboratory, a new research initiative headed by climate expert Mathy Vathanaraj for researchers and community partners who want to explore urban environmental challenges and solutions.

I hope that as you learn about these developments that you imagine them as I do, a chance to build bridges across our own culture and create an even more nimble, innovative and equitable University that is positioned to make the greatest possible contributions to American society and beyond.

Sincerely,

John Fry / President

EDITOR'S LETTER

New Starts for Philly

In a previous life as a business writer, I sometimes blogged about how Philadelphia was faring as a big city, doing what big cities do, which is make big business. After a few years of doing this, I started to feel a little bad for Philadelphia.

My paper produced a list of the city's 100 largest public companies, and each year, that list seemed to shrink. We added in freshly minted IPOs, and that helped. But gradually, we had to decide whether to remove "Top 100" or stretch the definition of Philadelphia to include more outside counties.

Can a city thrive if it doesn't have a healthy supply of bonafide corporate headquarters? For a while, up to a point. But the city that "Saturday Night Life" burned as "a small town somewhere between New York and D.C.," deserves to be a destination in its own right. This was once the "Workshop of the World," for pete's sake.

No one wants to see Philly lose ground, especially since this city crushes it on so many other levels.

As I was doing some background reading about this issue's story, "Land Science and Talent," I learned that West Philadelphia has a history in gene and cell therapies that's second to none. I hadn't been paying attention to how much that history was influencing startup growth throughout the region, and here on campus. It's heartening news. There is energy here in drug development, tech commercialization, FDA approvals and manufacturing: Fresh business blood that can make a city thrive and provide alumni with a career path after graduation.

So if you also were too busy pandemicking to notice all of the construction in University City, please read the story. There's a buzz in the Navy Yard, too, and at the former Sunoco refinery site in South Philadelphia, where an innovation district is planned.

But the sweet spot is where eds and meds make fertile ground, here on Drexel's campus, next to the University of Pennsylvania, Penn Medicine, the Children's Hospital of Philadelphia, University of the Sciences (now St. Joseph's as of June 1), and Amtrak's 30th Street Station.

Drexel's development partners are building out millions of square feet of space for research, academics and innovative companies, and there's plenty of room, reason and opportunity for some of them to grow into the next Top 100 employers.

Thanks for reading.

Sonja Sherwood / Editor

ABOUT THE COVER
Illustrated by Brian Stauffer.

Drexel
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Kempis Songster and Professor Rachel Lopez talked about second chances for the incarcerated in the winter/spring issue.

Pride in Progress

I graduated from the Drexel Institute of Technology in 1969. That was the last class under the DIT name.

I had been back on campus a number of times in the early years after my graduation, but nothing had really changed.

In 2014, I returned for the 75th anniversary of my fraternity. The changes were overwhelming and they continue.

I've spent my entire career involved in the construction of buildings, bridges and stadiums and the latest and future additions to the Drexel footprint are a source of pride to my Drexel heritage.

The Drexel name has grown here in western Pennsylvania and I continue to be amazed at the number of people who comment about my Drexel license plate on my car.

Keep up the good work.

FRANCIS VESPAZIANI
BS civil engineering '69
Bethel Park, Pennsylvania

Redemption, But Not Release

I disagree with the idea that redemption necessitates release (Lifers Speak Out on Right to Redemption, Winter/Spring 2022).

One can be converted, and redeemed, yet out of justice, still be required to carry out the terms of a just sentence. Caring for sick fellow prisoners is an act of redeeming mercy, and if done with love, can bring meaning to the lives of the incarcerated.

Also, the notion that the United States is somehow inhumane because we have a higher rate of life imprisonment than other nations is wrong. Perhaps we have more prisoners in for life because we execute a smaller percentage of violent offenders than, say, China.

Lastly, as far as whether or not prisoners should be in for life is concerned, I don't care what color the majority of violent prisoners are. If they took a life, they should be imprisoned for life. Period.

If the incarcerated are over represented by minorities of a particular color, that is evidence that we need to look closer into why those communities have a higher rate of offense, not let them free to victimize others. This is beneficial to those same minority communities who make up the majority of victims.

JOHN MOLOKO
Stafford, Virginia
Drexel Parent

GAMING

Student-Athletes for the Digital Age

They don't have helmets or gear, nor fields or courts. In fact, they spend most of their time in front of computers. Yet they're the No. 1 collegiate team in North America in their sport. *By Beth Ann Downey*

There's a team of Drexel student-athletes who, in December, defeated a team that outmatched them in resources, coaching support and practice time. They rebounded after losing the first match of a grand finale to beat their rivals from Davenport University two out of three in what was considered a David-and-Goliath-esque underdog victory. In December, they won a $5,000 prize and a first-place trophy.

Then in April, they did it again, going undefeated the entire season to become back-to-back two-time national champions.

They're the Drexel CS:GO team and their sport of choice is Counter Strike: Global Offensive, a first-person shooter video game. They're one of seven club sports that play video games competitively through Drexel Esports. And their wins against 100 teams in the National Association of Collegiate Esports (NACE) Starleague fall 2021 season, and again in the spring season, were huge accomplishments within a burgeoning collegiate sport.

"This was a big accomplishment, a school coming from basically nothing to winning and becoming the best school in the country at this game," says Noah Vaknin, a third-year software engineering student on the winning CS:GO team. "Maybe it will never reach the sense of pride and accomplishment that [other sports teams] feel, but we've done

BETH ANN DOWNEY

The CS:GO team is Junjie Lin, Noah Vaknin, Jacob Lee, David Stone, James Tran, and William Trampel (not pictured).

The top Counter Strike: Global Offensive team in North America is kind of a big deal (and that trophy smells of rich mahogany).

GAMING

something that I don't think 99 percent of the other teams at our school have done."

Like other athletes, Vaknin has been honing his craft in CS:GO for years, since his early teens. He is approaching 10,000 hours of play in his lifetime, supported by a four-hours-a-day, seven-days-a-week practice schedule. He dreams of someday soon going pro and making a living playing CS:GO.

"My parents weren't always the most supportive, but they've definitely grown on the idea," Vaknin says. "My grandma watches every single game that I play, which is really cool. It's been a really long road to get to where I am. We're not cracking into the pro scene quite yet, but we are definitely all getting there."

Counter Strike: Global Offensive is a team-based, first-person shooter game with an objective of eliminating opposing players while planting/defending or defusing bombs. Each round, or map, unfolds in a new environment with unique advantages and strategic challenges. Every map goes to best of 30, so the first team to 16 wins. A 15-15 draw warrants overtime.

"[My grandma] describes it is as a game of chess," Vaknin says. "You have to maneuver around the opponent. You have to understand why they're doing things that they're doing. And then there's … the strategic element, which is that your body has to keep up with your brain. You have to be able to react."

"The thing I really like about this game is…there's a lot of personality to each player, and there's a lot of coordination, teamwork and also individual talent that goes into the game more than other esports I've seen," adds David Stone, a fourth-year computer science major and the team captain.

Matt Moran, club sports coordinator for Recreational Athletics, hopes the CS:GO victory is just the beginning for Drexel esports.

"It's honestly astounding how fast esports have grown," Moran says. "I think it's the next up-and-coming thing. There's a lot of money involved in it. It's a big, growing organization, so for Drexel to be involved in that even at the club sport level is a huge advantage. You're seeing more and more universities get into it."

Drexel is positioned to ride the esports wave. It has a large gaming community already and gaming-related research partnerships with Comcast Corp., which is completing a new esports stadium in South Philadelphia.

On the academic side, LeBow's Department of Sport Business recently launched an esport business degree program in collaboration with the Antoinette Westphal College of Media Arts & Design.

"My dream is to get us moved to Athletics and also to have an esports facility on campus," says Alexis Malamas, a biomedical engineering student and president of the Drexel Esports Club, which has a social sister organization called Drexel Gaming Association.

"Club sports is definitely the start of it, but us becoming the best university in North America for CS:GO is our golden ticket to that," says Malamas.

> "We literally won North America. How many other teams do that?"
>
> ALEXIS MALAMAS

"We literally won North America. How many other teams do that?"

Drexel esports teams have been accepted into the NACE varsity program, and they have gained access to top-tier facilities operated by Nerd Street Gamers, a gaming venue in Philadelphia. Malamas says she is also working on creating Drexel's own esports league to host their own tournaments with other universities of their choosing.

"More growth would really help us pass this down in the next couple of years when we graduate," says Will Trampel, a fourth-year information systems student on the CS:GO team. "That way, we can keep this going. We don't want this to die. This is something we've invested so much time into and we really care about."

In the meantime, they're just looking forward to the next match, the next laugh, and maybe to find a spot in the Rec Center for that trophy.

"Every time we walk past [it] we'll be like, 'Yeah, that trophy? We won that playing video games,'" Stone says.

Robia Smith-Herman

INCLUSION

She's Helping Students Where They're At

There won't be any "one-size-fits-all" approaches from Drexel's newest staff therapist, who will also be the first to be embedded in both the Counseling Center and the Center for Black Culture.

Robia Smith-Herman was named staff therapist and embedded BIPOC (Black, Indigenous and people of color) specialist in January. A licensed certified social worker, Smith-Herman received her MSS in clinical social work from Bryn Mawr College and brings a decade of experience.

Her arrival reflects Drexel's embrace of a 2021 report by Drexel's Anti-Racism Task Force, in which Black students recommended hiring diverse counseling staff. Citing that report, President John Fry noted a resolve to create a more inclusive and equitable campus.

"You can't turn a blind eye to systemic racism and all the things that disproportionately affect BIPOC individuals," she says.

Smith-Herman relies on integrative therapy that incorporates components of cognitive, dialectical and other forms of behavioral and mental health treatment and focuses on the unique ways that the social environment affects different individuals, to help them shape and tell their own stories.

"It's OK to come in and talk about whatever is important to you in a space that's not judgmental," Smith-Herman says. "Accessing a therapist isn't a scary thing."

To see a gallery of Alumni Weekend 2022 photos, visit drexelmagazine.org.

EVENTS

Back on Campus for Alumni Weekend!

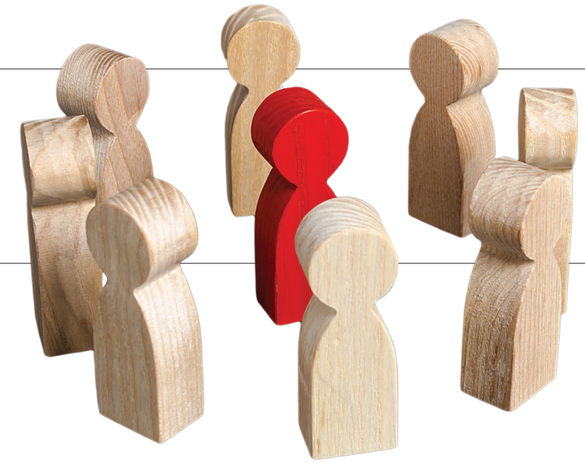
After a three-year hiatus, Dragons returned to campus for an in-person Alumni Weekend on May 19-22. The weekend included a rich variety of activities, from the screening of a documentary, "Frederick Law Olmsted: Designing America," to an open house at the Center for Black Culture to a special breakfast at The Barnes that explored art from a social justice lens.

The 25, 30, 40 and 50-year classes gathered for milestone reunion celebrations, and the Classes of 2019 to 2022 took part in their first-ever on-campus Alumni Weekend as Drexel grads.

Entrepreneurs from the University community exhibited and sold wares including pasta, pottery, spirits and soaps at the new Makers Market Festival. The weekend closed with dancing and fireworks in Drexel Park.

President Fry and Blair Christie '94, '99, induct Cleo Kirkland '78 into the Drexel 100.

RESEARCH



'Good' Students Can Often Be Covert Bullies

Who's being picked on in school, and who's doing the bullying? Research shows that students are adept at perceiving it, even when teachers miss the signs.

A recent study of classroom relational aggression — defined as attempts to damage a person's relationships or social status through shunning or spreading rumors — may point to why that is.

Drexel researchers from the Department of Psychological and Brain Sciences in Drexel's College of Arts and Sciences, along with colleagues from the Center for Violence Prevention at Children's Hospital of Philadelphia (CHOP), observed problematic behaviors in third- through fifth-grade classrooms in Philadelphia.

They evaluated students' academic competence, prosocial behavior, popularity and gender and then determined the contribution of each variable to the probability of a student being identified as relationally aggressive by a teacher and/or peers.

"We found that 10 percent of students were identified as relationally aggressive by their peers, but not by their teacher," says Chandler Puhy, a doctoral student who wrote the study with Associate Professor Brian Daly and two co-authors affiliated with CHOP, Stephen Leff and Tracy E. Waasdorp.

Students with higher levels of academic competence were more likely to be identified as relationally aggressive by their peers, but not by their teacher, and female students were more likely to be identified as relationally aggressive by both their teacher and peers.

The researchers theorized that academic competence could be tied to greater executive functioning — like planning and insight — which could contribute to aggressive behaviors occurring in a more covert manner. Or, alternatively, these students may receive less monitoring from teachers given their on-task behavior, resulting in fewer opportunities for teachers to observe relational aggression.

Their findings, which were published in *School Mental Health*, could help educators more effectively intervene for those at risk of depression, anxiety, physical complaints and conduct problems that result from aggression.

CO-OP

Show & Tell

RAISA SHARIF

BS/MS COMPUTER ENGINEERING '25

In a typical year, more than 92 percent of Drexel's undergraduates participate in the Drexel Co-op program — the University's signature model of education that balances classroom theory with job experience. What does a Drexel co-op look like? In this regular feature, we ask Raisa Sharif, who spent her first co-op tracking social service delivery on SEPTA subways, to show us.
— By Sarah Greenblatt

THE CO-OP
I didn't expect my co-op to put me in the center of an interagency effort to address the needs of people without homes or those with addiction or mental health needs. But it did, and I love it. I'm working as a management analyst in SEPTA's Surface Operations Division. My role is to maintain records related to SEPTA's SCOPE (Safety, Cleaning, Ownership, Partnership, Engagement) initiative. That includes monitoring the deployment of social service workers from three nonprofit organizations who offer resources to those in need. This experience has exposed me to all levels of management that I hoped for, and I've gotten to meet Gov. Tom Wolf, Rep. Matt Bradford, SEPTA General Manager Leslie Richards and even Bon Jovi!

THE OBJECT
This is a map I created of stations within SEPTA's system, highlighting hot spots where vulnerable populations congregate. Volunteers and outreach workers used it on a night in February to tally homeless persons on the street and in SEPTA stations for a bi-annual point-in-time count that the U.S. Department of Housing and Urban Development requires from each county.

JEFF FUSCO

THE TAKEAWAY
Observing the interactions between different agencies, I've come to appreciate how important collaboration and partnerships are. I've also learned that I thrive in a hybrid environment that combines remote and in-person work. As the first person to tackle this job in the first year of a fairly new program, it's been exciting to help put the pieces of the puzzle together. And it's confirmed that I love working in my home city, Philadelphia.

HEALTH

The Opioid-Alzheimer's Connection

Deaths from the nation's opioid crisis have overshadowed another nightmare for communities and families across the United States: the long-term health effects of *nonfatal* opioid overdoses.

Researchers at the Dornsife School of Public Health explored a large body of data on opioid overdose survivors, finding that repeated overdosing can lead to neurodegeneration, which can produce risky behaviors that may make future overdoses more likely.

Led by Janna Ataiants, a senior research scientist, and Stephen Lankenau, professor and associate dean for research, the team plowed new ground in understanding the long-term consequences of repeated nonfatal opioid overdose.

"We found strong evidence in the literature that opioid overdoses lead to these Alzheimer's-like pathologies in the brain," Lankenau says. "We also know that these processes in the body may progress for decades before these symptoms are evident, because of lower rates of health care access for many of those who use opioids."

The Drexel study — published in the *International Journal of Drug Policy* — notes that fatal overdoses that have skyrocketed "might be only the visible tip of a looming iceberg."

The team notes that fatal overdoses constitute only 3–4% of all overdoses.

RESEARCH

The Architecture of Knitted Stitches

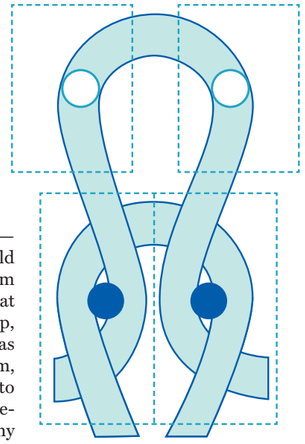
It turns out that the stitches that generations of grandmothers have lovingly knitted into sweaters, mittens and baby booties can inform the design and production of functional fabrics.

David Breen, a professor in the College of Computing & Informatics, led a team that created a suite of algorithms for modeling pathways that yarn takes within a knitted textile. A computer-based modeling and simulation tool Breen's team created, TopoKnit, can provide functional fabric designers and producers with the equivalent of an architectural blueprint.

TopoKnit translates stitch commands — like knit, purl and transfer — as they would appear in a knitting pattern or the program of a digital knitting machine, into a map that shows where the yarn travels, loop by loop, and how it interacts with adjacent loops as the textile is formed. The resulting diagram, called a topology graph, allows designers to pinpoint where a piece of yarn is, with respect to the overall plane of the textile, at any given point within it.

This breakthrough provides textile designers and producers with thread-level detail they need for digital sampling and precision manufacturing of everything from high-performance and technical military gear to high-end fashion concepts.

Building up this baseline design information for knitting comes as researchers show increased interest in knit-and-purl stitches as a basis for making functional fabrics. Breen suggests this is partly because knitting supports more intricate yarn interactions than weaving — an enormous advantage when creating electric circuits. In addition, knitting makes it easier to generate 3D shapes without added manufacturing steps, such as cutting and sewing.



