BIO
A publication for alumni, donors and friends of the
COLLEGE OF BIOLOGICAL SCIENCES at the UNIVERSITY OF MINNESOTA

LIFE AS WE DON'T KNOW IT

Kate Adamala is leading an international collaboration with the goal of creating cells from scratch.

Seeing is believing

Chino Nwakama creates opportunities for historically marginalized and low-income students to connect with science.

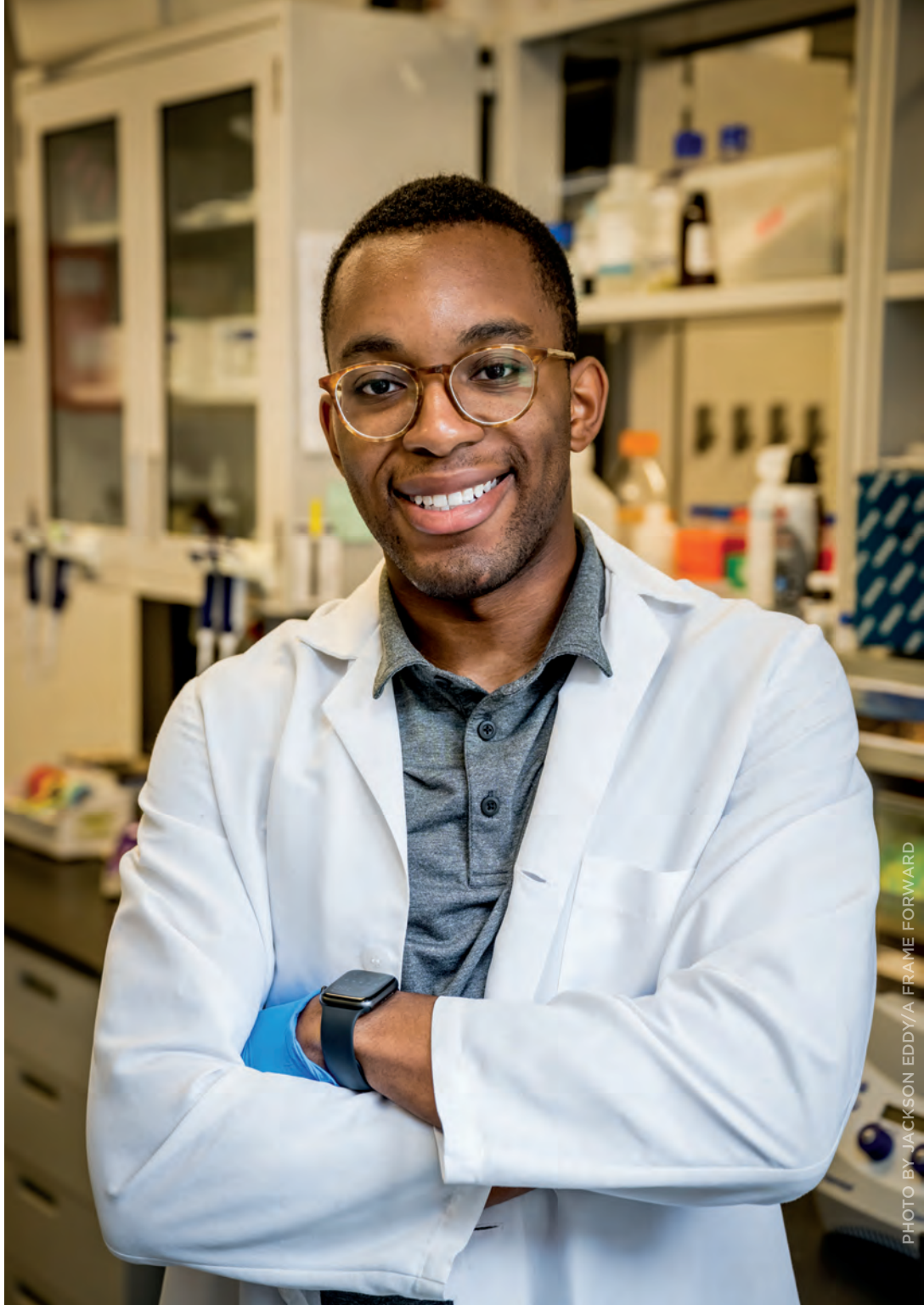
Chino Nwakama didn't grow up knowing he wanted to be a scientist. He didn't see many people of color doing science and his opportunities to engage with science in a meaningful way were limited. Nevertheless, he found his way to the field and discovered a fascination for neuroscience. The gap in representation and opportunity he observed growing up stuck with him.

"Science isn't a very diverse field and so not seeing other people of color doing amazing things in science made me question my place in the field," says the CBS senior. Reflecting on his relationship with science as a kid made him realize that there are probably other youth who, like him, lacked meaningful science experiences. He decided to do something about it.

Nwakama organized KidSTEAM, an after-school program that partners with the University YMCA near campus and local schools to make science, technology, engineering, art, and math (STEAM) fun and accessible. He recruited 15 undergraduate peers to help deliver 12 weeks of programming to nearly 50 youth in second through eighth grade. With an emphasis on reaching historically marginalized and low-income students, the program seeks to expose students to science with an eye to sparking their curiosity about the living world and helping them see themselves as potential scientists.