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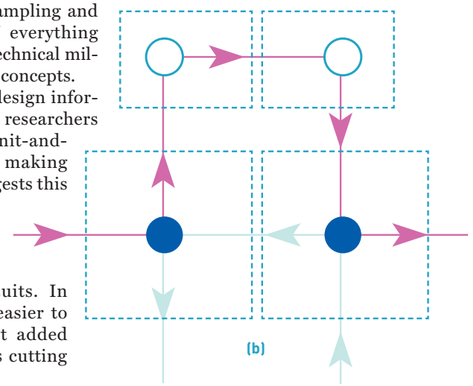


(b)

TopoKnit is a suite of algorithms that can chart the route of yarn by way of a knitted material, which is vital for the successful layout and creation of functional fabrics.

"Knitted fabrics...give designers more entry points to manipulate the material, which makes it very promising for building in new functionality."
DAVID BREEN

Send letters to the editor to **magazine@drexel.edu.**

Doctoral student Lena Champlin is helping parents discuss climate change with children.

Olya Yarychkivska

SHIRA YUDKOFF PHOTOGRAPHY

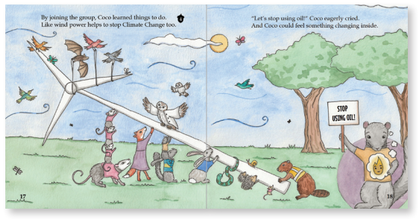
"Hormones play a critical role in regulating depression after a traumatic brain injury."
— Ramesh Raghupathi

COMMUNITY EDUCATION

A Children's Book on Climate Change

A chance encounter at the Academy of Natural Sciences of Drexel University inspired a doctoral student to co-author and illustrate a book that lets young children comprehend the perils facing the planet.

It started when Lena Champlin, who is pursuing her PhD in environmental sciences at the College of Arts and Sciences, engaged a young girl in conversation while she conducted community outreach work at the Academy. After asking the girl what she knows



about climate change, Champlin was stunned when the mother intervened to say the topic was off limits.

Embracing that moment as an opportunity, Champlin decided to join her fiancé, University of Pennsylvania medical student Jeremy Wortzel, in writing a book that explains the process of climate change in language that would engage school-age children.

Thus, "Coco's Fire: Changing Climate Anxiety to Climate Action" was born. Geared toward early elementary school students, the book follows Coco the squirrel and her father as they seek ways to stop climate change. In the process, things that initially worry Coco wind up inspiring her to get to work.

By providing a model for how to have "The Climate Talk" with children, the book tackles apprehension that could prevent some parents from passing along life-saving information.

Champlin and Wortzel, who is studying psychiatry, teamed up with the Climate Committee of the Group for the Advancement of Psychiatry in crafting the message. The goals were to communicate in an age-appropriate way and instill hope for the future.

ACTIVISM

Help for Ukraine

RAZOM, a nonprofit co-founded by alumna Olya Yarychkivska to support Ukraine's independence, has been a lifeline since Russia's invasion began.

Russia's assault on Ukraine displaced millions of citizens, killed thousands of civilians and turned cities into piles of wreckage.

From her home in New York City, Olya Yarychkivska (BS biological sciences '09) observed the events with foreboding, knowing that her grandmother lives alone in Nadvirna, in western Ukraine.

The war quickly became a pivot point for RAZOM, a nonprofit Yarychkivska co-founded in January 2014, just as a democratic uprising known as the Revolution of Dignity gained momentum, leading to the overthrow of President Victor Yanukovych and the Putin-backed government.

The clamor for democracy and closer ties to Europe inspired Yarychkivska and other expatriates to form RAZOM, which means "together," to expand Ukraine's capacity in health care and information technology, to document human rights abuses and to build a network of support for the country around the world. In its first eight years, RAZOM raised $1 million and attracted 1,200 supporters.

The infrastructure created by Yarychkivska and her colleagues empowered RAZOM to deliver life-saving tactical medical equipment, provide hospitals with supplies, distribute communications equipment and give grants to partner organizations that evacuate internally displaced people.

"All of our focus shifted to emergency response," Yarychkivska says. "We've been able to scale up what we do."

A team of drivers delivers supplies by the busload to Dnipro, Donetsk, Kharkiv, Kyiv, Mykolaiv, Odessa and Zaporizhzhia, cities that face heavy bombardment.

"Because we have trusted people on the ground, we can assure our donors that we deliver to the very end users and it doesn't collect dust in a warehouse," Yarychkivska says "It will be immediately be delivered where it's needed to stop the bleeding."

By late April, RAZOM had provided more than 200 tons of medical equipment and communication devices. The organization facilitated the evacuation of more than 300 people from Donetsk in early April, around the same time that a Russian missile struck the train station in Kramatorsk where fleeing civilians had gathered.

The organization also managed a small evacuation of children with spinal muscular atrophy, who use wheelchairs or ventilators that keep them from boarding crowded buses or trains.

RAZOM has raised $40 million since the invasion began.

Voicing gratitude for support Ukraine has received from the U.S. government and citizens, Yarychkivska says there are myriad ways to get involved.

In addition to making donations to RAZOM, Yarychkivska recommends supporting Revive Soldiers Ukraine, a small nonprofit that helps wounded members of the Ukrainian military service. She also recommends using the hashtag #armukrainenow on social media.

"I'm a scientist," says Yarychkivska, a postdoctoral fellow at Rockefeller University. "I never wanted to talk about weapons. But it's the only way to stop the war."
— Sarah Greenblatt

ENVIRONMENT

New Initiative Tackles Environmental Justice

Sustainability and environmental justice are the foci of a new Environmental Collaboratory launched in early 2022 by the University and the Academy of Natural Sciences of Drexel University. The initiative will forge partnerships between academics, community members, industry and the public sector to pursue transdisciplinary, community-based solutions to environmental problems here and abroad.

Leading this groundbreaking initiative is Vice Provost and Executive Director Mathy Vathanaraj Stanislaus, a leader in addressing natural disasters and approaching global environmental issues from a human rights perspective.

Stanislaus previously led efforts to work with policymakers on the impact of polluting facilities in low-income neighborhoods in New York City and he successfully advocated for passage of the country's first laws linking community-based planning with tax credits to rebuild impoverished neighborhoods.

Working with the Environmental Protection Agency, Stanislaus led the federal response to the Superstorm Sandy and Deepwater Horizon disasters and helped address permafrost fracturing in Alaska that forced tribal communities to relocate. As a member of the Obama Administration, he represented the United States in discussions by G-7 nations that established an alliance to decarbonize and conserve natural resources in global supply chains.

He later joined the World Economic Forum, where he assembled CEOs, government officials, academics and leaders of nonprofits to tackle overlapping issues of business and environmental justice, such as human rights issues in the production of batteries and in the mining of lithium and cobalt.

The Collaboratory's first project, supported by the inaugural Glenmede Environmental Collaboratory Research Fund, will be an assessment of actions needed to reduce lead poisoning in West Philadelphia.

MEDICINE

Estrogen's Role in Brain Injury After-Effects

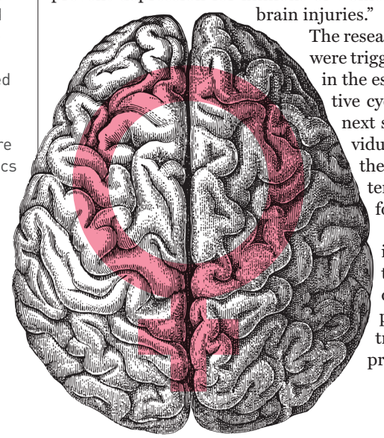
Researchers in the College of Medicine who have studied traumatic brain injuries for decades are revealing new insights about how and why the brains of male and female concussion patients recover differently.

Using swim and maze tests, Professor Ramesh Raghupathi and colleagues found that female rats with past adolescent traumatic brain injury were more likely to develop depression-like behavior in adulthood than their male counterparts. They also found that this behavior — recorded six weeks after the injury — took place during the estrus phase of the reproductive cycle, which takes place after estrogen and progesterone hormone levels drop in the body, suggesting a depression-like characteristic.

The team took this knowledge a step further, blocking estrogen and progesterone receptors with a dose of the drugs tamoxifen and mifepristone during the proestrus phase, when these hormones would otherwise be at their highest levels.

This intervention prevented depression-like behaviors that previously occur only in specific phases of the reproductive cycle — right after the increase in estrogen and progesterone.

"Hormones play a critical role in regulating depression after a traumatic brain injury," Raghupathi reports. "Therapies that target these hormones may help alleviate or even prevent depression for millions of women and girls suffering from a history of these brain injuries."



The researchers determined that the behavioral changes were triggered by a combination of injury and hormones in the estrous period — not by the injury or reproductive cycle alone. This knowledge should inform the next steps in research, such as studies on the individual influence of estrogen and progesterone and the interaction of hormones and neurotransmitter signals in inducing depression-like behaviors following a traumatic brain injury.

"If male and female rats experience the same injury — we find the male rats are more resistant," says Raghupathi. "Regulating hormones during the proestrus phase may open up opportunities for more targeted treatment after a traumatic brain injury rather than the current prolonged prescribing of anti-depressants."

Noel Goodstadt, inventor

Seven Characters

INNOVATION

THE STORY OF NO.

11099089

It can take inventors years to receive an official U.S. patent, usually represented by a seven-digit number. But the full story behind most patents is much longer. When a professor found that he was lacking **a key tool in his field**, he and his colleagues set out to build an alternative that was even better. Their patent was approved in 2021, and this is the story of how it came to be. *— By Mike Unger*

This Drexel-made dynamometer will be far less costly to produce than existing machines.

The Drexel-born dynamometer pinpoints force exerted by a patient, providing a reliable measure of muscle strength.

When Noel Goodstadt arrived at Drexel in **2008** and began working at Drexel Physical Therapy Services, he didn't have access to an isokinetic strength-testing device, considered the gold standard for measuring the muscle force of patients' knees and other joints. While the University does have one now, the devices are expensive, at around **$45,000** each.

Goodstadt and some of his colleagues thought there had to be a better way. A device called a handheld dynamometer was being used in the field, but it has issues as well.

"With the handheld device you can't tell if you're measuring the therapist's force on the person, or the person's force on the therapist," says Goodstadt, who serves Drexel as associate clinical professor of physical therapy and rehabilitation sciences and director of residency programs and human gross anatomy. That leads to unreliable readings, especially if the patient is stronger than the physical therapist.

So in **2014**, Goodstadt formed a project team made up of **five** students from the School of Biomedical Engineering, Science and Health Systems, who came up with a prototype for a portable dynamometer. He then finetuned their prototype with colleagues Arun Ramakrishnan, director of research labs at the College of Nursing and Health Professions; Sheri Silfies, associate professor of exercise science at the University of South Carolina; and Sri Balasubramanian, associate professor at the School of Biomedical Engineering, Science and Health Systems. In August **2021**, the device received patent No. **11099089**.

Their invention is a **one**-foot-tall, portable, extendable machine that attaches to common gym weight equipment. "Through **several** design iterations, we were able to build a sleek, wireless, portable and adaptable device that performed comparably to the gold-standard isokinetic machine," says Ramakrishnan.

Goodstadt believes it allows clinicians to get more reliable readings from their patients. "There are a high rate of subsequent injuries upon return to high-level sports post ACL reconstruction," Goodstadt explains. "The expectation is that if we can get them stronger as **one** of the criteria, and not rush them back but focus on their movement dysfunctions, maybe we can actually lower the number of **second** ACL injuries."

Their goal is to sell the device for between **$1,500** and **$2,500**.

"Securing the patent is a big milestone in terms of commercialization," Ramakrishnan says.

The process has involved Drexel at almost all steps along the way. The group received grants from the ExCITe Center and the Drexel Coulter Translational Research Partnership Program for product development and clinical testing. The device is currently being used at the Drexel Physical Therapy clinic, where they're seeing "great results," Goodstadt says.

"The whole process has been exciting," he says. "Hopefully we can give therapists and potentially personal trainers and athletic trainers and sports performance specialists another option."

FROM THE DAC

ROWING

The Regatta Returns, and Drexel Reigns

Dragons were crowned champions in the 83rd Dad Vail Regatta, the largest collegiate boating race in North America, on May 14, 2022.

Drexel thoroughly dominated the Dad Vail Regatta, where the men's rowing team swept all three eight-man boats and Dragons won in overall points.

It was the first time in three years that the event unfolded before a raucous, screaming audience, thanks to a letup in the pandemic.

The big prize on the Schuykill River — the Varsity 8+ — went to junior Sam DeSilva as coxswain, sophomore Josh Diggons as stroke, junior Roman Smigiel as bow, and teammates graduate student Matt Reilly, senior Dimitrije Ibrocic, junior Damian Lis, sophomore Michael Pazderski, freshman Andrew Manns and senior John Karen. With a time of 5:30.611, the team defeated second-place Colgate University by more than two seconds in Lois Krall III. Their effort marked the third time the men's rowing team won the heavyweight race at Dad Vail, where Dragons had previously brought home the big trophy in 2013 and 2017.

Not to be outdone, Dragons competing in the 2V8+ rowed Lois Krall II to victory, led by senior Billy Ernst as coxswain, sophomore John Little as stroke, sophomore Kosta Petkovic as bow, and teammates graduate student C.J. Rooney, sophomore James Schmidt, senior Herbert De Cokere, freshman Nemanja Sajatovic, junior Sam Valigorsky and senior Jake Miller. The team out-rowed the defending champions, George Washington University, by 12 seconds.

In the 3V8+, junior Alex Dragovits as coxswain, sophomore Lake Watson as stroke, graduate student Chris Cail as bow, and teammates junior Nikola Loncar, junior Richmond Coney, sophomore Nick Perks, junior Sean Blair, sophomore Daniel Yurcisin and sophomore Jack Anderson crossed the finish line in the Sandra Lee Sheller II nearly three seconds ahead of Temple.

The Novice 4+ added to the Dragons' luster, when the all-freshman squad of Emma Houghton as coxswain, Maxwell Frey as stroke and Carter Hubbard as bow joined teammates Sean Williams and Zach Key to earn a silver medal.

In the first day of competition, the women's rowing Novice 8+ team won its heat with more than 13 seconds to spare before going on the next day to earn a gold medal over West Point. Belen Rosales as coxswain and Baylor Henry as stroke led fellow freshman teammates Emily Gresham, Margaret Dobrenko, Maya Jacobsen, Delaney Gellert, Emily Ellis, Ellen McCallin and Bella Lee in the Maria Papadakis.

Overall, the Dragons accumulated 139.75 points in the regatta, giving rival institutions more reason than ever to respect Drexel's water Dragons.

LACROSSE

Top-Seed Turvy

Defeating top-seeded Towson University, the Drexel women's lacrosse team won its first Colonial Athletic Association championship.

The Dragons dominated the No. 1 seed Towson University, starting in the first quarter of the conference title game on May 8, 2022. Led by graduate student Lucy Schneidereith, a midfielder who coincidentally graduated from high school in Towson, Maryland, the team asserted its authority throughout most of the game. In the first 5:29 minutes, the team had tallied a 4-0 score.

The Dragons ended the first quarter 5-3, the second quarter 8-4 and the third quarter 10-8. It was not until the final quarter that Towson clawed its way back to a 10-10 tie.

Less than a minute into overtime, graduate student Colleen Grady passed to attack junior Allison Drake, who found the back of the net, enabling the Drexel women to win 11-10.

Along the way, Schneidereith was credited with four goals, while fellow midfield graduate student Karson Harris, senior midfielder Hayleigh Simpson and Drake each scored two. Goalie graduate student Zoe Bennett made 14 saves, her second-highest total in a remarkable season.

The showdown on Vidas Field marked the second time in as many years that the Dragons had played in the championship game.

SOCCER

Dreamers Never Settle

For Chris Donovan, becoming the second Dragon ever selected in the MLS draft isn't enough. He wants to play in the pros. By Kevin Rossi

Chris Donovan is not one to settle. There's always more to achieve to get to the next level.

In January, Donovan (BS sport management '22) was selected by the Columbus Crew in the third round, 68th overall, of the Major League Soccer SuperDraft, joining Jeff Parke '04 as the only players in Drexel history selected in the pro draft.

"Ever since soccer became my main sport," Donovan says, "that was when I was going to be a professional athlete. From then on, that was the goal."

While proud to be drafted, he knew the selection was only a promise for a tryout, not a guaranteed contract. When his stint with the Crew ended after training camp, he knew he still had work to do to reach his dream.

"It was always going to be tough to make the team," Donovan says. "I didn't get many chances. I spent more of the time off to the side with a couple other trialists. I was trying to make myself get noticed, but that was going to be tough."

In March, he signed with the Philadelphia Union II, formerly the Bethlehem Steel, in MLS NEXT Pro, a new professional league that develops players for the MLS.

Now he has another shot to stand out from the pack and he intends to make the most of it. "It's a certain type of greediness in the game, just wanting more, and being willing to do the dirty work," he says. "The things you don't think get noticed, the coaches, the people who really matter realize them, and it helps the team a lot."

A multisport athlete growing up, he dropped basketball while at Conestoga High School to dedicate himself to soccer. As a senior, he earned 2018 Gatorade Pennsylvania Player of the Year honors.

"Playing professionally was always the goal, but I would always play down the possibility," Donovan says. "I had a good senior year and a lot of people started talking about that being a possibility, but it was really important to shut that out, because it was still four years of college away."

Drexel offered immediate playing time, so he quickly committed. Once on campus, he relied on his offensive talents, like controlling the pace, movement off the ball and aerial skills. After Donovan's strong sophomore season, Michael Marchiano took over as head coach. Donovan says the fresh direction "lights a fire under every player."

"We allow players, whether it's Chris or anybody else, to drive their development," Marchiano says. "How hard do they want to be pushed? How high do they want to dream? We set very high standards in our program."

Donovan credits Marchiano with pushing him to improve his defensive effort to set himself apart from offensive-minded forwards.

"For me, that was it," Donovan recalls. "That was the main thing I improved, especially throughout my final two years. It's what would turn me from an average player into a good player."

"Chris had parts of his game that were easy to recognize would translate to the next level," Marchiano says, "but there were parts of his game that he needed to, and still needs to, work on if he wants to have a career in professional soccer."

Donovan completed a decorated Drexel career. He won numerous awards, notably 2021 CAA Player of the Year, 2021 CoSIDA Academic All-America Second Team, and three first-team CAA selections. Still, he maintains, "for me, it's not about the awards."

"It's just getting to a higher and higher level," he says. "The goal is to get to the MLS."

Never settle. That's how Chris Donovan will achieve his dream.

SIDELINE PHOTOS

JEFF FUSCO

LEADERSHIP

Surrounded by Champions

Maisha Kelly, the first Black woman to direct athletics at a Division I school in Philadelphia, reflects on the forces that shaped her trajectory and brought her back to her hometown. ***By Mike Unger***

It's always game time at the Kelly household. On this Friday afternoon in early November, Maisha Kelly is planning to pick up her children Gregory, 7, and Kennedy, 5, from school so they can head to their new home away from home — the DAC. The men's and women's basketball teams are playing a doubleheader, and the Kellys can't wait to root for their new favorite school. (Her husband, Kevin, is an assistant track and field coach at Temple University, so their kids are Owls fans too, at least in one sport.)

Kelly was tapped as director of athletics in June, replacing Eric Zillmer, who decided to step down in the spring after more than two decades of service. The job is a homecoming for Kelly, who was born and raised in West Mount Airy, in the northwest part of Philadelphia. She earned her undergraduate degree from Saint Joseph's University, where she ran the 400 and 800 meters on the track team and has a master's from Temple.

"It's home," she says. "I love this city because I think it's a tough city, and not just because of Rocky. I love the diversity of Philadelphia. I grew up in one of the most diverse neighborhoods, so given my background of being biracial, it's just such a rich city."

Prior to coming to Drexel, Kelly served as Bucknell University's senior associate director of athletics and senior woman administrator. During her more than 10 years at the school, she oversaw as many as 12 of the 27 varsity athletics programs. She also served as the athletic department's liaison to the academic deans, human resources, financial aid and admissions, student affairs and NCAA compliance. Kelly spearheaded the department's long-range planning, served as the University's deputy Title IX coordinator and played an active role on the President's Diversity Council. In 2011, she created the athletic department's first student-athlete leadership development program, and in 2020 organized the Bucknell Athletics Diversity, Equity and Inclusion Council, comprised of administrators, coaches and student-athletes.

Drexel Magazine spoke with Kelly about the benefits of being a student-athlete, her goals at Drexel and the landscape of collegiate athletics today.

Q: WHEN DID YOU FIRST GET INVOLVED IN ATHLETICS?
A: I always played football in the streets with the boys, and was on the basketball courts. My first sport was swimming. I swam for Philadelphia Parks & Recreation, where city kids got a chance to learn how to swim and then become part of a competitive team. I also learned to play tennis as another early sport. I began, probably around seventh grade, to get really involved in track and field. That just ballooned to become the only sport I did in high school through college.

Q: WHAT DID YOU LEARN ABOUT BEING A STUDENT-ATHLETE DURING YOUR TIME AT ST. JOE'S THAT YOU STILL DRAW ON TODAY AS AN ADMINISTRATOR?
A: Resilience. As a high school student, I was a state champion in Pennsylvania, and there are great expectations that come with early success. And great pressures. Oftentimes, it's how you react and respond to it. I went through those roller-coaster battles. I had a group of champions around me — certainly my mom was my biggest champion. But I had champions in my head coach, the athletic director, my history professor who was the chairman of the department. These people believed in me on or off the track.

Q: WHAT DID SERVING AS A CAPTAIN OF ST. JOE'S TRACK-AND-FIELD TEAM TEACH YOU ABOUT LEADERSHIP?
A: There is a power in your voice. It was really my senior year when I started to get more laser focused. A women's track-and-field program is 35 to 40 people, and you have to figure out how, those times when coaches aren't around, you're helping to build the group and bring

people together toward a common goal.

Q: DID YOU ALWAYS KNOW THAT YOU WANTED TO GET INTO HIGHER ED ATHLETIC ADMINISTRATION?
A: No. I thought I was going to be a doctor, but then I realized I didn't particularly care for seeing blood. Then I was a history major and I thought I'd pursue law school, but I realized I didn't want to be in school for so long. I loved learning but I just don't know that I had four or five more years of school in me. So I got a secondary education degree. My first career was actually as a sixth-grade teacher. In the meantime, I learned that you can make a career in intercollegiate athletics.

Q: YOU WORKED FOR THE NCAA IN INDIANAPOLIS AS ASSISTANT DIRECTOR OF CHAMPIONSHIPS. WHAT DID THAT JOB ENTAIL AND WHAT DID YOU LEARN ABOUT RUNNING A DIVISION I ATHLETIC DEPARTMENT BY WORKING ON THE NCAA SIDE?
A: There's no other place where you can [learn] what the broad spectrum of intercollegiate athletics is, the kinds of institutions that comprise Divisions I, II and III. Division III Oshkosh, Wisconsin, was the first championship that I did. I came back to Pennsylvania to do Division II championships, and I spent multiple weeks at Texas A&M University and University of Texas, so I really had the opportunity to work with administrators and coaches across the spectrum. I learned decision-making, how organizations run and communication.

Q: YOU STAYED AT BUCKNELL FOR ALMOST 11 YEARS. WHAT DID YOU LIKE SO MUCH ABOUT WORKING THERE AND WHAT ARE YOUR PROUDEST ACCOMPLISHMENTS?
A: Initially, I liked just getting back to a campus, one where athletics and academics are done really well. There was really great balance. I look at athletics as a way of life, and at Bucknell, it was really easy to do that. Shortly after my husband and I got married, we had kids, and it was easy to be able to do our two jobs in a way that worked for our family.

We started a Bison Leadership Academy, where we organically built a leadership program. The program became endowed, and the endowment allowed for a full-time staff person committed to leadership programming for student-athletes. Toward the end of my tenure, we launched the Student-Athletes of Color Affinity Group. I remembered my experiences at a predominantly white institution, and I was lucky enough to be part of a team and to be in a city that had terrific values.

Q: WHY DID YOU WANT TO COME TO DREXEL?
A: I was contacted about this opportunity to at least be considered. Geography always mattered to me, and so, wow, this is Philadelphia, I've got to look at this opportunity.

One of the first things I did was I read the strategic plan and the Anti-Racism Task Force's Report. I thought, 'This is an institution that is being quite intentional. They are pausing their work in the moment to really do some things relative to issues that are important to me.'

Then I looked at the basketball teams' success, and I saw what the lacrosse programs were doing, and then I learned that Drexel is a much different place than when I left the city in 2004. I thought, 'Wow, here is an institution that has grown tremendously in the last 20 years.' The student population, the fact that Drexel is an R1 institution, the number of programs that exist and the diversity of the staff, faculty and students, it really resonated with me.

Four months in, that's what I've started to learn. There are good people who work here, and there's a lot of opportunity and promise.

Q: WHAT ARE YOUR PRIORITIES AT DREXEL?
A: Always the No. 1 priority is student-athletes and their experience. We want them to excel academically; there is such a broad scope of intellectual pursuits they can pursue. They have a set of talents that we need to develop to help the competitive success of their programs. It's a way for them to develop themselves and their skillsets. As with academic programs, and certainly our co-op programs, having really strong successful athletic programs helps to develop our university brand. All that gets rolled into helping student-athletes be good people: Preparing them to be leaders, preparing them to be good citizens, regardless of what communities they currently exist in or venture into.

Q: WHAT WOULD YOU WANT CASUAL FANS TO KNOW ABOUT THE STUDENT-ATHLETE EXPERIENCE AT A SCHOOL LIKE DREXEL?
A: There isn't an experience on a college campus like that of a varsity student-athlete, where you get to be on this platform. You're lining up for competition, and there are results and they're publicized. It's a huge time commitment. At Drexel, you're also doing that as a co-op student. No other kind of institutions, separate from other co-op schools, can say that there's this intensive approach and experience that our student-athletes get to have, as it relates to their fitness for life. It's physical. It's academic. It's professional.

Q: ISSUES THAT PEOPLE HEAR ABOUT SURROUNDING COLLEGE ATHLETICS LIKE NAME, IMAGE, LIKENESS AND CONFERENCE REALIGNMENT — HOW IMPORTANT ARE THOSE THINGS AT A SCHOOL LIKE DREXEL?
A: They're important. Are we going to get the seven-figure promotion deal? I don't think so. We probably won't even get the four-figure advertising or promotion deal. But the importance of it is to understand what the opportunity is, and how to manage and engage in that opportunity. For our student-athletes, the opportunity now becomes: We're going to educate you and talk about brand. What does your personal brand mean? What are your values? Those are things you should know separate from being able to make money in this space. Also, it's the right thing for student-athletes to be able to engage the way their non-student-athlete peers do.

Conference realignment is very important to us, too, because you're known by the company you keep. You want to be sure that you're with a collective of member institutions that are aligned with your values, which for us are institutions that are well situated and well thought of in the academic space. Does it create an opportunity for us to compete among some of the best of our peers? You should always understand the landscape in which you're operating.

Q: HOW DOES EXISTING IN A CITY WITH SO MANY PROFESSIONAL SPORTS TEAMS HELP OR HURT DREXEL?
A: I think it helps Drexel. [Men's basketball coach] Zach Spiker is the one who really likes to amplify these reports that [Philadelphia 76'er] Matisse Thybulle was on our campus this summer, working out with our guys. We have some opportunities and relationships on which we can build. We're going to host the NCAA lacrosse championships, and we get to partner with the Eagles at Lincoln Financial. It helps us to be able to gain synergy. There's a place for five institutions within Philadelphia, six with Villanova. There's a rich collegiate landscape as well as the professional landscape. There's a place for us all.

Q: GOT A FAVORITE CHEESESTEAK?
A: I do. Dalessandro's.

2.23.22

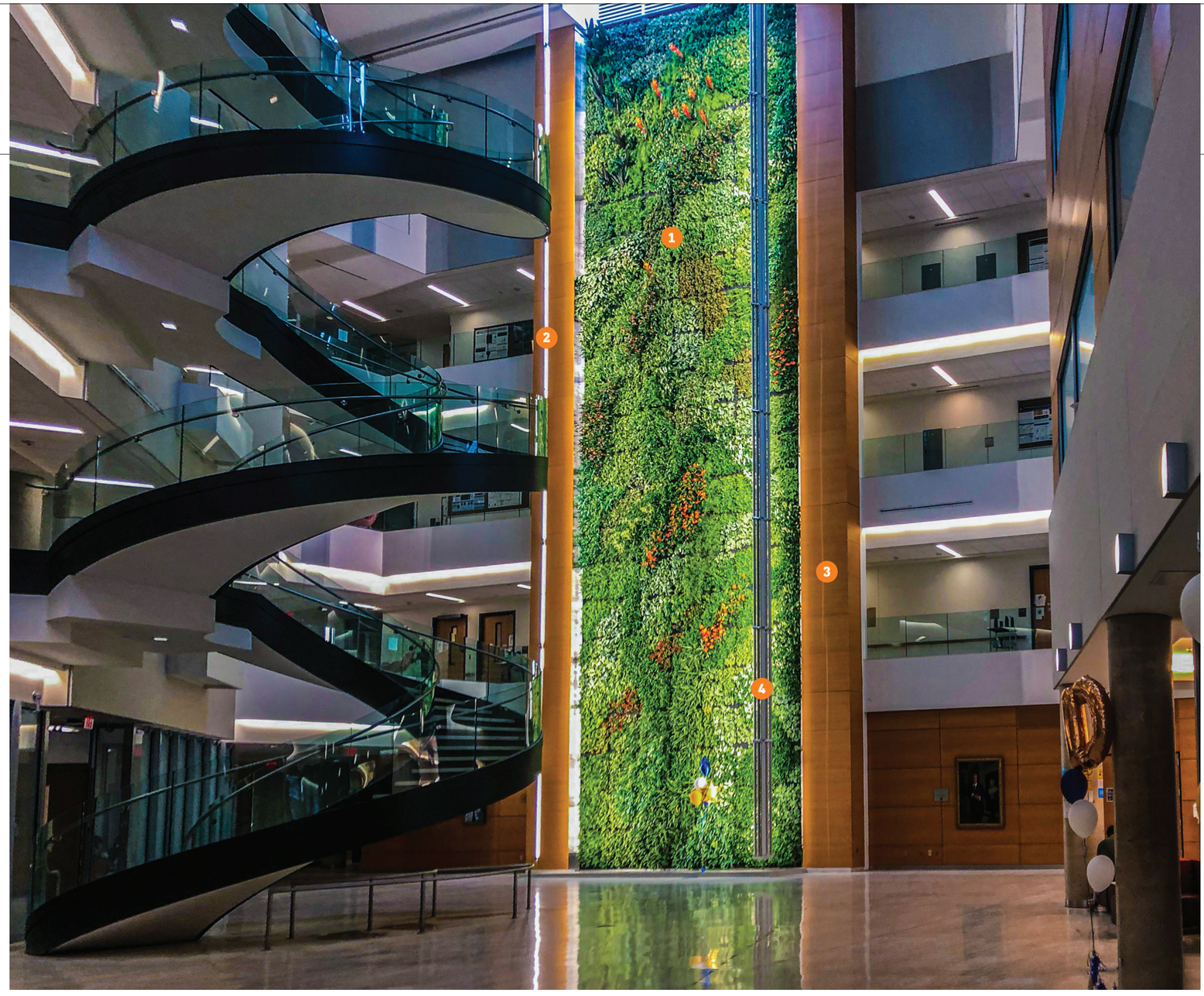
THE BIOWALL

Ten years after it was installed as the largest living biofilter in North America, Drexel's Biowall was successfully renovated and updated over the fall and winter to be greener than ever — in every sense of the word.

Now, the five-story structure in the Papadakis Integrated Sciences Building showcases a larger and more diverse array of plants, arranged in a colorful weaving pattern that also groups together plant materials with similar irrigation needs. A new 100% efficient watering system reuses water and protects the Biowall's structure, which was also replaced and fortified. The new lighting system brings a softer wash of light to the structure.

The seven-month renovation began in 2021 during a university-wide Climate Year initiative. In a 2021-themed twist, supply chain issues stemming from the pandemic caused delays in the shipping and receiving of parts, including microchips and sensors used in the lighting fixtures, as well as some of the plants themselves.

With the conclusion of the seven-month project, these improvements will allow the Biowall to continue as a colorful and noticeable campus landmark for Drexel Dragons. In this case, it's a clear sign that blue and gold makes green. *— Alissa Falcone*



ALISSA FALCONE

1
THE PLANTS
Chinese evergreens, lipstick plants, flamingo flowers and various types of philodendrons and ferns are among the species and cultivars on display. The new Biowall has more than twice the number of plants it used to: 6,762 plants from 26 different species, up from 12.

2
THE LIGHTING
The previous lighting system sometimes caused the plants to dry out and die prematurely. Drexel partnered with Norway-based Intravision Group to design and manufacture a specialized light wash better suited to the Biowall.

3
THE PANELING
The original watering system damaged the structure's wood panels over time. The renovations replaced the damaged panels and added stainless-steel trim and flashing along the 80-foot-high, 20-foot-wide perimeter to prevent water infiltration.

4
THE WATER
Between 80.5 and 161 gallons of water pass through the living wall every day. The efficient irrigation system was designed by EcoWalls to prevent overflow. Each panel receives approximately half a gallon of water one or two times a day. Water not absorbed by plants is captured, treated and then returned to the tank for reuse.

HOW TO SAVE THE WORLD

Thirteen ideas for coping with a changing planet.

ILLUSTRATIONS BY BRIAN STAUFFER

Against a backdrop of wildfires, floods and drought, there is cause for optimism. Drexel Dragons from all walks of life are responding to perils the planet faces with creativity, collaboration and even a degree of confidence. From their respective disciplines, they're converting industrial food waste into plastic, building electric vehicle batteries with domestic materials and helping vulnerable citizens adapt to extreme weather, to name a few. Each is exciting in its potential and gives us hope for the future, because the No. 1 way to save the world is simply to *start somewhere*.

1

MAKE 'PLASTIC' FROM FOOD WASTE

What if producing and discarding plastic could actually help the environment? Researchers in Drexel's Natural Materials and Polymer Processing Lab are exploring ways to make the materials a little more bio friendly.

Faculty and students are studying how to produce composites for consumer or commercial uses that incorporate industrial food waste. Their research could help to reduce massive greenhouse gas emissions that result from the production of petroleum-based plastics, while also decreasing the volume of plastic pollution. In the process, they hope to divert tons of industrial food waste that would otherwise wind up in landfills and produce harmful methane gas.

Leading this environmental research trifecta is Caroline Schauer, associate dean for research and faculty affairs at the College of Engineering and a professor in the Department of Materials Science, who was appointed the inaugural Margaret C. Burns Chair in Engineering in 2021.

"By 2050, there will be more plastic in the ocean than fish," Schauer says. "That's not that far off."

Some of Schauer's protégés are developing polymer composites made with coffee grounds, spent grains from breweries and distilleries, and cranberry and apple pomace left over from juice-making.

Doctoral student Emma Snelling is focusing on the use of cranberry pomace and spent grains as filler material in polymers made from polylactic acid (PLA), which is synthesized from renewable sources such as corn. Snelling is studying the pomace and spent grain's potential to strengthen or otherwise enhance PLA's mechanical properties. This is important, Snelling notes, since recycling plastic diminishes its strength.

Should cranberry pomace prove to be an effective filler for biopolymers like PLA, it could create a durable material that could be repurposed repeatedly.

It would also solve the dilemma of how to dispose of cranberry pomace, which is a problem unique to the United States, Schauer says, because Americans alone have a taste for the sour fruit. Because cranberry growers have, in the past, discarded about one fourth of their annual harvest to sustain market prices, she adds, "we have all of this waste that really doesn't have a good home."

In addition to processing polymers that are environmentally friendly, the lab is also focused on their end-of-life repercussions.

Where Snelling's research could give birth to hardy new composites, doctoral student Emily Herbert is studying their equally impactful demise — and their potentially beneficial legacy.

Herbert's research examines what happens when bacteria feed on spent grains and coffee grounds that have been incorporated into PLA and polycaprolactone (PCL), a biodegradable polyester. Using reactor vessels that contain either seawater or soil, Herbert is watching how effectively bacteria are able to break down the novel polymers. She's also analyzing the spoils.