"Every week it was rejuvenating to see the kids eager to approach science from a different angle," he says. "I simply wanted to share a different side of science. The side of science that captured me." Meanwhile, undergraduate students participating in the program gain valuable skills by learning how to communicate their science.

The University recognized Nwakama for his science outreach work last spring with its Undergraduate Scholarly Excellence in Equity and Diversity Award and the President's Student Leadership and Service Award. He hopes the KidSTEAM partnership will be long-lasting for both the benefit of CBS students and youth in the community. *—CHRISTINE HAZUKA*



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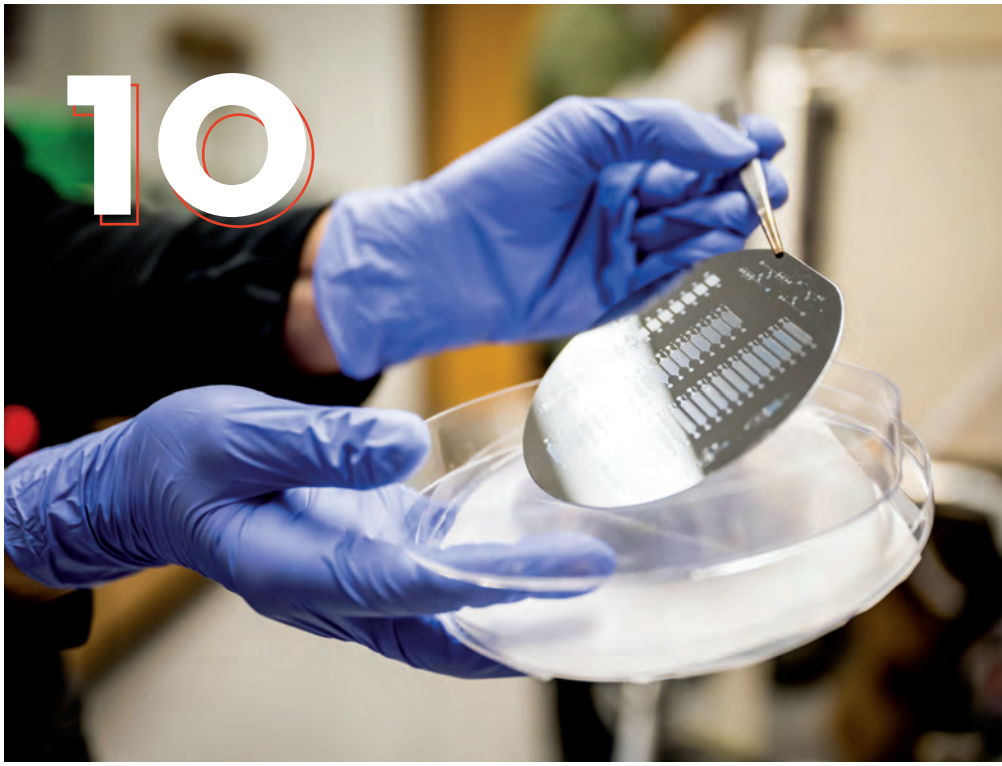

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Future focused

Even as things change, the sense of community and spirit of collaboration remain hallmarks of the college.

PHOTO BY JACKSON EDDY/A FRAME FORWARD

When I took on the role of interim dean this summer, I did so with the knowledge that CBS has a strong foundation and a great deal of positive momentum. There's so much good work happening across the college.

I spent four years as associate dean for research and nearly two decades working with CBS students as a member of the faculty. During that time it's been my privilege to help advance the college's mission as an educator, researcher, and administrator. I intend to do all I can over the coming year to continue building on the positive momentum created through the stewardship of the dedicated staff, faculty, alumni, and students who have helped set us on this course.

While this is a period of transition for the college, it's also a time of growth: in research funding, in enrollment, in scholarship and fellowship support. As we grow, we want to ensure that all of our students have every opportunity to make the most of their time here. With that in mind, we continue the push to improve the quality of our programs and the student experience as a whole.

One way we are doing that is by expanding the Dean's Research Program, which provides paid research opportunities for undergraduate students in the college. Since launching the program in 2021, we've steadily grown the number of spots available in faculty labs. Ultimately, we'd like to offer positions to any student who wants an authentic research experience regardless of financial need.

In addition to the Dean's Research Program, we hope to offer additional programmatic and financial support for our transfer and graduate students this year.

Transfer students are incredibly motivated and accomplished. They graduate at a higher rate than other students at the U, but they have less time on campus to take advantage of all that's available here. They need to be able to hit the ground running, which is why we are focused on creating new transfer student scholarships. Doing all we can to attract transfer students to the college and support them while they are here is a top priority.

We also know we need to prepare our graduate students for careers outside academia. With that in mind, we are focused on expanding the professional development opportunities available to them.

We tend to think of ourselves as a small college within a large university. In some ways, that's no longer true. Yet the sense of community remains strong. As I connect with alumni and donors in my role as interim dean, I can see that the collegiate community is actually quite expansive. In this case, bigger *is* better.