"Any kind of chemical breakdown is a win, honestly," Herbert explains. "It really depends on how the bacteria behave and how they break foods down. What those byproducts are will determine how they could be useful."

Polymers may not reliably break down into Earth-friendly components without some kind of controlled intervention, Herbert says, but ideally, "you could throw this thing into the garden or the ocean."

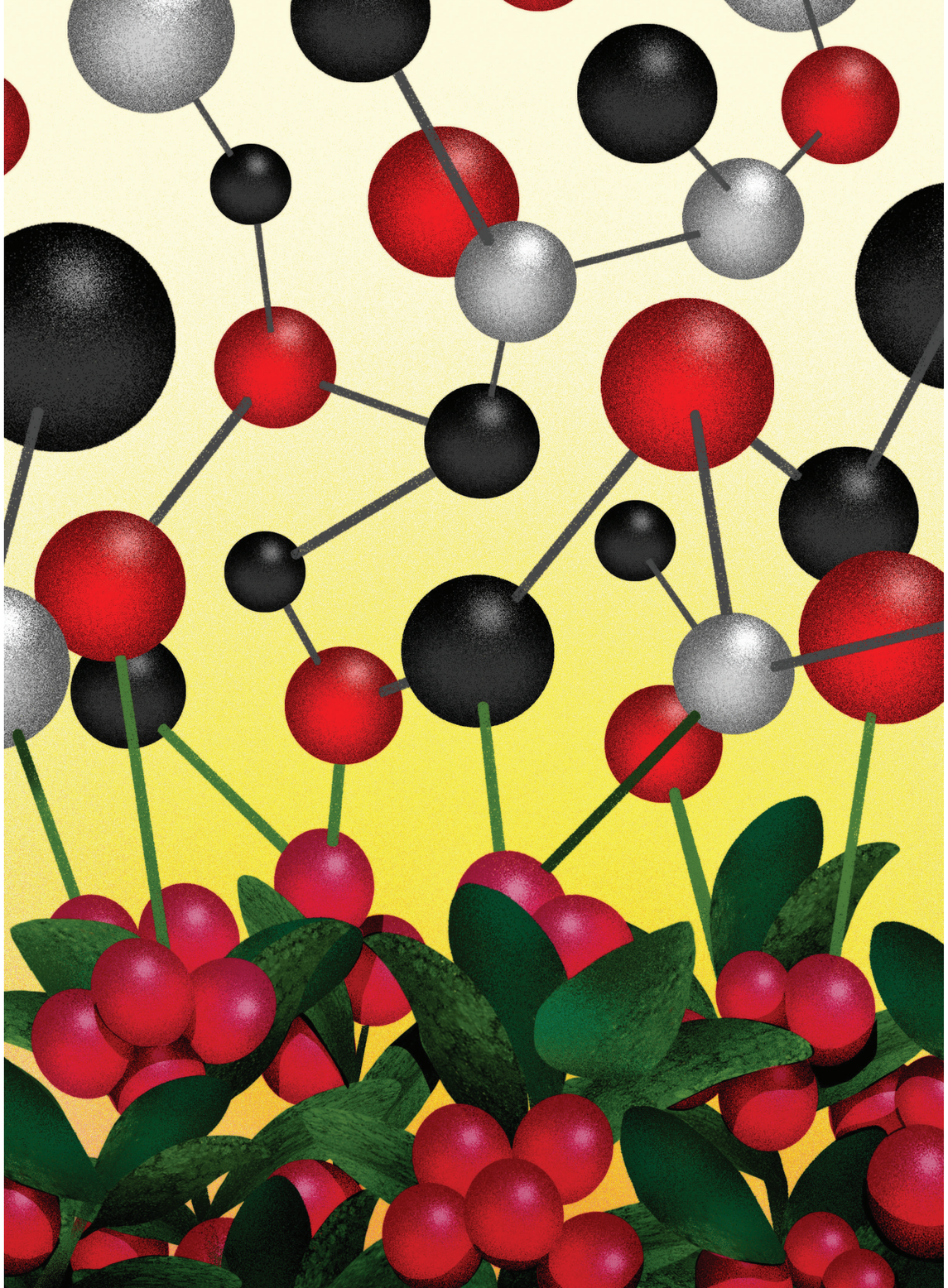
Because bacteria have demonstrated a keen appetite for spent grain, composites that contain it would degrade quickly, Schauer says.

"That could be good, if it's a food liner that you use once and then throw away," Schauer says.

While scientists around the globe are devising strategies for improving polymers, Schauer's lab has the capacity to prototype the materials as consumer goods.

"BY 2050, THERE WILL BE MORE PLASTIC IN THE OCEAN THAN FISH."

— Caroline Schauer



Cranberry pomace is a waste byproduct that may be a suitable material to make polymer composites that can be recycled repeatedly.

"Great, you can make a polymer, but how does it become a computer or a cup?" she asks. "And that's where we come in. A big focus is on how to produce these things. That's really the next step."

In three years' time, Schauer estimates, composites being tested and produced in her lab could be ready to attract the interest of commercial producers. From there, it could be another year or two before consumers will find such items on store shelves.

In the meantime, the "Recycling of Materials" course Schauer teaches each spring is among just nine offered in the country, according to a 2021 article in *Recycling* that examined 105 universities with environmental engineering or polymer science programs.

"Drexel is at the forefront, not just in research but also in pedagogy," Schauer says.

SARAH GREENBLATT

2

FIND GOOD (RE)USES FOR BAD THINGS

Styrofoam is among the planet's most problematic products. It's neither biodegradable nor recyclable, and when exposed to sunlight or burned, it releases toxic contaminants into the air and water. It is estimated to make up some 30 percent of landfill waste and has a lifespan of hundreds of years.

So anything that can give Styrofoam a second life as a nontoxic, biodegradable force for good in the world is a win.

College of Engineering Assistant Professor Yaghoob Amir Farnam has spent a good part of his research career seeking ways to make concrete in structures and roadways more durable, often with a sustainability twist.

One of his inventions is a new process that can convert ash waste from coal-fired power plants into a versatile new construction material, called SPoRA. The affordable, customizable aggregate can be mixed with con-

crete to give it properties desired by the builder, at a lower cost than alternatives, while diverting waste from landfills.

More recently, he has turned his attention to roads and highways in cold climates, and how to protect them from damage caused by the freeze-thaw cycle and road salt.

"So many bridges and roads are made of concrete, which leads to potholes, cracks, corrosion," says Farnam. "In Pennsylvania we use a lot of salt, we have rain and snow. One of the things to do to improve the durability of concrete is protect it, to put a layer on top so water and corrosive chemicals can't get into the concrete."

The solution he's working on is a road spray made from a cocktail of soybean oil and Styrofoam.

With his sponsor, the Indiana Soybean Producers Alliance, Farnam tested a compound, soy methyl ester-polystyrene (SME-PS), as a concrete protectant.

Farnam says the spray already is being used on roadways in the Midwest. His testing determined that it would also work in the Northeast, where rapid temperature changes and humidity, coupled with heavy salt use, take a toll on concrete.

"We understand the mechanism behind this behavior and it shows better results," he says. "Sealants have been around for decades, but SME-PS is a bio-based protectant that not only improves the durability by physically sealing the surface, but also by blocking concrete surface pores through beneficial non-destructive chemical interactions, which is why it is better."

While the protective spray doesn't eliminate the need for road salt, which is itself damaging to the environment, the nontoxic and biodegradable SME-PS mix could mean less is needed. And it could eliminate potentially hazardous cracks and potholes, Farnam says, which would save states money.

Soybean oil and Styrofoam work well together, Farnam says. The soybean oil is liquidy; the Styrofoam makes it more viscous, he explains.

"Like water plus honey," he says. "It gets into the porous structure of concrete, and it stays there."

Farnam says his road treatment mix may not solve the entire Styrofoam waste problem — after all, the mix is just 3 percent Styrofoam. "But it could be part of the solution," he says.

Farnam plans to encourage state transportation departments to implement the technique, starting with Pennsylvania, which has almost 252,000 miles of roads — making it one of the most highly paved in the country.

"Our results are very promising," he says. "Imagine if it was applied to all roads in Pennsylvania? It could add up to something huge."

AMY WORDEN

Blending soybean oil with Styrofoam produces a nontoxic, biodegradeable sealant that extends the life of paved roads.

3

BUILD AN ECO-FRIENDLY BATTERY

Global electric vehicle sales more than doubled in 2021, and that has driven surging demand for battery cathode materials like nickel, manganese and cobalt extracted from countries with poor environmental and human rights records like Congo and China.

For years, engineers have dreamed of using sulfur instead to power batteries for cars, computers and phones. Sulfur exists in vast quantities in the United States because it is a waste product of petroleum production. It promises to extend battery capacity three-fold, while alleviating both supply-chain constraints and sustainability worries.

Until now, however, sulfur has proven to be incompatible with electrolytes in Li-ion batteries.

But recently a team in Drexel's College of Engineering discovered a way to stabilize a rare chemical phase of sulfur that can function with carbonate electrolyte — the energy-transport liquid used in existing Li-ion batteries. Their discovery finally puts the sought-after sulphur technology within commercial reach.

"Having a cathode that works with the carbonate electrolyte that [Li-ion batteries] already use is the path of least resistance for commercial manufacturers," says Vibha Kalra, the George B. Francis Chair professor in the College's Department of Chemical and Biological Engineering, who led the breakthrough study published in the journal *Communications Chemistry*. "So rather than pushing for the industry adoption of a new electrolyte, our goal was to make a cathode that could work in the pre-existing Li-ion electrolyte system."

And if that doesn't rev motors, the team recently completed a year-long test of their sulfur cathode and saw no degradation in the stability or performance of the battery over 4,000 charges — equivalent to 10 years of use.

BRITT FAULSTICK AND ADAM STONE

By stabilizing a rare chemical phase of sulfur, Drexel researchers found a way to dramatically extend the life of Li-ion batteries.

4

HELP URBAN DWELLERS ADAPT TO HEAT AND FLOODS

Civil and environmental engineering Professor Franco Montalto and his students devise powerful tools to help residents of local neighborhoods cope with scorching heat and flood waters.

His students are working on three projects — in Hunting Park and Eastwick sections of Philadelphia and in Camden in New Jersey — that could help local partners apply for hundreds of millions of dollars in federal funding and grants to address extreme heat and rising water in vulnerable neighborhoods.

In Philadelphia's Hunting Park neighborhood, Montalto's research team is developing cooling strategies urgently needed due to that community's sparse tree canopy, abundant pavement and black tar roofs and general lack of air conditioning. The project began during the first summer of COVID, when public cooling places like libraries, senior centers and pools were closing.

Montalto's research team, working in conjunction with the community group Esperanza, devised a plan to install 130 benches with attached planters and umbrellas, providing shade along several streets. They also distributed sprinklers so residents could cool the pavement during the day, reducing the heat it releases at night, when the so-called "urban heat island" is at its worst.

The program also provided 15 jobs to local residents who were trained in carpentry and horticulture in order to build and deploy the bench planter shade structures. Others were hired by Esperanza to monitor the temperature and humidity of the neighborhood.

The project was so popular, Esperanza kept getting phone calls from people wanting bench planters on their own blocks, Montalto says. Inspired by the program, shade-hungry residents also started requesting more street trees from the Pennsylvania Horticulture Society, Montalto adds.

Montalto and Esperanza have received a third round of funding from the William Penn Foundation to cool three more blocks in Hunting Park and also to extend the project into three other heat-vulnerable neighborhoods.

"Installing 30 umbrellas up and down one block doesn't measurably change air temperature in the community, but it does provide localized relief from the sun's radiation," Montalto says. "Now, you can actually go outside on a hot day and experience some air movement while you sit under an umbrella. And you get other benefits, like interacting with your neighbors."

The project has a social justice component, too. A study by researchers at the Dornsife School of Public Health shows that the heat vulnerability in Philadelphia neighborhoods dominated by Black and low-income residents is likely a legacy of redlining by banks. The study — led by Leah H. Schinasi, Chahita Kanungo, Sharrelle Barber, Loni Tabb and Irene Headen and published in early 2022 by the *Journal of Urban Health* — links a history of institutional racism within the housing market to present-day disparities in heat vulnerability in numerous city neighborhoods.

Another climate impact is worsening floods. In the Eastwick section of Philadelphia, residents have experienced excessive flooding for decades, with little progress made on a solution. Montalto's students are developing predictive modeling tools that planners can use to assess whether flooding in the community can be reduced by building a levee, trapping stormwater higher up in the watershed or relocating residents of the most flood-prone areas to city-owned land on a higher elevation through a land swap similar to one in New Orleans after Hurricane Katrina.

Other students in Montalto's hydrologic and hydraulic modeling class have simulated the flow of wastewater and stormwater through the Cramer Hill neighborhood of Camden, New Jersey, where sewers regularly overflow into the Delaware River. The team is exploring whether sewer overflows and flooding can be reduced by diverting flows from Pennsauken, a municipality to the North, away from Cramer Hill's sewer pipes.

Graduate student Brandon Hensyl worked on the Cramer Hill project with Montalto and almost got stuck there during Hurricane Ida in 2021. The experience brought the issue home for him, as did a resident's comment at a community meeting.

"Someone said that '10 years ago, if they asked what the major problem was in Camden, they would have said crime; if they asked now, people agreed it would be flooding,'" Hensyl recalls.

The Camden County Municipal Utilities Authority asked Montalto's students to present their data to city officials, and they are using it to seek FEMA support for restructuring their sewer system.

"What's unique about what we're doing is the integration of real-world problems and partners into research, teaching and mentorship," Montalto says. "What I'm hearing from students is that they're worried about climate change. They don't want to wait until they graduate to get involved."

Montalto, who runs Drexel's Sustainable Water Resource Engineering Lab, was instrumental in launching the groundbreaking Environmental Collaboratory in 2021 that unites Drexel, the Academy of Natural Sciences of Drexel University and marginalized communities in collaborative sustainability efforts.

CAREN CHESLER

"WHAT'S UNIQUE ABOUT WHAT WE'RE DOING IS THE INTEGRATION OF REAL WORLD PROBLEMS AND PARTNERS."

— Franco Montalto

5

CUT THROUGH CLIMATE APATHY

A new class at Drexel is tackling the very real dilemma of climate apathy head-on by asking students to consider how different approaches to film and video influence viewers — and to put theory to practice in a public film festival of their own.

The class, "Climate Films & Advocacy," was co-taught last fall for the first time by Ben Kalina, an assistant professor of film and television in the Antoinette Westphal College of Media Arts & Design; and Elizabeth Watson, an associate professor in the College of Arts and Sciences and senior scientist at the Academy of Natural Sciences of Drexel University.

"The goal was to give students a sense of agency in figuring out how to address climate change through communication," says Kalina, who is also an award-winning documentary producer and director.

Kalina and Watson structured the class around weekly film screenings, which culminated in panel discussions involving filmmakers, scientists, practitioners and others that delved into the topics addressed in the films. These conversations were moderated by small groups of the students themselves. Kalina says it was important to include a variety of genres and approaches among the films shown, so students could reflect on the impact of, for example, hopeful films versus darker ones, or character-driven films versus those that are more factually focused.

At the end of the term, students collaboratively organized "Cinema for the Climate," a public film festival that ran in December 2021.

"Students signed up for different roles to organize the festival, and that really allowed different entry points in the idea that to get involved in climate justice activism, you can ask, 'How do my talents intersect with this problem?'" Watson says. "We had people who made artwork, we had writers, people who ran the technical side

— there were a lot of different ways to be involved, which I think is true for any event or organization."

At the festival, students distributed pre-film and post-film surveys, to assess how effective the films were in shifting people's attitudes, however slightly.

One student, Lauren Jackson, says that the class inspired her to pursue a career in environmental documentary filmmaking. The class also convinced her that the most effective way to communicate about climate change is by connecting to our universal humanity, rather than sticking to scientific facts or political ideology, she says.

"It is generally much more effective to be practical, encouraging and solution-oriented, as opposed to pessimistic or worst-case scenario oriented, which may overwhelm people and scare them away," she says.

KATIE GILBERT

6

GET SMART ABOUT USING DATA (AND BEES HELP, TOO)

It used to be that "sustainable building" just meant LEED certification, but today it's much more. Kaya M. Gentile (BS environmental engineering '20) is using data, artificial intelligence and even honeybee ambassadors to make a portfolio of over four million square feet of real estate more environmentally friendly.

"We are operating buildings with multimillion-dollar budgets for cooling in the summer and multimillion-dollar budgets for water usage, so there is a big opportunity here to optimize the use of resources," says Gentile, a sustainability analyst with global real estate investment and facilities management company Hines, in New York City.

Take trash, for example. It's either going to a landfill, a recycling plant, or a composting operation. A building manager can help to optimize those outcomes and decrease the landfill proportion.

"We have a major endeavor to wrap our hands around the data," she says. "In New York City, you have a waste management broker, you have the trash haulers, and you get some data from each of them — but it typically comes six to eight weeks later, and it doesn't show you the full story," she says.

To get better insights, she's leading an effort on behalf of a Hines client to track trash from the source of the waste all the way to the landfill. "One of our major projects is to roll out sensors within individual trash cans, in individual dumpsters — actual camera sensors that are run with artificial intelligence and report to a dashboard," she says.

Data reveals what's being picked up and when, among other things. That makes it possible to optimize the routes of trash trucks, so they aren't picking up empty cans, thus cutting down on harmful emissions. If occupants are contaminating the recycling with trash, or if food waste isn't being composted, building managers can adjust.

Bees help, too. As part of her efforts, Gentile has put beehives atop numerous office buildings, both to boost the pollinator population and to get people talking about sustainability.

"This is one of the most engaging ways to bring out the idea that we all live in an ecosystem, even within major metropolitan areas," Gentile says. "Where does your food come from? What plants grow natively? The bees give us a way to engage people on all sorts of sustainability topics."

ADAM STONE

7

DESIGN BUILDINGS TO USE LESS ENERGY

Buildings are power hogs, consuming 40 percent of the world's energy. That's especially true of health care and academic research buildings, which typically consume three times more.

Growing food indoors brings healthy fruits and vegetables closer to home for city residents, reducing the carbon costs of transporting food long distances.

Which means Ballinger Associate Principal Mike Radio (BS mechanical engineering '07) had his work cut out for him when he took the lead engineer role for the new 450,000-square-foot Drexel University Health Sciences building being developed by Drexel's uCity Square partner Wexford Science & Technology.

Once complete, the tower at 36th and Market streets will become home to the College of Nursing and Health Sciences and the administrative units of the College of Medicine.

"Many of these buildings are occupied 24 hours a day," Radio says. That means round-the-clock heating and cooling, plus energy-intensive equipment. At the same time, it is critical to maintain healthy indoor environments with clean outdoor air. Conventional methods for conditioning air can increase energy demands even further.

Radio is leveraging state-of-the-art tools and strategies to reduce the carbon footprint. This means finding creative ways to deal with "waste heat" — all the heat generated by human activity, equipment, lighting and so on. Rather than blow it out into the atmosphere, he's instead looking to use that heat to pre-warm outdoor air coming into the building.

In addition, Radio is examining how the heating and cooling systems interact with the building's envelope, insulation and lighting systems. It's a multi-team, multi-disciplinary approach to sustainability. "Decisions have to be understood by the developers, the contractors, the design architects," he says.

The work combines his interests in design, architecture and engineering. As a Drexel student, he did a co-op in the water industry and another in light-rail public transportation, but it was a stint in the building industry that pulled it all together for him.

"I saw a way to blend all of my passions and also have an impact on society," he says. "In my role, I can influence the design of buildings and drive sustainability."

His efforts are projected to reduce the building's energy usage by 40% and its fossil fuel emissions by over 60%, compared with a typical code-compliant building.

"It's not acceptable to just design a code-compliant building...it's paramount that we reduce the carbon footprint," says Radio.

ADAM STONE

8

DESIGN ETHICALLY

The inventor of the ubiquitous K-Cup coffee pods, John Sylvan, doesn't have a Keurig machine himself and has said that he regrets inventing the notoriously wasteful single-use coffees.

Maybe, if he had had a different kind of design education, he would have placed more importance on the waste-stream impact of his idea from the beginning.

That notion — that designers should think before they produce — energizes Raja Schaar and Chris Baeza, both program leaders and faculty members in the Antoinette Westphal College of Media Arts & Design.

They've incorporated a revolutionary ethic into their design courses at Drexel, in which they ask students to pause and reflect about the overall ethical implications of what they bring into the world.

"The ultimate goal is to get students to think more critically about their work," says Schaar, who is program director and assistant professor of product design.

What students really crave is "applied ethics," which means thinking about "'Who do I become?' or what it means to do no harm," says Baeza, who is the design and merchandising program director and assistant teaching professor.

In 2020, the two developed a course centered on embedding ethics in designing for climate change. For the course, they created a speculative world-building game inspired by the game "Afro-Rithms from the Future," by Lonny Avi Brooks and Eli Kosminsky. Their game, "Cli-Fi Futures," is based on themes of apocalyptic climate fiction ("cli-fi") and Afrofu-

turism — a cultural aesthetic that explores the intersection of African diaspora culture with technology to reimagine history and envision a more hopeful future.

"Cli-Fi Futures" uses cautionary tales, doomsday scenarios and real and imagined climate disasters to help designers forecast the impact of their decisions.

"Just because we can design things, ought we?" asks Schaar. "Does this design need to exist in the world? The game connects these ideas."

"Cli-Fi Futures" is made up of "tension" cards (migration/racial equity/ecotopia) that asks participants to set priorities in designing a fictional world for better or worse, by mixing "inspiration" cards (food systems/sustainable housing/education) and "objects" (shoes/drones/trash cans) to factor in the role of design.

The two have presented their game at conferences and workshops around the country to high school students, academics, industry and even a design thinking group within the Department of Defense.

Both previously worked in industries known for placing the highest value on generating new and more things, regardless of the societal consequences.

Baeza and Schaar both arrived at Drexel in 2016; Baeza from Immaculata University and a 25 year-career in the fashion industry and Schaar from Wallace H. Coulter Department of Biomedical Engineering at Emory and Georgia Tech. The two immediately bonded over the notion that something vital was missing from the design curriculum.

Baeza was moved by the notion that it was time to break free of the philosophy of "design for design's sake."

In one classroom scenario, students were asked to imagine themselves as the inventors of plastics, once seen as life-changing and now recognized as having a catastrophic impact on the environment. "Given what we know today, might they have made different decisions? Can we be more sensitive, predictive way further out?" Baeza asks.

Or consider one-for-one fashion brands, where one item is donated for every item purchased, she says. They have a social mission to provide products for marginalized groups, yet many products are made of material that doesn't degrade, or that can't be reused or upcycled.

Through the "Cli-Fi Futures" world-building game, students respond to climate doomsday scenarios, imagining the enduring environmental impact of their decisions.

"We have the ability to predict, but lack the ability to imagine the future," Schaar observes.

"Could we build it better? How can we divert product from the landfill?," asks Baeza.

This summer, Schaar and Baeza are working on a grant they received to collaborate with colleagues Justin Henriques, Carissa Henriques and Kyle Gipson at James Madison University on empowering students to lead climate-resilient change. The goal, they say, is to develop a suite of open-source tools that build on speculative and sustainable design to inspire students to think more critically about their responsibility as designers to act as stewards of the planet.

AMY WORDEN

9

LEAVE NO COMMUNITY BEHIND

Being green is relatively simple when you have the luxury of options. But many of the world's citizens live in challenging corners of the world — like the residents of Tyonek, Alaska.

Tyonek is a tiny, remote village of Athabaskan-speaking Native Alaskans, located 40 miles from Anchorage and accessible only by boat. Residents there are fed up with their outdated, unreliable — and very costly — energy system.

They want affordable, renewable energy instead — and through a unique nonprofit called Community and College Partners Program (C2P2), students in a Drexel senior capstone class are working to make Tyonek's dream a reality.

The seniors and their faculty advisor Mira Olson, an associate professor in the College of Engineering and a co-founder of Drexel's Peace Engineering program, learned about Tyonek from a contact of Olson's at C2P2.

The nonprofit connects universities — and in some cases, funding — to underserved communities in need of pro bono technical work, with a mission of honoring communities' self-identified needs.

"The community repeatedly expressed interest in developing a renewable energy source to decrease its unaffordable energy costs," says Kathryn Ryan, who's earning her BS in actuarial science through Drexel's custom-design major. "That means we need to design a whole new energy system and understand the upfront costs."

Tyonek's boat-only location increases the cost and complexity of some options, such as wind turbines, which are preferred by the community but would be expensive to transport. So the five students are also exploring solar power, and they've prepared energy costs and savings estimates for the community to evaluate. Next year's class of seniors will take up the project and see it through in consultation with residents.

"Research and innovation should be directed at what society needs, and who are we to say what an individual community needs?" Olson says. "If we want to build something that's useful for people, it should be co-developed with people who will be using it."

KATIE GILBERT

10

BAN SINGLE-USE PLASTICS

Since the 1970s, the volume of plastics in our garbage has jumped from 2% to 13%, and almost none of that can be recycled, warns College of Arts and Sciences Professor Diane Sicotte.

An environmental sociologist who studies the natural gas and petroleum industries, Sicotte has turned her scholarship toward illuminating the grave environmental risk posed by single-use plastics and advocating for their outlaw.

"Plastic manufacturers put a recycling arrow on the bottom of the container," Sicotte says. "So of course, people think it's recyclable. But the problem is, they are made out of so many different components and formulas. That's why we can't talk about 'plastic;' we have to talk about 'plastics.'"

Those impurities mean that when it's time to recycle plastics into other goods, many can only be downcycled into something less valuable (like a plastic container that's used for a toothbrush handle). So unlike recycled glass, paper and metal, there isn't much of a market for recycled plastics.

The result is that at least 50 percent of what we say is recycled in the United States is actually discarded or shipped overseas. Plastics wind up in our waterways, in our seafood, and ultimately, in our bodies.

"Plastics are made from petrochemical substances like ethane," Sicotte says. "In Louisiana and Texas, where most of the plastics are made in this country, people are breathing toxic and carcinogenic substances. And when you dispose of plastic in the United States, it gets disposed of, usually, in poor communities of color."

"All of this stuff is not only producing harm for the earth and animals and people, but also producing injustice," Sicotte says.

Municipal and statewide bans on plastic shopping bags are growing coast to coast, with Philadelphia's going into effect just this year. But Sicotte says it's a mistake to think that this problem can be solved on the local level.

Instead, she recommends a mix of laws and policy incentives such as those adopted in European countries that have helped reduce waste at the source, increased recycling rates and shifted the costs associated with waste disposal from the public to plastics producers and retailers using plastic packaging. Her scholarship also advocates for passage of federal legislation banning the sale of the most ubiquitous single-use plastic items.

Knowing that we can't recycle our way out of the problem, Sicotte argues, we must reduce the volume we produce.

MIKE UNGER

11

EMPOWER THE CHANGE AGENTS

Since the early 2000s, numerous U.S. cities have published plans aimed at making their municipalities more sustainable and climate resilient. But city plans aren't usually the key to advancing sustainability, according to Alexis Schulman, a professor in the College of Arts and Sciences who has been studying the specific factors that put local governments on a path to success.

While citywide plans can affect improvements at the margins, systemic change actually happens through decisions that are much less visible, often made in policy silos and pushed forward by influential individuals and organizations during periods of upheaval, she says.

"What you need are these windows of opportunity precipitated by crises, where change agents can say, 'Hey there's a problem here. We all see that. I have the solution,'" she says.

"PLASTIC GETS DISPOSED OF, USUALLY, IN POOR COMMUNITIES OF COLOR."

— Diane Sicotte

Schulman observed such a scenario at the Philadelphia Water Department (PWD) in the late '90s. At the time, the utility was under pressure by the state environmental agency to develop a plan to manage its sewage overflows in compliance with the federal Clean Water Act. Two-thirds of Philadelphia relies on a combined sewer system that collects stormwater and sewage in a single pipe. During rainstorms, this wastewater exceeds the capacity of the sewer system or the treatment plant, and billions of gallons of diluted raw sewage is dumped into local streams and rivers every year.

Typically, a city deals with this problem by constructing an underground water storage tunnel — which would have cost Philadelphia an estimated $5 to $6 billion.

But a middle manager named Howard Neukrug saw a better way, Schulman says.

"He told his team to start exploring other options from the world of stormwater control — controlling stormwater as it falls through infiltration practices and keeping it out of the sewer system entirely," she says.

Neukrug had the blessings of the Water Commissioner and the advantage of working in a city where the water utility was a single integrated authority overseeing all sewage, drinking water and stormwater runoff — a rarity among big cities.

Nonetheless, he faced significant internal opposition from water engineers who were used to doing things the "old way"— with tunnels and pipes. He was able to leverage support for his plan from important external actors, including historically adversarial environmental nonprofits and EPA policymakers, who were increasingly supportive of city efforts to use greenscaping practices to control sewage overflows.

After nearly two decades of planning and persuasion, in 2011 Philadelphia's 25-year plan called Green City Clean Waters was approved — the same year that Neukrug, now recognized as a national authority in the water industry, was named Philadelphia's Water Commissioner. One decade later, the Philadelphia Water Department is meeting its benchmarks and has installed over 800 projects citywide.

Challenges remain, Schulman says, but the plan has put Philadelphia at the vanguard of investments in green infrastructure.

"It didn't happen because everyone in the water department was like, 'We want to be sustainable, this is the right thing to do, or because of Philadelphia's sustainability plan,'" says Schulman. "It happened because of a quirk of history that integrated the utility, it happened because of good timing, and it happened especially because of this internal champion who seized this opportunity to make change."

MIKE UNGER

12

URBAN INDOOR 'FOOD MACHINES'

Imagine the carbon savings if cities could grow their own fruit and vegetables year-round in specially built indoor farms downtown, rather

than have to ship their food from other parts of the country.

"Most of us in Philadelphia get our produce from California. It's grown and harvested, and then it gets put in a truck and shipped over here. That uses up a lot of gasoline and produces a lot of carbon emissions," says Eugenia Victoria Ellis, a professor emerita with a joint appointment in the Antoinette Westphal College of Arts & Design and in the College of Engineering.

Working with Philadelphia inventor Jack Griffin of The Farm Works, Ellis is developing an indoor hydroponics solution that can bring fresh food much closer to home.

Early attempts at indoor agriculture used the same technology paradigm as ordinary buildings. They were loosely based on greenhouses which are porous, open systems susceptible to moisture migration, mold and pathogens. Griffin is instead engineering his indoor agriculture system, called V-LIFE (value-added localized integrated farming enterprise), not as a building, but as a machine for growing food.

Ellis' interest in hydroponics grew out of her work as director of Drexel's dLUX Light Lab, where interdisciplinary researchers investigate light in the built environment. She started out investigating the impact of natural daylight on circadian rhythms and human health, which steered her toward urban agriculture and community gardens and, with Griffin, the idea of indoor agriculture for the city.

Sounds easy: You put in boxes, water, lighting, and you've got an indoor farm. In fact, it's a bit more complicated than that.

"Strip mall buildings aren't suitable for this," she explains. "These spaces are conditioned for people, whereas you need a grow space to be 75 degrees with 50 percent humidity. Then when it is time to harvest the produce, it needs to be in a cold room at 38 degrees," she says. "So, it's kind of like moving from a tropical jungle to the Arctic north all within one building."

She talked to a New York medical-marijuana grower who didn't take all that into account, and whose building subsequently rusted out within a year. "That's when the alarm went off in my head that there were issues surrounding retrofitting a characteristic strip mall space for indoor agriculture," Ellis says.

Indoor farming would put fresh fruit and vegetables within easy reach of city dwellers, reducing need for cross-country shipment of produce.

Around that time, a colleague came to the fore with a key resource.

Dean of Engineering Sharon Walker put her in touch with Ken Fulmer, president and CEO of Philadelphia-based Urban Engineers, a multidisciplinary planning, design, environmental and construction services consulting firm.

Together, they plan on tackling the problem to come up with a design that meets this need.

"The secret is in the building envelope, everything that separates the inside of the building from the outside of the building. It's the structure, it's the material of the inside wall, the outside wall and the insulation," she says. "We'll be working with Urban Engineers to design the building envelope so that water will not condense on the structure and rust out the building."

Through the dLUX Light Lab, Ellis was also able to support one STAR scholar and two co-op students during the pandemic to develop a tunable LED lighting system for agriculture. "The colors are mixed to optimize the growth and the flavor of the plants," she says. "The lights also move up as the plant grows, so the distance from the light to the plant remains the same throughout the growing process."

She is also hoping to collaborate with engineering colleagues to develop strategies to use organic waste — such as root balls harvested from millions of plants — to power the building.

"The root balls ferment and create gas, and you can capture the gas and use it to make electricity," Ellis suggests.

At 40,000 square feet — nearly an acre — the building she envisions would also have ample rooftop space for solar panels.

"Essentially, this project shows the potential of being its own bioloop that uses waste residue as a resource for energy and solar panels to supplement the energy being used by the building to grow food," she says. "The ultimate goal is to design a building that is as carbon neutral as possible for this energy-intensive industry."

ADAM STONE

13

GIVE FOOD A REDUX

Culinary arts and science professor Jonathan Deutsch of the College of Nursing and Health Professions is helping to forge an entire industry by turning food waste into treasure.

As director of Drexel's Food Lab, Deutsch has long been interested in combining food science and culinary arts to make our food systems more sustainable. He played a critical role in launching the Upcycled Food Association, a group of manufacturers focused on finding wholesome uses and a market for food parts that would otherwise be discarded into compost or landfills. (Using the shorn-off stems and scraps of mushrooms as a flavor and texture additive in a half-plant, half-beef burger, for example.)

The association started with nine members but has grown to more than 165 companies.

"We're now working together globally on this issue (with other universities), but I would say we were the first and are probably the leader on developing upcycled products and measuring consumer acceptance," Deutsch says.

Appealing to consumers is vital. To that end, the association came up with a certification process for products that are upcycled, not unlike the approvals for organically grown foods, so consumers can look for the "UPcycled" label.

Upcycling isn't just a noble cause but an important one. Some 33–40% of food is wasted, representing the largest source of preventable greenhouse gas emissions. Upcyclers reduce that waste by creating new recipes or food products out of leftovers or cosmetically flawed foods. Del Monte, for instance, sells two types of certified canned green beans that are made from 100% upcycled and sustainably grown vegetables. Matriark Foods sells a broth made from fresh-cut vegetable remnants. And Renewal Mill uses the spent soybeans and oatmeal left behind after oat and soy milk are made and turns them into high protein flours that can be used for baking.

"Waste is inevitable; but we shouldn't have such huge amounts of it," Deutsch says.

Drexel isn't only a leader in the movement; the University created one of the newest entrants to the market when Food Lab alumnae Sheetal Bahirat and Zuri Masud developed a beverage from avocado seeds. Their product, Reveal Avocado Seed Brew, saved over 5,000 pounds of avocado pits from landfills in 2020.

"It tastes and looks like iced tea," Deutsch says. "They essentially created a new ingredient for the food industry that previously had only been a waste ingredient."

Marketers used to believe that if consumers knew they were eating foods that had been deemed "waste" they'd view it negatively or want some kind of discount, says Deutsch.

Drexel's research found, to the contrary, that consumers feel good about foods with an environmental benefit, and if products are marketed well and explained well, consumers will actually pay a premium, Deutsch says.

"If you think about it, the hot dog and sausage and those kinds of foods were very much a response to using as much of the product as you can," Deutsch adds. "What's changed, and what's new and exciting, is the marketing of new products as 'upcycled.'"

CAREN CHESLER

Land, Talent and Science

West Philadelphia has the history and momentum to lead the region in a life sciences renaissance, and Drexel is building a home for it all.