DAVID GREENSTEIN, Interim Dean
College of Biological Sciences

A golden family tradition

Tim Tripp grew up hearing about the University of Minnesota, so when it was time for college he knew where he wanted to go. His daughters followed in his footsteps. Tripp earned his undergraduate degree in microbiology and went on to receive a master's in molecular biology and an MBA from the Carlson School. His daughters, Megan (CLA class of 2021), Rachel (CSE class of 2022), and Emma (CBS class of 2024), represent the next generation of Golden Gophers in the Tripp family.

PHOTO BY AARON FRAHER/AFRAY PHOTO

"Every student and alum can recall an experience where they engaged with and learned something new about the state and the Twin Cities community." —Megan

"Anybody can find their home he e. The U has the resources to support an incredible variety of academic interests as well as passions outside the classroom." —Rachel

"CBS has so many opportunities early in undergrad to get involved in your field of interest through volunteering, research, and extracurriculars." —Emma

"CBS allows students to find what they are most interested in and, chances are, there is world-class research and teaching happening in that field in the college." —Tim

THE EXPERIMENT CONTINUES

The Petri Dish explores how biology affects our lives and what it means for our future. No PowerPoints. Just lively, curiosity-driven conversations on timely topics with University of Minnesota experts.

OCTOBER 12 | 6PM | URBAN GROWLER

Making moves: Should we help plants and animals migrate?
Tickets at z.umn.edu/makingmoves

NOVEMBER 9 | 6PM | URBAN GROWLER

Food for thought: Is it time for a new "green revolution"?
Tickets at z.umn.edu/greenrev

Bringing Native perspective to the MN Ecology Walk at Cedar Creek

Building on a longstanding partnership with St. Francis Area Schools' American Indian Education staff, Cedar Creek Ecosystem Science Reserve developed learning resources and signage for the new MN Ecology Walk. The interpretive walk offers visitors an accessible way to learn about the state's major ecosystems, while also providing exposure to indigenous language, science, and ways of knowing. This summer, two interns from St. Francis High School worked with Dakota and Anishinaabe elders to create signage and a trail guide with Native plant names alongside western common and scientific names. These materials include information about traditional and contemporary uses of the plants. They also designed, built, and filled a "little free library" structure with books that share indigenous perspectives on land and natural resources.

"This new trail is an opportunity to share some of the cultural and traditional practices that have taken place on these lands over time and to bring indigenous science and indigenous ways of knowing and learning into our western science community," says Potter. "This is the kind of project that takes a village. Bringing in elders that have the knowledge—both of the cultural uses of the plants and the language—has been essential to make sure the resources we create share information in an accurate way."

Point of pride

U.S. News and World Report ranked the University of Minnesota 23rd among public universities in the United States, up three spots from last year!