BY LINI S. KADABA

LEFT: JEFF FUSCO. BELOW: COURTESY SPARK THERAPEUTICS

Jeff Marrazzo (left) turned over the future of Spark Therapeutics to incoming CEO Ron Philip '96 (below) in early 2022.

ON THIS RAINY LATE AFTERNOON, fog envelops much of University City. But from his 10th floor offices in the FMC Building, Spark Therapeutics co-founder Jeff Marrazzo peers west through the gene therapy company's floor-to-ceiling windows and clearly discerns the future.

"The first thing I see is a vision being realized," he says.

Marrazzo's bird's-eye view takes in a parking lot at 30th and Chestnut streets belonging to Drexel, known as F Lot. By the end of 2022, under an agreement with Drexel announced in December, Spark intends to break ground there on a $575 million, 500,000-square-foot gene therapy innovation center, eventually creating hundreds of genetic medicine manufacturing jobs on the University's campus. The new center will be a short walk from Spark's other office and lab facility, in the historic Bulletin Building at 3025 Market St. located within Schuylkill Yards, a mixed-use neighborhood in development by Drexel and Brandywine Realty Trust.

The "vision" Marrazzo refers to is the expanding footprint of Spark, a young company that has experienced a meteoric rise from a Children's Hospital of Philadelphia spinoff to a standout in the field of life sciences. In 2019, global pharma giant Roche snapped up the company for $4.8 billion.

But he just as easily could be talking about a far-reaching transformation underway — one that's positioning Philadelphia as an increasingly popular destination for companies in the thriving field of life sciences, particularly in cell and gene therapy, and which has made Drexel a go-to partner for land, talent and science.

"It's a really exciting time," says Marrazzo, who after nine years leading Spark announced in February that he is passing the CEO baton to Chief Operating Officer Ron Philip '96 and moving on to other adventures. "It's a promising next five to 10 years for the life sciences ecosystem."

That ecosystem — flourishing across the region but notably concentrated in West Philadelphia — is years in the making but has blossomed of late. On the western end of campus, Drexel's development partner Wexford Science & Technology is wrapping up on 1.3-million-square-foot phase of construction for uCity Square. Adjacent to the 30th Street Station, steel framing for the first mixed-use high-rise of the Schuylkill Yards innovation district is under construction by Brandywine Realty Trust, with plans to break ground on another tower built expressly for life sciences nearby. Most recently, Drexel also signed an agreement with Gattuso Development Partners to build what is expected to be the city's largest life sciences lab facility, designed for startups. The $400-million, 500,000-square-foot project will go up in the center of campus at the current site of the Buckley Recreational Field, which will be relocated to the grounds of Myers Hall after that dormitory is demolished.

All of these office and lab clusters — uCity Square, Schuylkill Yards and now the Spark and Gattuso buildings — convert previously fallow land into lease revenue or endowment funds for Drexel. And crucially, they promise a classroom-to-workplace conduit worthy of an R-1 research institute.

"What Drexel is doing is quite remarkable," says urban policy expert Bruce Katz, co-founder and inaugural director of the Nowak Metro Finance Lab at Drexel and formerly at the Brookings Institution. "It's playing many roles, a real-estate–building role and a placemaking role. In some ways, it's rebalancing the geography of the city's economy, making 30th Street a new center. It's changing the geography of innovation."

Open Floodgates

West Philadelphia's life sciences pedigree traces back to the '80s and '90s. After false starts in the field, a fresh explosion of science and investment by research teams at the University of Pennsylvania and Children's Hospital of Philadelphia bore fruits that built the nation's epicenter of cell and gene therapies. Between 2013 and 2018, the Philadelphia region became the top locale for National Institutes of Health grants for cell and gene therapy, according to Philadelphia-based Econsult Solutions Inc.

A string of FDA approvals for cancer, a genetic form of blindness, rare diseases, and mRNA vaccines for COVID-19 — beginning with the first U.S. approvals for cell and gene therapies in 2017 — have laid the path for transformative changes in fields once thought impossible to crack.

That history makes the Philadelphia area one of the top three cell and gene therapy hubs in the country, according to ESI. The economic development organization predicts that if universities and private industry collaborate successfully in coming years, the region's workforce in gene and cell therapy could skyrocket from 4,900 in 2019 to more than 11,200 by 2030.

"If you think of economic growth as a funnel, the top of the funnel is research being done that can yield commercial activity out of the bottom," says Claire Greenwood, an executive director and senior vice president of economic competitiveness at the Chamber of Commerce for Greater Philadelphia. "In the past several years, we've seen that research investment yield companies, spinoffs, licenses."

Drexel's piece revolves around its strengths in gene editing and immune engineering, among other areas, says Aleister Saunders, executive vice provost for research and innovation. The University also has its share of spinoffs, particularly in the area of medical devices.

Plus, no other regional university supplies more graduates to the life sciences than Drexel, Saunders says.

Saunders cites a recent McKinsey & Co. study that found the highest number of tech workers in the Philadelphia metro area — about 8 percent of the total — are Dragons. In addition, a 2021 Jones Lang LaSalle analysis ranked Drexel as the leader in preparing students for careers in the life sciences among more than 100 regional colleges and universities. Since 2015, the University has conferred more than 7,800 degrees in programs that prepare students for careers in the life sciences.

"We are helping to drive this revolution," he says.

And Philadelphia has a lot of momentum. In the past three years, cell and gene therapy companies in the region increased to 45 from 30, says the Chamber's Greenwood. More than half are based within the city limits, including in University City, she estimates.

"The total dollars in the life sciences market are extraordinary relative to our history," she adds. More than $12 billion was invested across the region in 2021 — an astonishing 250 percent increase from 2020 that makes the Philadelphia area a leading life sciences market, according to a Big4Bio report. Of that investment, $3.2 billion pinpointed the cell and gene therapy sector.

"It's a sign," she says, "of the continued growth and demand to come."

Drexel President John Fry is determined that University researchers and graduates catch this wave. "Unless we move fast, we're going to miss it," he says. "Groundbreaking cell and gene therapy work is happening all around us. CHOP and Penn's health system are set up to do that…but once the fundamental work is done, those discoveries are made, where do you set yourselves up? Who do you hire?"

If Fry has his way, Drexel will be the answer.

"We're translational," he says. "Our whole job as a university is to figure out how you take great ideas and actually make stuff happen."

Certainly John Gattuso, CEO of his eponymous firm, sees the potential. His Drexel campus building project came about when a major player already in Boston and the San Francisco Bay area approached him about expansion. "There was a clear choice of focusing on Philadelphia … in terms of where this company thinks the next most important growth will be," he says. "It speaks to the quality of sciences being done in Philadelphia. It speaks to the talent in Philadelphia."

His optimism is shared by Drexel's other development partners. Brandywine Realty Trust intends to more than double the size of its successful B.Labs, a science incubator inside Cira Centre. The incubator, which provides "plug and play" lab space to researchers, will be a resource to the future tenants of Schuylkill Yards buildings that Brandywine is building near 30th Street Station. At completion, the total Schuylkill Yards project could bring approximately 3 million square feet of new construction to the eastern edge of University City.

On the west end of campus at 36th Street, Wexford Science and Technology has completed more than 4.5 million square feet in its latest phase of uCity Square, a cluster of educational, medical, lifestyle and commercial space that includes a neighborhood public school and a 460-unit apartment building called Anova at uCity. This fall will see the opening of Drexel's high-rise academic building for programs in nursing, health professions and medicine and the completion of One uCity Square, commercial lab space for life sciences tenants such as Century Therapeutics, Exponent and Integral Molecular.

Tenant appetites are strong, says Wexford. One uCity Square was built on spec, rare in the city, and is already 80% committed with six months of construction remaining, says Pete Cramer, Wexford's senior director of development and local market lead.

"We want to be an even better Kendall Square," Cramer says, referring to the tech cradle in Cambridge, Massachusetts. "We're at a pivotal moment in the history of University City — of Philadelphia, really. And Drexel is at the forefront of that growth."

> **"We're at a pivotal moment in the history of University City — of Philadelphia, really."**
>
> **Pete Cramer, Wexford**

Float All Boats

The success of any innovation district depends on an array of players coming together: Developers (Brandywine, Wexford, Gattuso), research parks (Schuylkill Yards, uCity Square), real estate investment trusts (Ventas), nonprofits (Science Center, West Philadelphia Skills Initiative) and research institutions (Drexel, Penn).

The community is a central character, too. Every stage of this transformation has included dialogue with resident groups to ensure sensitive, beneficial construction and commitments from developers to hire minority-owned firms. Years before any shovel hit the ground, Drexel administrators were successfully pursuing public and private funds such as PECO grants and a federal Promise Zone designation to support libraries, playgrounds and educational programming at neighborhood schools and to spur economic development in West Philadelphia.

A big reason why these projects have come so far in a little over a decade, many say, is Fry's leadership. In May, the Chamber of Commerce for Greater Philadelphia awarded Fry, who was chairman from 2016 to 2018, its William Penn Award, given to a business executive who has contributed to the betterment of the region.

"Drexel is essential," Cramer says. "When we think of partnerships across the country, President Fry, and the University, is the poster child of who we want to work with. He gets the vision."

The new building by Gattuso Development Partners on Drexel's campus will be the city's largest life-science research lab for startups.

COURTESY GATTUSO DEVELOPMENT PARTNERS

New labs and offices in development will be available to researchers and entrepreneurs from across the region.

COURTESY GATTUSO DEVELOPMENT PARTNERS

In nearly 12 years at Drexel's helm, Fry has unlocked the power of the University's prime real-estate location through the magic of third-party development. At their own expense, developers erect buildings on Drexel-owned land. The University collects ground rents and commitments for civic engagement, as well as options to occupy the space on favorable terms for classrooms, labs, and faculty offices. At the end of the long-term leases, ownership of the buildings reverts to Drexel. Some third-party developers have constructed apartments that provide campus housing for students, too.

But the University doesn't want to attract just *any* tenant.

"If it was only about the real-estate deal," says Alan Greenberger, vice president for real estate and facilities, "we wouldn't worry about it being research or science or technology. We wouldn't be thinking about the *who* part. But we *do* think about the *who* part."

As Drexel smartly curates its campus, it also has looked to shape the city.

The University was among the stakeholders that proposed a Brookings Institution audit of the Market Street corridor to assess entrepreneurship outcomes, industry strengths and research expertise. Based on the recommendations of the 2017 "Connect to Compete" report and at Fry's behest, the chamber launched in 2019 its Cell & Gene Therapy and Connected Health Initiative to accelerate growth in precision medicines and position the region as a top 25 metro in the world.

Such a designation would be transformative for the entire region. The new spaces being built on Drexel's campus will be available to Drexel researchers, alumni and spinoffs, obviously — but other institutions are welcome, too.

"It's another playbook," Fry says. "The playbook is not just flying the Drexel flag and doing all those things that translate Drexel expertise into practical solutions. I'm going to fly the Penn flag, the CHOP flag, the Spark flag. I'm going to fly any flag that's about innovation. The idea is that you have a campus that in and of itself is an innovation district."

This approach, says Paul E. Jensen, executive vice president and Nina Henderson provost, complements Drexel's 2030 Strategic Plan "perfectly, because so much of the plan is about expanding our partnership model to drive innovation in our research and academic programs." He points out that in the fast-moving tech world, staying current can be a challenge. "The great advantage that Drexel has is that we've always been so connected externally. It enables us to build this dynamic aspect of the world into the curriculum."

Hands down, the biggest success story — the prototype — is Spark. The state-of-the-art manufacturing facility would house over 1,000 colleagues, expanding Spark's footprint to approximately 1 million square feet, the company says.

"It's a monster-sized commitment," says Greenberger. "I don't think Philadelphia has seen the likes of this since Comcast bought NBC Universal in 2013. It's that big."

From Spark's perspective, deepening ties with an institution in the business of applied higher education made sense as it looks to future workforce needs. In addition, the University's support network for tech commercialization and industry collaboration — the Coulter Translational Research Partnership Program, Drexel Applied Innovation, Drexel Solutions Institute — bolsters its appeal. A memorandum of understanding between Spark and Drexel describes research collaboration, job opportunities for graduates and community engagement, an unusual step but one that enshrines shared goals and values.

"I think John anticipated these developments," says Spark's new CEO Philip, an information systems alumnus who joined Spark in 2017. "He built a really nice strategy that allowed him to be the partner of choice for us from multiple angles."

Already, Drexel is in talks with Spark about its future workforce needs — not just for traditional degree holders, but for the broader population. "We're also thinking about the incumbent workforce, apprenticeship training programs that build off our experiential learning approach to train and reskill individuals, including local residents, to ensure that our local community thrives as Market Street is developed," says Anna Koulas, vice president of Drexel Solutions Institute.

That means curricula focused on industry skills; certification programs for lab techs and other non-degree positions; bespoke executive education degrees similar to the Vanguard-Drexel MBA; and, of course, co-op programs. It also means new approaches for Drexel, Koulas says, whether co-designed courses with industry partners; experiential, project-based learning at firms; or new certificate and degree programs and jobs still to be imagined.

"This is a new frontier in terms of research, in terms of career paths," she says. "There's an opportunity to create models in manufacturing and production that don't exist currently."

Fry has long championed University City as an economic powerhouse for the city and for the residents of West Philadelphia. "The whole goal here in the end," he says, "is how do you connect innovation and inclusion?"

Ships Passing

There is also the *felicity of vicinity,* so to speak…those serendipitous encounters that foster a new relationship or spark an idea. It's what you hope for when brilliant people mingle.

"We wanted…the *aha*-moments," Marrazzo says of Spark's decision to locate in West Philadelphia. "Just the idea of people walking down the same street, going into different buildings — one into a classroom, the other one into Spark. It creates a level of vibrancy around an organization and around an ecosystem."

That vibe is what drew Associate Professor Kara L. Spiller (PhD biomedical engineering '10) to Drexel in 2013 — and eventually into conversations with Spark.

"I didn't do cell or gene therapy at all; that wasn't on my radar," the immunology engineering scientist says. "But being in this environment and culture, where that is what a lot of people are doing, made me start to think I should incorporate some of those aspects into my own research. I view it as very important to actually impact human health, rather than just writing grants and publishing papers."

Since then, Spiller has collaborated with Mallinckrodt Pharmaceuticals, with operations in Hampton, New Jersey, to investigate the immune response to an engineered skin tissue construct used for burns.

More recently, Spiller invited Spark's head of immunology for a stroll. She mentioned that she works across the street and is studying ways to control the immune response to gene therapy vectors such as those developed in West Philadelphia.

"We liked each other," she says.

Now, they're discussing possible collaboration.

Fry's bet is that bringing all these pieces together will yield a whole that's greater than its parts, with the University at its nucleus.

"In my mind, all of these pieces — people, place, partners — are absolutely necessary for carrying out our mission," he says. "We're building an innovation ecosystem that will help to propel our region to global leadership in the life sciences, and we're laying the path for our researchers, co-op students, graduates and neighbors to participate. Drexel wins when our community and city thrive, too."

"I don't think Philadelphia has seen the likes of this since Comcast bought NBC Universal in 2013. It's that big."

Alan Greenberger, Drexel

Drexel University College of Medicine at Tower Health occupies the first four floors of a new six-story, 180,000-square-foot building, which was developed with Equus Capital Partners and the SLAM Collaborative architecture firm.

PAUL BURK PHOTOGRAPHY COURTSEY SLAM COLLABORATIVE

A NEW MEDICAL CAMPUS

Drexel University College of Medicine at Tower Health opened its doors last summer to its first cohort of medical students, launching a proud new chapter in the college's 174-year history.

In August 2021, 40 first-year medical students arrived at the College of Medicine's new four-year regional medical campus in West Reading, 60 miles west of Philadelphia.

The grand opening began a fresh chapter for the College of Medicine, whose predecessor institutions — Hahnemann Medical College and the Woman's Medical College of Pennsylvania — were among the first in the world to train homeopathic doctors and women physicians.

The modern medical education tower bears no resemblance to the quaint stone building on Arch Street in Philadelphia where the College of Medicine's forebear institutions opened in the mid-1800s. But like the pioneering students of that era, these future physicians will be steeped in a mission of health care equity, inspired by a curriculum that emphasizes the social determinants of health.

West Reading medical students will study the same outstanding curriculum as their peers on the Queen Lane Campus in Philadelphia, under the tutelage of expert faculty mentors. They will engage with the regional community through lectures and reflective activities that will give them insights to tackle health care disparities and provide trauma-informed, community-based care. In their third and fourth year, they will embark on clinical rotations at Tower Health's flagship Reading Hospital, the largest hospital between Philadelphia and Pittsburgh, to help care for a diverse and underserved community.

1 LABS Students hone clinical skills in advanced simulation and anatomy labs, and practice diagnostic and interpersonal communication skills in simulated patient rooms.

2 LOBBY A monumental lobby connects the first and second floors, where there is also outdoor seating overlooking the valley.

3 CLASSROOMS Multiple classroom and flex spaces, offices, lounges and small-group rooms are located throughout the building. This tiered team-based learning space on the first floor accommodates 120 students.

4 HISTORY A mural drawn from the college's archives and special collections links the new building to its predecessor institutions: the Woman's Medical College of Pennsylvania, the Medical College of Pennsylvania and Hahnemann University.

5 SITE The building is located on a promontory above the Schuylkill River, on the opposite bank from Reading and less than a mile from Reading Hospital. With views of the Lehigh Valley in all directions, the building's shape follows the curve of railroad tracks, while the vertical fins on the building façade mimic the pattern and flow of the river below.

6 COMMUNITY During orientation week, the incoming class donned white coats and toured public art and murals in downtown West Reading with a local art teacher. Afterward, they joined members of the community in painting a 45-foot-tall mural sponsored by a Berks County suicide prevention campaign.

7 AMENITIES Activities and services include lounge spaces, a fitness center, movement studio, library, game room and café space.

8 INSTRUCTION Students in an Art in Medicine class gain a unique perspective on anatomy by observing bone models.

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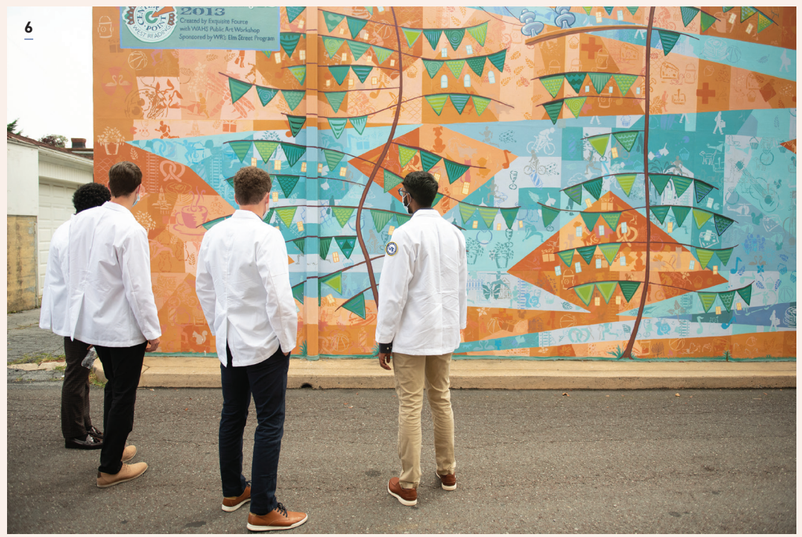

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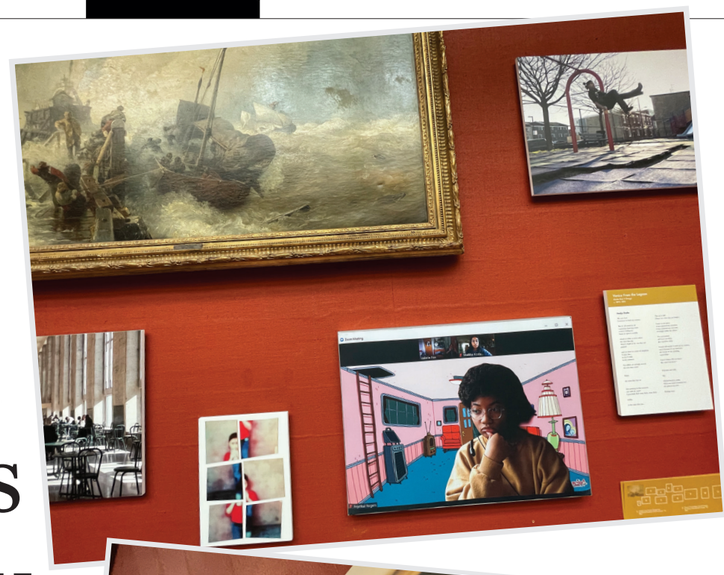
More Than Writing; It's Community

The Writers Room is a hidden gem at Drexel, and alumni and community members have many ways to be involved through events and exhibits. By Louisa Wilson

"Writers Room is family," says Lauren Lowe '17. "It's still an anchor in my life, a place where I met my friends and where we come back as alumni to meet with one another."

Lowe got involved with Writers Room in her second year at Drexel. Now an MFA candidate in the creative writing program at New York University, she continues to be active in Writers Room and serves as a program coordinator.

Writers Room is a literary arts program established in 2014 that brings together Drexel students, alumni, faculty and staff, along with members of the University's neighboring community, to form collaborative, inclusive spaces for creating art. Writers Room offers a wide range of free programs including workshops and cultural events; a visiting artists series; and TRIPOD, a writing and photography program supported by Canon.



For information about Writers Room's free programming, visit **writersroomdrexel.org.**

Founding Director Rachel Wenrick follows a collective approach to designing programs, with social justice as a core value. "The goal is always to listen to the group intently," she says. "Everything we do with Writers Room is about following the needs and experiences of our participants. For example, when one of our founding members was displaced after a developer bought her building to convert to student apartments, we began pursuing a project on housing. We're using the transformative power of the arts to address larger social issues."

Continues Wenrick, "Our Second Story Collective is a revolutionary program. We're working with a cross-sector partner network to develop a co-housing network of student tenants and homeowners as an alternative affordable housing strategy — expanding aging-in-place options and creating an intergenerational community grounded in a shared love of storytelling. This is civic engagement. Doing the work to change the world."

For Lowe, being able to collaborate with the surrounding community has been one of the most enriching parts of the program. "There were aspects of their writing and their storytelling that I wasn't going to learn in classes," she reflects. "I learned from them how to be open and how to share stories. There's just no other experience like it, where so many different people of different ages and stages of life are in a room together, creating together and sharing in this way. After my first workshop, I was hooked, and then I just never left."

The bonds that Lowe created through the program remain. "Having these intergenerational relationships from when I was 19 is so special," she says. "As a young person, it's helpful to have older friends who can offer advice based on their experiences. It's not lost on me that most people don't have those types of relationships and bonds." After graduating in 2017, Lowe originated roles with Writers Room as Artist-Year Fellow and Alumni Fellow, creating a trajectory to graduate school.

Lowe isn't alone. Says Wenrick, "For such a young program, the alumni engagement in Writers Room is really extraordinary. So many people, especially now, are looking to take part in creative expression and building connection. They are craving ways to make a difference in the world. Most of our alumni aren't writing for a living. They're entering all sorts of professions, but at Writers Room, they're learning a different way of being in the world, learning how to collaborate and come to consensus in a diverse group."

In March 2022, Writers Room opened a year-long exhibition, *A New Kind of House,* in the Anthony J. Drexel Picture Gallery. The retrospective exhibit celebrates eight years of Writers Room and features the photography and writing of students, community neighbors and eight alumni. The works are displayed alongside those of the Drexel Collection. "It's a conversation about how the University and neighborhood have changed and are changing," says Wenrick. "Having a Paul Robeson High School student's work next to a traditional oil painting is a way to say, 'We're here. This is what Drexel looks like now.'"

A New Kind of House runs through March 2023. It is free and open to the public Mondays to Fridays, from 3:30 to 5 p.m.

"Everything we do with Writers Room is about following the needs and experiences of our participants."

— RACHEL WENRICK

MAKE A GIFT

Please consider a donation to the Writers Room. Your generosity will help build new programs and events and enable staff to promote activities to a wider range of students, alumni and community members. It's easy to donate using this secure website: *giving.drexel.edu/WritersRoom.*

Nominate an outstanding alumnus or student at **drexel.edu/alumni/about/awards.**

A Cut Above

Active, dedicated and impactful. Drexel is lucky to have alumni like these.

Get to know the incredible Dragons selected this year by the Alumni Board of Governors for the Drexel Alumni and Student Awards. They're risk takers and disruptors, advocates and mentors, visionaries and creators. They represent an array of Drexel's colleges and schools, class years and backgrounds. And they demonstrate the transformative power of a Drexel degree coupled with passion, commitment and drive.

1. SERVICE TO PROFESSION AWARD

LINDA ABRIOLA
PhD, BS civil engineering '76

Abriola is the Joan Wernig and E. Paul Sorensen Professor of Engineering at Brown University. She is an international expert on the multiphase transport, fate and recovery/destruction of contaminants in the subsurface and the author of more than 160 refereed publications. Abriola was a founding member of the National Advisory Board for Drexel University's Executive Leadership in Academic Technology and Engineering (ELATE) Program.

2. EXCELLENCE IN CO-OPERATIVE EDUCATION AWARD

MATTHEW BAHR
BS mechanical engineering '95

An associate fellow at GlaxoSmith-Kline, Bahr instituted the co-op program for his company's group and has mentored 14 students since. He is most proud of having co-authored several journal papers with his former students, coaching them while they have progressed into their own graduate programs, watching one of them earn recognition as the 2020 Drexel Co-op of the Year Award recipient, and hiring one as a full-time employee in his lab.

3. JOSEPH JACOVINI OUTSTANDING SERVICE AWARD

GREG BENTLEY
Trustee

Bentley is CEO and chairman of Bentley Systems, which provides software to engineers, architects, construction professionals and owners for the design, construction and operations of infrastructure. He is on Drexel's board of trustees and chairs the Pennoni Honors College board of advisors. In 2019, he and his wife established Bentley Hall, a true living and learning community on Drexel's campus for students of Pennoni Honors College.

4. OUTSTANDING STUDENT AWARD

BRANDON CISNEROS
BS marketing '22

As a student, Cisneros founded the first Prospanica university chapter in the Northeastern region, which won the 2020 University Chapter of the Year Award. He was involved in a number of organizations, including Latinos for a United Campus; LeBow BRIDGE; Drexel Student Ambassadors; Drexel University Bienvenidos; ¡HOLA! Drexel; the LeBow Diversity, Equity & Inclusion Action Committee; the Drexel Anti-Racism Task Force; and the Greater Philadelphia Hispanic Chamber of Commerce.

5. RECENT ALUMNI ENTREPRENEUR AWARD

ERIC EISELE AND ALEXANDER ROSCOE
BS materials engineering '09 and BS electrical engineering '13, respectively

Eisele is the CEO and co-founder of GrowFlux Inc., a leader in IoT controls and sensors for horticultural lighting, equipping lighting manufacturers or integrators with the latest in intelligent horticultural lighting control. Co-founder Roscoe is responsible for the development and commercialization of products. He also holds one patent pertaining to RF wireless systems and won an award for wireless systems from *Architect Magazine*.

6. GOLDEN DRAGON SOCIETY AWARD

RAJ L. GUPTA
MBA business administration '72

From 1999 to 2009, Gupta served as chairman and CEO of Rohm & Haas, a worldwide producer of specialty chemicals. He is chairman of the board at Avantor Inc. and a senior advisor with the private-equity firm, New Mountain Capital. At Drexel, Gupta was a member of the LeBow Corporate Governance Advisory Council, the LeBow Leadership Circle, the LeBow Dean's Advisory Board, and was a Drexel trustee from 2001 to 2007. He received the A.J. Drexel Paul Service to Alma Mater Award, was named the Business Leader of the Year, and was inducted into Drexel's Alumni Hall of Fame, the Drexel 100.

7. GOLDEN DRAGON SOCIETY AWARD

NINA HENDERSON
BS design '72, trustee

Henderson was a corporate officer at Bestfoods and president of Bestfoods Grocery until its acquisition by Unilever. Currently she is a director CNO Financial Inc, HIKMA Pharmaceuticals PLC and IWG PLC. At Drexel, she is vice chair of the Board of Trustees, chair of the Academic Affairs Committee and a director of St. Christopher's Hospital for Children. Henderson has received numerous awards including the A.J. Drexel Paul Service to Alma Mater Award and was inducted into Drexel's Alumni Hall of Fame, the Drexel 100. In 2017, she endowed the Nina Henderson Provost at Drexel University and the Nina Henderson Scholars, providing enduring support for Drexel's core educational mission.

8. ALUMNI ENTREPRENEUR AWARD (>$1M)

REV. CHRISTOPHER HOLLAND II AND LAWRENCE JAMES
BS computer science '03 and BS information systems '02, respectively

Holland is the co-founder of Connexus Technology, a provider of information technology-managed services and technical recruiting services for companies in both the private and public sectors. He is also the executive pastor of Salt and Light Church and is the executive director of The Common Place, a nonprofit serving children and families in Philadelphia. James is president and CEO, responsible for leading strategic initiatives and business development efforts. He is on the board of the Philadelphia Chamber of Commerce and is a mentor at the Philadelphia Chamber of Commerce CEO Access Network.

9. A.J. DREXEL PAUL SERVICE TO ALMA MATER AWARD

PAUL K. JOHNSON
BS business administration '92, MBA '07

In his more than two decades volunteering for Drexel, Johnson was instrumental in establishing the Young Alumni Association and was named Drexel's Young Alumnus of the Year. He has also served on the LeBow Alumni Council and was a member of the Drexel University Alumni Association Board of Governors. As a board member, Johnson served on the Community Service Committee and chaired its Grants Committee. Johnson firmly believes in the power of sports to enrich the lives of young people, and has created, managed and coached a series of youth baseball teams in his community, including the Philly Area Black Sox.

10. RECENT ALUMNI DISTINGUISHED SERVICE AWARD

SHARON MANKER
MEd, BS communications and applied technology '14

Manker is an award-winning supply chain and supplier diversity strategist who connects, positions and partners with diverse businesses to grow their brands and make an economic impact in underserved communities. Manker knows what truly drives change in advocating for an inclusive supply chain and she strives for equitable access, policies and procedures. Among her many accolades, she was named to *DiversityPlus Magazine*'s 2021 Top 15 Women in Power Impacting Diversity and *ROI-NJ*'s 2020 New Jersey's Most Influential DEI Leaders.

11. SPECIAL DISTINCTION AWARD

HAZEM MARAGAH
PhD, associate professor, LeBow College of Business

Maragah is the associate professor of decision sciences and management information systems at Drexel's LeBow College of Business. He joined the faculty of LeBow College of Business in 1989. He is also the recipient of the LeBow College 2001 Outstanding Service Award, and he received the 2000 Award for Outstanding Service to the University. A steadfast Drexel Athletics fan, The Hazem Maragah Suite in the Daskalakis Athletic Center is named in his honor.

12. GOLDEN DRAGON SOCIETY AWARD

CYNTHIA A. MARYANOFF
PhD, BS chemistry '72

An organic and materials chemist, Maryanoff is a distinguished professor at the Baruch S. Blumberg Institute and a professor of drug delivery at the Pennsylvania Drug Discovery Institute. At Drexel, she serves on the Board of Visitors as well as the College of Arts and Sciences Advisory Board. Maryanoff was named to Drexel's Alumni Hall of Fame, the Drexel 100, and was nominated by Drexel and inducted into the World Association of the Cooperative Education Hall of Fame. The Bruce and Cyndie Maryanoff Endowed Chemistry Prize is named in honor of the Maryanoffs, and they also fund the Department of Chemistry's Freshman Summer Research program.

Head to **drexel.edu/alumni/awards** *or scan the QR code for video interviews where each recipient discusses their experiences, motivations, accomplishments and more.*

13. MARY S. IRICK DREXEL SOCIETY AWARD FOR CIVIC ENGAGEMENT

LYNETTE MEDLEY
MEd, BS mental health technology '97

Medley is an equity consultant, educator and therapist with more than 20 years of experience around diversity and inclusion, intersectionality principles and sexuality awareness. She is the founder and CEO of No More Secrets Mind Body Spirit Inc., the only comprehensive sexuality awareness organization in the nation, whose mission is to save lives by changing biased social justice systems and communities.

14. ALUMNI ENTREPRENEUR AWARD (<$1M)

SHERRILL W. MOSEE
MS electrical engineering '91

Mosee is the inventor and designer of MinkeeBlue organizational travel and work bags which have been featured on the "Today Show," "The Katie Couric Show," in *Forbes*, *Cosmopolitan* and *People* magazines, and sold on QVC. She clinched a $100,000 deal to sell her bags in Macy's after winning a live shopping pitch competition on the T.V. show "America's Big Deal."

15. RECENT ALUMNI EMERGING LEADER AWARD

L. JEFF SHAFER II
BS business administration '12

Shafer is a CPA who works as a real estate law associate at Simpson Thacher & Bartlett in New York City and authored "Black Excellence: 20 Stories about Rising from Ordinary to Extraordinary." He has worked with organizations like the Black Law Student Association at the University of Pennsylvania, National Association of Black Accountants, Abundant Life Fellowship and Drexel, to encourage and support young people — particularly Black boys and girls.

16. SILVER DRAGON SOCIETY AWARD

ROBIN THORNE
BS chemical engineering '97

Thorne is the founder and CEO of CTI Environmental Inc., a firm providing engineering, environmental, safety and construction management services. In 2019, she started DemoChicks, a nonprofit corporation that introduces girls to nontraditional careers and empowers the women who are in them. DemoChicks conducts hands-on workshops for students in K–12, scholarships and mentoring to college students and honors women in the community. Thorne was inducted into Drexel's College of Engineering Circle of Distinction.

17. HARRIET E. WORRELL SOCIETY AWARD

KARLA TROTMAN
MBA business administration '15

In addition to her role as CEO and owner of Electro Soft — which creates electronics manufacturing solutions for clients in aviation, rail, transit, OEM and defense —Trotman is a member of numerous boards and organizations. At Drexel, she was the president of the LeBow Executive MBA Alumni Council and is a member of the Drexel Alumni Board of Governors. In addition, Trotman has served on the steering committee for the Drexel Black Alumni Council, and she shares her professional insight and expertise as a speaker for alumni career services programs and classes within the LeBow College of Business.

18. FACULTY/STAFF ALUMNI AWARD FOR CAMPUS IMPACT

REBECCA WEIDENSAUL
MS arts administration '95, PhD education leadership and learning techniques '01

As assistant vice president of Student Life, Enrollment Management and Student Success, Weidensaul oversees the Center for Learning and Academic Success Services, Drexel's Louis Stokes Alliance for Minority Participation, Inter-College Advising and the Office of Veteran Student Services. Prior to Student Life, Weidensaul spent nearly two decades of leadership in Drexel's Athletics Department, where she founded the ACHIEVE Center and focused mainly on NCAA compliance, academic support and life skills.

CAREERS

90s

James Brady, MBA '99, joined the board of directors of Verona Pharma, a clinical-stage biopharmaceutical company that focuses on respiratory diseases.

Darryl Carbonaro, BS chemical engineering '90, was promoted to general counsel at Generate Capital, a leading sustainable infrastructure investment and operating platform.

Jun Chon, MD, MCP '98, joined Elizabethtown Community Hospital, part of Burlington-based University of Vermont Health Network, as chief medical officer. Most recently, he was the vice president of medical affairs at WellSpan Ephrata Community Hospital.

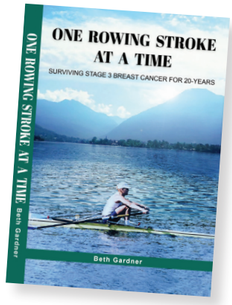
Beth Gardner, BS psychology '94, released a new book about her journey beating breast cancer, "One Rowing Stroke at a Time — Surviving Stage 3 Breast Cancer for 20 Years."

Andrew Oltmans, BS chemical engineering '98, is the patent attorney and managing director of Palq IP, a new consulting firm that brings intellectual property strategy and business consulting to smaller companies and entrepreneurs.