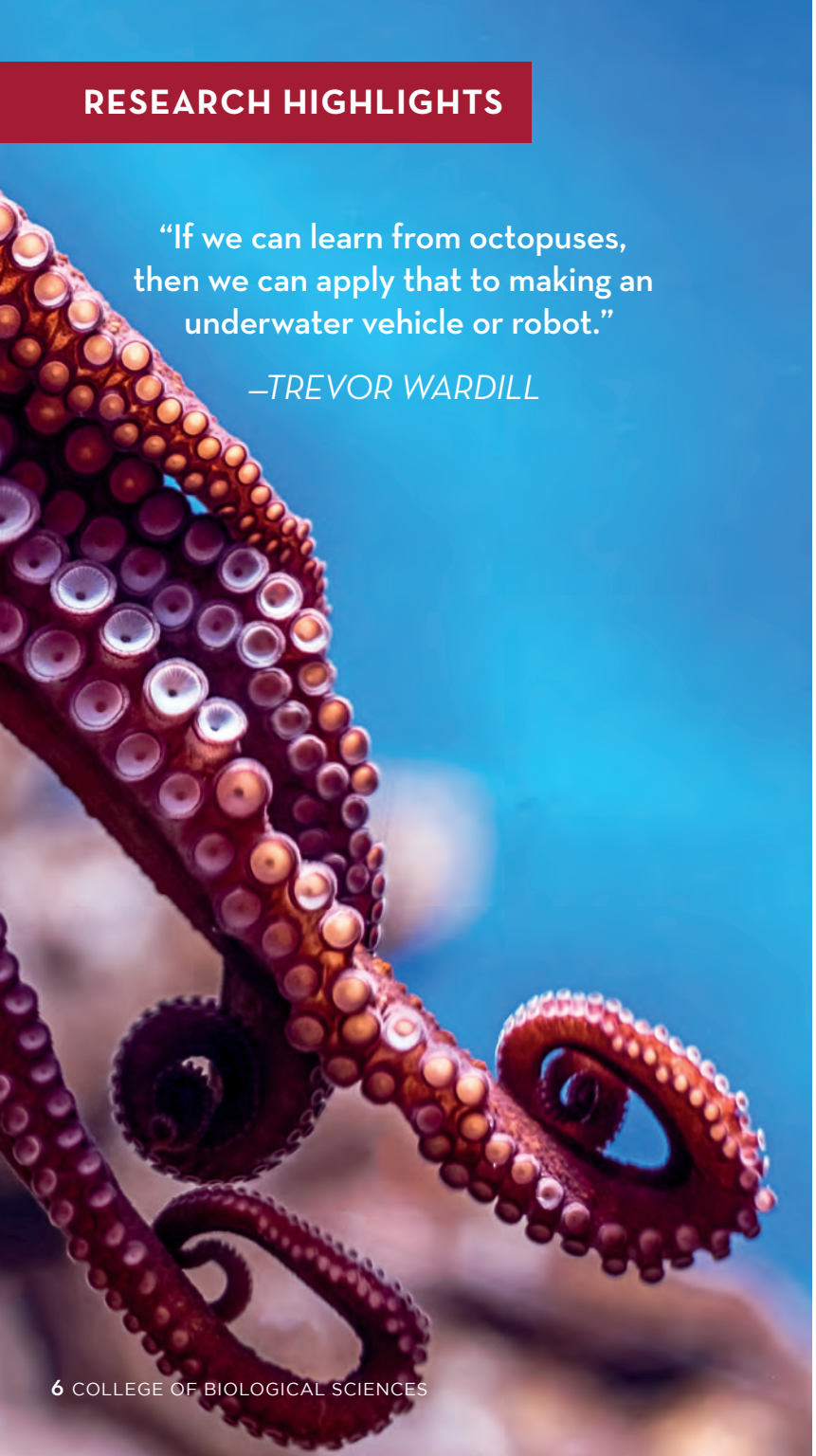
Research within reach

Since its start in 2021, the Dean's Research Program has provide nearly 200 students with paid research opportunities in faculty labs. This fall, the program welcomed its largest cohort with 51 students participating! Ensuring students have access to an authentic research experience regardless of financial need is a top priority for the college.

A quest for crabs

Retired Ecology, Evolution, and Behavior Professor Frank Barnwell recently donated a massive collection of fiddler crabs to the American Museum of Natural History. The museum received 13,000 crabs including 11,000 fiddler crab specimens from more than 50 countries on six continents collected over decades.

Learn more about Dr. Barnwell's quest to collect these unique crabs at z.umn.edu/crabcollect



"If we can learn from octopuses, then we can apply that to making an underwater vehicle or robot."

–TREVOR WARDILL

ARMED FOR SUCCESS

Studying what arms octopuses favor when hunting with their eyes helps inform bio-inspired robot design.

Nature is inspirational for many, including designers and innovators. You can thank geckos for surgical glue and express gratitude for burrs (yes, those pesky seeds!) when you Velcro a bag shut. We might be thanking octopuses next.

Researchers are optimistic that knowing more about how they control their arms could help designers create soft-bodied robots.

Octopuses leverage all eight appendages to guide them through the water, sense their surroundings, and capture prey. Despite their impressive arm array, their movements can look awkward and seemingly unplanned at times.

"Normally when you look at an octopus for a short while, nothing is repeatable. They squirm around and just look weird in their exploratory movements," says Trevor Wardill, an assistant professor of Ecology, Evolution, and Behavior who studies octopuses and other cephalopods, including cuttlefish and squid. Wardill and colleagues recently published their findings in *Current Biology*.

To study this, researchers dropped different types of prey, including crabs and shrimp, into the tanks with California two-spot octopuses and recorded videos. The octopuses, who were hiding in ornamental SpongeBob Squarepants "dens" with one eye facing outward, lunged for the snacks.

How they lunged differed depending on whether it was a crab or shrimp. When hunting crabs, octopuses pounced on the prey with a cat-like movement. When hunting shrimp, the octopuses were more careful to avoid spooking the prey. They led with an arm and then used neighboring arms one and three to secure it.

No matter the prey though, the octopuses always lead the attack with the second arm from the middle, which is somewhat surprising given how awkward their movements often are. Additionally, the second arm on the right or left side was always the same side as the eye that first spotted the prey from the den.

Flavie Bidel, the lead author and a postdoctoral researcher in the lab, was shocked at how predictably octopuses began prey capture with the second arm. For creatures whose movement appears unpredictable, the hunting behavior was actually exceedingly repeatable. One of the next steps is to study how neurons facilitate arm movements.

"Octopuses are extremely strong. For them, to grasp and open a door is trivial, given their dexterity. If we can learn from octopuses, then we can apply that to making an underwater vehicle or robot," says Wardill. Underwater vehicles inspired by octopuses could play a crucial role in deep ocean exploration. *—CLAIRE WILSON*

AN EYE ON INVASIVES

Using remote sensing and machine learning, researchers can spot an invasive species from space—and predict its spread.

Invasive plant species crowd out native species, outcompete crops, and cause havoc to rangelands. In the United States alone, the economic losses are estimated at over $20 billion each year. The most effective way to cut down on pesky plant invasions is to prevent them from taking root in the first place. The second best option is to detect arrivals early on and mitigate their spread.

For countless years, the best way to monitor invasive plants was by completing field surveys. These tactics are expensive, labor intensive, and slow. Delays in getting data gathered, compiled, and shared leads to missed opportunities of detecting and mitigating early.

David Moeller, a professor in the Department of Plant and Microbial Biology, sought to find a better way. Moeller, alongside graduate student Thomas Lake and research scientist Ryan Briscoe Runquist, found promise in a new method that leverages images from satellites.

Leafy spurge—the invasive plant in question—wreaks havoc on rangelands and pastures. It crowds out plants that are more nutritious for livestock and it's toxic to them, causing sickness and death in cattle, sheep, and horses.

The research team took aerial images from two kinds of satellites to sort out how sharp the images needed to be to detect leafy spurge. Some images were high-resolution images taken infrequently and others were low-resolution images taken daily. From these images, and field data, researchers developed deep learning models by training a computer to identify leafy spurge from the images.

The deep learning models detected leafy spurge in the Twin Cities region with greater than 96 percent accuracy. The model leveraged a time series analysis and used numerous images across time to help detect the plant. The plant's distinctive emergence, flowering, and senescence helped the model accurately identify the plants.

"Time series analysis is relatively new in this type of deep learning model so we were really excited to find that it worked so well at identifying leafy spurge populations," says Runquist. "Deep learning allows scientists to discover patterns that previously were impossible to detect."

The findings suggest that deep learning models can accurately identify individual species over complex landscapes with satellite imagery, even using lower-resolution images. This gives researchers hope of leveraging techniques to track invasive species—with limited lag time—using publicly available satellite images.

"Invasive species are more difficult than ever to manage and surveillance via satellites is a low-cost, rapid method for dynamically monitoring invasions," says Moeller. *—CLAIRE WILSON*

"Invasive species are more difficult than ever to manage and surveillance via satellites is a low-cost rapid method for dynamically monitoring invasions."

—DAVID MOELLER

A CBS standout

Cheryl Quinn received one of the University's top alumni honors in recognition of her many contributions as a biotechnology leader.

A highly accomplished scientist. A leader in the biopharmaceutical industry. An entrepreneur and inventor. A mentor and advocate for women in science. A passionate supporter of higher education. Any one of these would distinguish Dr. Cheryl Quinn (B.S. Biochemistry and Microbiology, '85). She's made an impact across all of these areas. So it can come as no surprise that Quinn was recognized with a 2022 University of Minnesota Alumni Achievement Award.

After completing undergraduate degrees at the College of Biological Sciences, Quinn went on to earn distinction as a graduate student at the University of Illinois and a postdoctoral fellow at Oxford. She began a career in pharmaceutical R&D, eventually serving as CEO of a biotechnology company using engineered T cell receptors that has led to an anticancer agent in clinical trials.

As a co-inventor on over 50 issued patents, Quinn is known for her ability to spot potential new therapeutic targets and move them toward real-world applications. Due to the breadth of her business experience and her reputation as a researcher, many in the biopharmaceutical industry continue to look to her for advice and insights relating to drug discovery and development. She continues to serve as an independent consultant for biotechnology companies and as an advisor to academic labs, the National Institutes of Health, and nonprofit foundations around discovery of new treatments for fungal and bacterial infections.

In addition to her many scholarly and professional achievements, Quinn is a proud and engaged Gopher. She maintained a strong connection to her alma mater and gave generously of her time and resources as chair of the College of Biological Sciences Campaign Steering Committee. Passionate about ensuring opportunity and representation for women in science, she is determined to support young scientists with the hope of increasing the diversity of students who can access all the educational and training benefits CBS provided her. Quinn and her husband, Dr. Robert Buck, have established scholarships for students studying in the College of Biological Sciences and continue to support efforts to increase opportunities for nontraditional students.

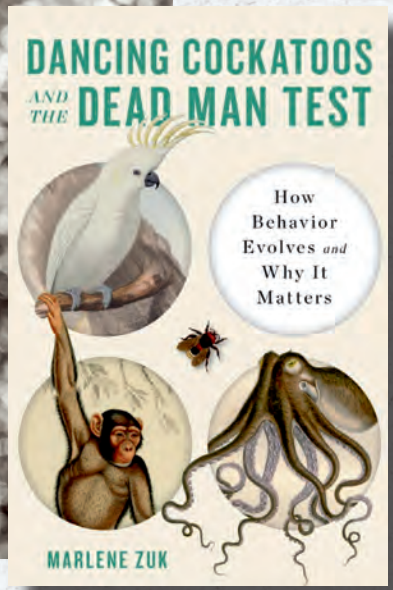
PHOTO BY JONATHAN PAVLICA

"I feel very lucky to be an alum of CBS. The rigorous education in science, the support I received from the college faculty, and the opportunities to experience research in top-notch labs as a CBS undergraduate were all key to my scientific success and the success of many others as well," says Quinn. "I'm honored to be part of such a vibrant community of field-shaping faculty, accomplished alumni, and bright, engaged students." *—STEPHANIE XENOS*

NATURE *and* NURTURE

Professor Marlene Zuk's newest book dives in to the debate about what drives behavior.

In her latest book, Marlene Zuk, illuminates how all our attributes, behavior or not, are shaped by both genes and the environment, in a complex way that defies a simple binary. She shared her thoughts on the topic as well as writing about science.