00s

Candace Hickey, MS engineering geology '00, was awarded the 2022 Lehigh Valley Businesswomen of Influence's Circle of Excellence Award for her dedication to her field expertise, professional development and the community.

Amol Sathe, BS digital media '06, MS '08, was recognized with the Outstanding Created Environment in an Animated Feature Award by the Visual Effects Society for the film, "Encanto."



Mark A. Scheyer, MPT '00, joined AbsoluteCare in Columbia, Maryland, as president of Medical Centers and a member of the executive leadership team. Prior, he was chief operating officer of Steward Medical Group in Dallas. He is a Fellow of the American College of Healthcare Executives.

Daniel Starr, BS psychology '02, founder and owner of GameMine, went to the Ukraine/Romania border to provide food, clothing, SIM cards and shelter to war refugees.

Olya Yarychkivska, BS biological sciences '09, is a Ukrainian immigrant and co-founder of RAZOM, a nonprofit that is providing emergency humanitarian aid in response to the Russian invasion. See story on page 12.

10s

Alison Beam, JD '14, the former Pennsylvania acting secretary of health, was appointed vice president of government affairs and chief government relations officer at University of Pittsburgh Medical Center (UPMC) in June.

Yuyue Chen, MS mathematics '16, PhD business administration '21, joined Lehigh University as professor in the College of Business. Her research interests include machine learning, mathematical modeling and optimization algorithms.

Lucas M. Glass, MS biostatistics '12, was a speaker at a presentation titled, "Precisely Practicing Medicine from 700 Trillion Points of Data," hosted by health industry tech company, IQVIA. Glass is the vice president of the IQVIA Analytics Center of Excellence.

Kate Heaney, MS library & information science '10, was a panelist at the Rosemont College Publishing and MFA Career Symposium to discuss "Landing a Job in Academic, Medical, or Trade Publishing." Heaney joined Clarivate in 2018 and is the product manager of the *JCR (Journal Citation Reports).*

Martha Meiers, MS arts administration '19, joined Kendall College of Art and Design at Ferris State University as the program coordinator for the college's Wedge Prize.

Cara D. Noel, MS public policy '12, joined Actum LLC, a public strategy firm, as senior vice president.

Erik B. Scott, BA communication '15, joined Saxton & Stump law firm as a business development strategist and works directly with the firm's attorneys and practice area chairs to identify and capitalize on opportunities.

Joyce Tong, MS digital media '11, was recognized with the Outstanding Effects Simulation in an Animated Feature Award by the Visual Effects Society for the film, "Raya and the Last Dragon."

Josh Weiss, BA communication '17, released his debut novel, "Beat the Devils," a crime thriller set in an alternate United States during the height of the Red Scare.

20s

Sudipti Attri, BS chemical engineering '21, is the CEO and co-founder of ClearWater Algae Solutions, which participated in the Philly Startup Leaders' Ethical Entrepreneurship accelerator program for businesses with a social, environmental or economic mission.

John Bassanello, MS interior architecture and design '20, joined CPL — a full-service design firm that has served public and private-sector clients for 46 years — as an interior designer in the Buffalo, New York, location.

We want to hear about your weddings, new babies, special traditions, group trips and regular get-togethers with fellow alumni. Send stories and photos to Sara Keiffer at **seb434@drexel.edu.**

OBITUARIES

Friends We'll Miss

Farewell to departed alumni reported to the University between Jan. 16 and March 20, 2022.

1940s

Mary Bagan Dratman, MD Medicine 1945
Christopher Branda, Cert. Mechanical Engineering 1945
George Brown, Cert. Mechanical Engineering 1942
James Carey, BS Business Administration 1949
Reynolds Dry Becker, Cert. Secretarial 1946
Marion Ensminger Reppert, RN Nursing 1946
George Nelson, BS Business Administration 1949
Sara Jean Parks-Pendleton, MD Medicine 1949
Virginia Pfau Fagerstrom, BS Home Economics 1949
Katherine Rhodes Lowe, RN Nursing 1947
Ingeborg Rihm Harwick, BS Home Economics 1946
George Webber, BS Mechanical Engineering 1948

1950s

Robert Auge, BS Business Administration 1951
Albert Baikauskas, BS Business Administration 1959
Samuel Bashore, BS Chemical Engineering 1955
Carl Bauer, BS Business Administration 1953
Elaine Beck Knerr, RN Nursing 1952
Juris Berzin, BS Electrical Engineering 1956
Walter Bird, BS Metallurgical Engineering 1956
Marvin Blumberg, Cert. Chemical Engineering 1959, BS 1961
Walter Bodine, BS Business Administration 1958
Raymond Boyle, BS Business Administration 1959
Phyllis Braniff, MS Home Economics 1959
James Breslin, BS Business Administration 1959
Lee Brown, MS Mechanical Engineering 1967
Ronald Brownstein, BS C&E General Studies 1958
Nicholas Bucci, BS Electrical Engineering 1950
Frederick Burgess, BS Business Administration 1959
Thomas Burke, MS Electrical Engineering 1958
George Burna, Cert. Chemical Engineering 1959, BS 1961
Paul Cahill, BS Business Administration 1953
George Erwin, MS Electrical Engineering 1959
Bernard Esoda, Cert. Mechanical Engineering 1958, BS 1964
Patricia Gernerd Aldrich, RN Nursing 1957
Charles Giltner, Cert. Mechanical Engineering 1954, BS 1955
Arthur Griffith, Cert. Industrial Administration 1950, BS 1955
Edeltraude Hahn Chesney, BS Business Teacher Education 1953
Edward Houck, Cert. Civil Engineering 1957, BS 1959
Anne-Marie Hubert Shaw, BS Home Economics 1956
Mary Jordan Carlson, MS Home Economics 1958
Joseph Kramer, Cert. Electrical Engineering 1951
Luther Lee, Cert. Mechanical Engineering 1955, BS 1957
James Long, MS Mechanical Engineering 1953
Phyllis Mellon Murphy, BS Home Economics 1954
Harry Peacock, BS Electrical Engineering 1956, MS 1962
Ann Seraphin, BS Secretarial 1954
William Stillman, BS Civil Engineering 1953
Richard Trala, BS Civil Engineering 1959
Harry Tully, BS Business Administration 1950, MBA 1955
Richard Wabals, BS Home Economics 1958
Roy Wagner, BS C&E General Studies 1951
Paul Weisel, Cert. Civil Engineering 1955
Betty Woodward, MLS Library Science 1955
Elizabeth Zimski Zeller, RN Nursing 1955

1960s

Robert Adair, BS Chemical Engineering 1967
Leonard Bain, BS Architecture 1965
Walter Ball, MS Chemistry 1960
Verne Bausher, BS Business Administration 1961
Raymond Berke, BS Physics & Atmospheric Science 1960
John Bissinger, Cert. Mechanical Engineering 1966
Paul Bodnick, BS Metallurgical Engineering 1967
Frank Bogden, BS Mechanical Engineering 1963
James Boomershine, BS C&E General Studies 1967
Leonard Boreski, BS Business Administration 1960
Edward Bosworth, MS Library Science 1963
Edward Bowman, BS Electrical Engineering 1962
James Brennan, BS Mechanical Engineering 1966
John Brown, BS Electrical Engineering 1964
Robert Burgoyne, BS Mechanical Engineering 1969
Francis Burke, BS Mechanical Engineering 1962, MS Aerospace Engineering 1965
William Byer, BS Electrical Engineering 1964
James Campbell, BS Mechanical Engineering 1960
Elizabeth Cancroft, MD Medicine 1962
William Chambers, BS Chemical Engineering 1963
Olivia Cruz, MD Medicine 1962
Richard Danelutti, BS Business Administration 1968
Thomas De Fiore, BS C&E General Studies 1966
Marlene Eiter Rehnig, BS Business Teacher Education 1965, MBA Business Administration 1971
David Frowert, BS Civil Engineering 1965
Joseph Grabowski, MBA Business Administration 1963, MS Electrical Engineering 1967
Paul Gutlohn, MD Medicine 1960
Robert Henry, BS Business Administration 1967
Harold Hieter, BS Chemistry 1964
August Hisler, BS Business Administration 1960
Mary Holt Harbach, MS Library Science 1966
Gilbert Karlsson, BS Mechanical Engineering 1966
Frederick Kraft, Cert. Electrical Engineering 1965
George Krywolap, BS Biological Sciences 1960
Robert Lewis, MD Medicine 1968
John Linderman, BS Business Administration 1969
Patrick Logan, BS Civil Engineering 1967
Alan Loveland, BS Civil Engineering 1966
Anna Lyjak Chorazy, MD Medicine 1960
Donald Patterson, MD Medicine 1969
Robert Peel, BS Mechanical Engineering 1965
Irene Pelehach Howard, RN Nursing 1961
Peter Periconi, MD Medicine 1969
Robert Ringler, BS Chemistry 1968
Ralph Rippey, MS Electrical Engineering 1962
Patricia Saigo, MD Medicine 1969
Milton Stepansky, BS Electrical Engineering 1960, MS 1965
Lawrence Wittwer, BS Electrical Engineering 1962
Theodore Wohlsen, Cert. Library Science 1963
John Yanosov, BS Electrical Engineering 1963
Robert Yarrington, BS Business Administration 1963
Claire Zapiec Phelen, BS Medical Technology 1961

1970s

Larry Achter, BS General Business 1975
Chris Addison, MBA Business Administration 1970
Ish Aneja, MS Engineering Management 1975
Arthur Auerbach, BS Biological Sciences 1970
Donald Barici, BS Civil Engineering 1972
Joseph Barriero, MS Engineering Management 1973
Dilip Batabyal, MS Civil Engineering 1974
Robert Belz, BS Business Administration 1974
Steven Berhang, BS Retail Management 1976
Daniel Bevilacqua, MD Medicine 1970
William Bohnet, BS Industrial Engineering 1972
Stephen Braver, MBA Business Administration 1970
Paul Browne, BS Business Administration 1973
Michael Burke, BS Mechanical/ Industrial Engineering 1975
Frank Chiacchio, BS Physics & Atmospheric Science 1977
Thomas Ciccone, BS Mathematics 1975
Nina Deangeli Walls, MS Library Science 1971
Patricia Dietrich, MD Medicine 1974
Ronald DiNicola, BS Accounting 1975
George Flick, BS Marketing 1974
Cathie Garfield Barrera, BS Home Economics 1970, MS Clinical Nutrition 1994
Ned Godshall, BS Metallurgical Engineering 1975
James Granger, BS Electrical Engineering 1972
Diane Greene, RN Nursing 1972
Joan Hackett Lundeen, MD Medicine 1972
Howard Jenkinson, MS Physics & Atmospheric Science 1971, PhD 1982
Nancy Jokelson, MS Library Science 1971
John Kelleher, MS Mechanical Engineering 1970
Louis Kelly, BS Mechanical Engineering 1970
Frederick Kunz, BS Mechanical Engineering 1970
Stephen Laxton, MBA Business Administration 1979
Thomas Masapollo, BS Operations Management 1974, MBA Business Administration 1980
Patricia Michael Cooper, BS Nutrition Science 1973
Patricia Miller Harrington, MS Library Science 1974
Maureen O'Keefe Aptowicz, BS Biological Sciences 1973
Anne Ott Stolowski, MBA Business Administration 1976
William Piper, BS Electrical Engineering 1970
Karin Sundstedt Kuenstler, BS Design 1973
Wayne Wilson, MBA Business Administration 1979

1980s

Marianne Beam Abdul, BS Electrical Engineering 1989
Louis Bechkes, MBA Business Administration 1985
Barbara Bentley, RN Nursing 1980
Doug Dilliplane, BS Civil Engineering 1983, MS 1985
Maureen Fay O'Brien, BS Nutrition & Food 1985
Samuel Provenzano, BS Electrical Engineering 1982
George Sowerby, MD Medicine 1981
Robert Westall, BS Computer Science 1989
Gregory Yates, BS Civil Engineering 1981

1990s

James Airoldi, MD Medicine 1993
Soma Banerjee, MS Technology & Science Communication 1993
James Boardway, BS Information Systems 1990
Jan Dickler, MLIS Library & Information Science 1993
Delmar Dukes, BS Electrical Engineering 1992
Christopher Judson, BS Corporate Communication 1995
Colleen Kraus, BS Chemical Engineering 1990
Matthew Loftus, BS Hotel and Restaurant Management 1998
Sharon Taggart, MS Arts Administration 1999
Yu Yang, MS Arts Administration 1990

2000s

Richard Billingsley, MSN Nursing 2006
Glenn Mehnert, MBA Business Administration 2003

2010s

Angela Adams, Cert. Education 2013
Michael Amoruso, BS/MS Computer Engineering 2015
Terry Grant, MS Higher Education 2010

WHERE DID DREXEL TAKE *YOU?*

Tell us what moves you, how you got ahead, and where you're going next.

Nominate yourself or another Dragon for selection to the 40 Under 40 Class of 2023.

- Must be 39 years or younger as of March 17, 2023.
- Must have a Drexel degree.
- Must demonstrate success in business, arts, science, community or advocacy.
- Must submit high-resolution photograph and résumé.

Submit nominations to drexelmagazine.org/40U40.

Deadline: Aug. 19, 2022.

Questions?
Email magazine@drexel.edu

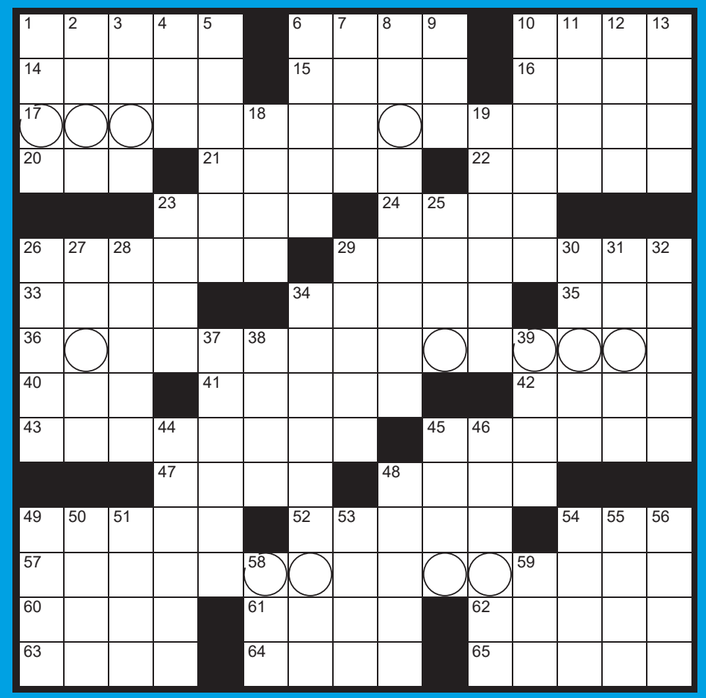
Crossword

THINK YOU'VE GOT ALL THE ANSWERS? *If so, send your completed puzzle to the address at right to be entered into a drawing to win a great Drexel prize. You can also email an image of your completed puzzle to magazine@drexel.edu.*

Drexel University
Office of University Communications
3141 Chestnut Street
Main Building, Suite 309
Philadelphia, PA 19104-2875

GREEN JOBS

Some businesses create jobs that can benefit the environment. This puzzle has a few jobs that contribute to a "green" living in their own way.



EVAN BIRNHOLZ

ACROSS

1 Newton who developed laws of motion
6 Ear feature
10 See 10-Down
14 Key ___ (island connected to Miami-Dade County by the Card Sound Bridge)
15 Congregation's cry to a preacher
16 Divine ring in a religious painting
17 Chauffeur who may transport a group of high school students to the prom
20 Clever like a fox
21 Line in a capital T in Times New Roman font, say
22 In an upright position
23 Recyclables receptacles
24 Pollen pouches
26 Strongly regret
29 Undermine in a destructive way
33 "I don't have the foggiest ___"
34 Prefix for national or continental
35 ___ *Spiegel* (news magazine based in Hamburg)
36 Worker who may wear a HAZMAT suit while making underwater repairs
40 Hot temper
41 Full of interesting information
42 What your spirits do when you begin feeling happier
43 Prohibitions on conducting nuclear weapons trials
45 Greeted enthusiastically
47 Deeply absorbed
48 "Who's the ___?" (1984-1992 sitcom)
49 Ariana DeBose's award for her performance in "West Side Story"
52 Cries like a banshee
54 CUUP undergarment
57 Employee who responds to the phrase "hit me"
60 Force from the throne
61 Make agitated
62 ___ double (action movie professional)
63 Historical periods
64 6-Across adornment
65 Things placed in flowerpots

DOWN

1 Societal woes
2 Take to the lake
3 Group seen in "Saving Private Ryan"
4 In the past
5 The actor Rip Torn, to the actress Sissy Spacek
6 Hibernation stations
7 Hotel chain with a Select Guest loyalty program
8 Certain skewered appetizer in Thai cuisine
9 "At the ___ of the day ..."
10 With 10-Across, seductive selfie posted on social media, perhaps
11 Electronic music event
12 "The Bridge on the River Kwai" actor Guinness
13 Coastal town
18 Email folder
19 World ___ (historic accomplishment at the Olympics)
23 Emission from a laser cannon, in sci-fi
25 Cain's brother
26 Legally permitted
27 Love, love, love
28 Viral videos showing everyday objects that turn out to be cake, e.g.
29 Huffy moods
30 Brand taken for muscle aches
31 Honking migratory birds
32 Made a wrong move
34 "It's gonna be great!"
37 Start a voyage
38 Gather, as rewards
39 Green ring, at times
44 Large expanses of land
45 "Don't ___ your breath"
46 Size up
48 Took part in some ultra-distance races
49 Instrument heard in the songs "I Got You Babe" and "Kiss From a Rose"
50 Curved line on a music score
51 House, in Guadalajara
53 Org. concerned with First Amendment cases
54 Dallas Mavericks uniform color
55 Tear to pieces
56 Painting, pottery, etc.
58 Third-year students: Abbr.
59 Enjoyed some pie