Q. What was the impetus for this book?

Most if not all of my books are about genes, evolution, and behavior, and this one is no different. I suppose you could ask why I keep writing the same thing over and over, but I assure you each one takes a separate tack on this very large subject. In this book, I became fascinated with the way that we keep coming back to the nature-nurture debate, no matter how many times we think we have resolved it. The minute I describe a behavior in an animal, the first thing people want to know is whether that behavior is instinctive (or genetic, or hard-wired, or a number of other synonyms), or whether it is learned (or cultural or flexible). We know it isn't really a dichotomy—all traits are both—but the nature-nurture debate has become what you might call a "zombie" idea, one that we can try to kill but that just keeps resurrecting itself.

Q. What do you think people get wrong about behavior and why and how it evolves?

First, people think behavior is special, or different from other characteristics like the physical body or physiology. You don't get particularly worked up about whether your liver is the size that it is because of your environment or your genes (news flash, it is a bit of both). But ask about a trait like sexual orientation or intelligence, and people are very invested in claims that it's all one or the other. Again, it's both.

Second, it's tempting to see behavior evolving for a purpose—"we needed to communicate, so we evolved language" (or bees evolved dancing). But evolution doesn't have a goal, and it doesn't march along improving organisms, those funny—and inaccurate—cartoons showing the fish moving out of the water followed by a reptile, an ape, and finally a person notwithstanding.

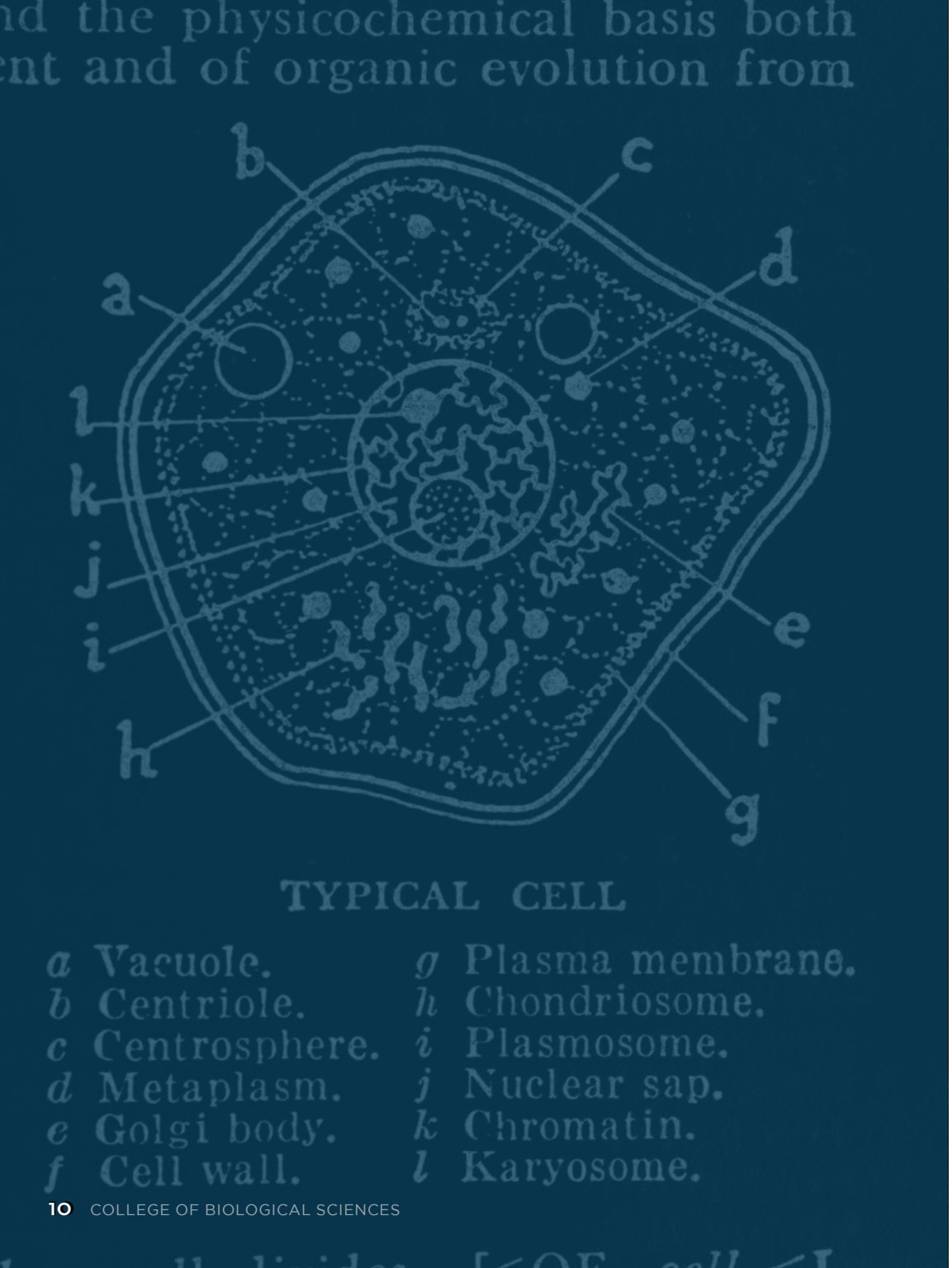
Q. The book explores the intersection of nature and nurture. What are some of the unexpected ways behavior has evolved in response to that interaction?

Because I'm arguing that all behavior, like all other traits, evolves because of interaction between genes and the environment, you might say that whatever behavior you find unexpected is an example of that interaction. Some of my favorite examples have to do with parasite manipulation of host behavior. For instance, a one-celled parasite called toxoplasma has to get into both a rodent and a carnivore, like a cat, to complete its life cycle. Mice infected with toxoplasma change their behavior and become more reckless around predators, increasing their likelihood of being eaten.

Q. This is your fifth popular scien e book. How has your approach to communicating science evolved since you started doing this?

I think of my writing as a scholarly endeavor on its own, rather than me "dumbing down" facts for the general reader. People don't want someone to translate a jargony scientific paper into words of one syllable, they want to understand the importance and wonder of the natural world.

Join Dr. Zuk at Open Book in Minneapolis October 20 for an author talk and book signing. RSVP at z.umn.edu/zukauthorevent.



LIFE AS WE DON'T KNOW IT

What if we could build cells from scratch to produce medicine in space and replace chemicals sourced from fossil fuels?

An astronaut battles a grueling headache. The pain reliever they brought on their mission is gone. Luckily, the ship is outfitted with an onboard mini-pharmaceutical factory powered by a synthetic cell system that can crank out a pill within a few hours.

It might sound a little like a science fiction novel, but Kate Adamala, an assistant professor in the Department of Genetics, Cell Biology, and Development, believes the scene is not that far off. Scientists expect to leverage synthetic cells to produce chemicals used in pharmaceutical drugs. The implications are far-reaching for life in space and here on Earth.

"When I was a kid I learned about astrobiology from science fiction movies and I thought it was so cool," says Adamala. "Then I realized it was something I could do for a living." Now, Adamala is part of a small but growing field of researchers working to create a programmable and controllable synthetic cell system.

"The research I do is like science fiction with real-life applications," says Adamala. "It's the best of both worlds."

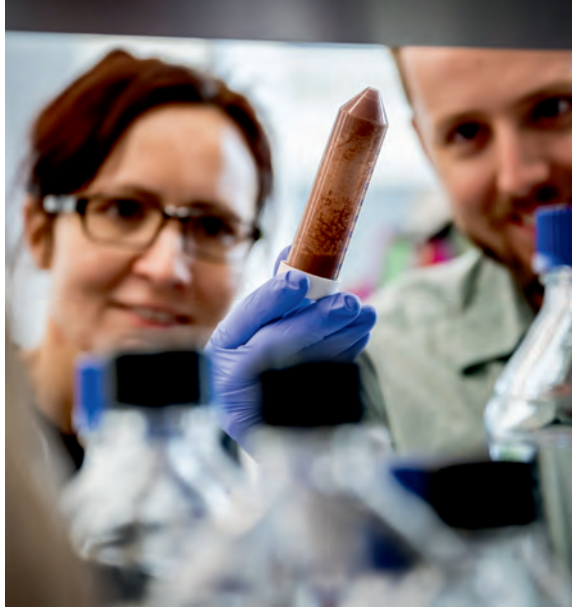
LIFE, MIRRORED

Cells function as factories, power plants, transportation networks, and warehouses. They're the smallest unit of life and they self-replicate, self-heal, and self-destruct. They carry out a wide variety of specialized functions thanks to the constant pressures of evolution and time.

Despite their incredible complexity, they're messy. Like some basements, there is a lot of unnecessary junk that's accumulated over a few decades (for cells, billions of years). Evolution does not act with a grand plan or end goal, which often leaves engineers and biologists scratching their heads at the inefficiencies of biological systems.

One of the starkest examples of this in cell systems is visible in the ribosome, a structure that translates detailed instructions to create proteins. Despite the fact that ribosomes across all cells are quite similar, they're picky about how they receive instructions. They are also wildly inefficient.

Cells leverage DNA to store instructions



Kate Adamala and Nathaniel Gaut prepare a solution to simulate Martian soil for an experiment.

and a uniform alphabet and language to decode, decipher, and build from them. Amino acids function much like alphabetical letters do. Stringing enough of them together results in proteins (words), protein complexes (sentences), and ultimately complex biological activities (paragraphs).

The "alphabet" of amino acids as we know it is just half the story, though. Each amino acid comes in two shapes, which are mirror images of each other—a right-hand version

"The research I do is like science fiction with real-life applications. It's the best of both worlds."—*Kate Adamala*

A template—known as a mask—used to prepare microfluidic devices for making synthetic cells.

and left-hand version. In biology, proteins are composed of only left-handed amino acids, which leaves the right-handed protein world largely unexplored.

This has long puzzled scientists, including Adamala. When thinking about developing a synthetic cell system, Adamala wondered if she could leverage right-handed amino acids, in part because down the road they show promise as therapeutics. She's also motivated to learn whether life could exist in a "right-handed" form. This concept grabbed the attention of Evan Kalb when he was just starting his graduate program. Now a fourth-year Ph.D. student in Adamala's lab, Kalb spends a lot of time thinking about how to create more "flexible" ribosomes.

"We are not trying to change the chemical functionality of the proteins. We are just trying to change their shape," says Kalb. This will come as a relief to biochemists who know firsthand that biology is already chock-full of complex chemistry, much of which is still not explained.

One key application is utilizing mirrored amino acids in pharmaceuticals, both in outer space and closer to home. Protein therapies debuted in the 1920s with insulin and involve introducing small proteins into a patient's body. The therapy is used to ease pain, replace hormones, and speed up injury recovery timelines. While some of these small proteins will make it to their target, many are chopped up before they do. A suite of enzymes known as proteases do a great job of breaking down foreign proteins. Proteins containing mirrored amino acids are harder for these proteases to recognize and thus show promise in developing more effective protein therapies.

While Kalb is driven by the potential applications, he also frequently ponders the philosophical question, "What would a mirror life look like?"

While individual amino acids don't change their function when right- or left-handed, does that hold true if scaled up to a living, breathing organism? While this "right-handed" organism is a long way from its debut, the prospect keeps researchers intrigued.

OILY ALTERNATIVES

Drug development is just one of several game-changing applications. Another includes alternative fuels that could dramatically reduce our dependence on fossil fuels. Chemical compounds derived from petroleum—known as petrochemicals—make up a massive number of products on consumer shelves (not to mention the shelf itself!). Plastics, coatings, gels, and fertilizers all use petrochemicals.

Technologies supporting the expansion of wind, solar, and hydrogen are expanding rapidly, but alternatives to petrochemicals remain stubbornly out of reach. Chemists working to develop them at the bench have

come up short time and time again. In part, this is because biological processes can produce chemicals so complex that when a chemist goes to synthesize them at the bench, it's exceedingly expensive and difficult.

Over the years, researchers successfully coaxed bacteria and cell systems to produce a range of common chemicals, including ethanol, butanol, and vinegar. They also succeeded in crafting more complex chemicals, including precursors to morphine and a drug to treat malaria. No such luck with petrochemicals.

"Petrochemicals are bad for anything with an ounce of common sense," says Adamala. "No bacteria will make them because it will kill them." Chemicals like ammonia and benzene come from crude oil and are toxic to cells.

Since synthetic cell systems don't have the same self-preservation tendencies of natural cells, they show promise as biologically viable chemical factories.

BUILDING TOGETHER

Decade-old rivalries between lab groups often drive discord and conflict amongst researchers. The emerging field of synthetic biology is unusually collaborative, in part because it is only now becoming established. Adamala saw an opportunity to bring the community together with an eye to sharing successes and failures. And thus emerged the Build-A-Cell Network.

"When a synthetic cell is developed, it will be one of the biggest discoveries in the history of science. That isn't the accomplishment of a single lab or even a single country," says Adamala. "It should belong to the scientific community."

This collaborative mindset means sharing failed experiments with colleagues. For Ph.D. students, that can mean gaining years of their life back. Working in a collaborative field saved a lot of headaches and time for Nathaniel Gaut, a member of Adamala's lab who recently defended his dissertation. For one of his key projects, he worked with a piece of technology that was finicky. After connecting with a colleague in another lab, he learned they also really struggled to get it to work reliably under controlled conditions. Knowing this, Gaut pivoted his approach, which saved months of frustration down a dead-end path.

"It's really powerful to not have the field repeat stuff over and over again if it doesn't work. Letting people know, we tried this, and it didn't work, saves people time," says Gaut. "It can make a field move much more rapidly because then they can go on and do something else that actually hasn't been done before."

Scientific journals don't publish "unsuccessful" experiments. If a researcher cannot get a new method to work, they have lab mates to help lift their spirits. But often that's where tales of failure ends. Another researcher half-way around the world might attempt the same tactic—unbeknownst to them that it's a prickly path.

Different research groups are focusing on different aspects of the system. Adamala's research group is one of the groups that's hoping to bring together multiple pieces into a synthetic cell.

FUZZY FINISH LINE

The first footprints on the moon, the first successful administration of a vaccine, and the first flicker of the electric light bulb all have something in common. They are all lines on a lengthy list of groundbreaking scientific achievements. They all also had a clear finish line.

Synthetic cell systems are poised to join the ranks in the coming years, but the finish line isn't as obvious.

These synthetic cells will divide, create proteins, and discard waste, to name a few functions. They'll resemble a pared-down version of a cell. Initially, the synthetic cells will require a very specific "diet" in order to survive. Akin to early computers that took over multiple stories compared to the smartphone in our pockets, early synthetic cells might be unrecognizable in another fifty years.

"We've never seen a living to nonliving transition happen before our eyes. Nothing has ever become alive that wasn't alive before," says Adamala. "That's one major reason that defining a finish line is so challenging."

Despite the finish line being a little fuzzy, Adamala is optimistic about seeing a synthetic cell system in her lifetime. "The science is just moving forward so incredibly fast, that there are things we didn't even imagine would be possible 20 years ago, and now they're routine." At least for a while, spaceships will need fully stocked medicine cabinets. *—CLAIRE WILSON*

Future focused

CBS alum Azion White turned his passion for bioengineering into a promising startup career.

On a small table in Azion White's kitchen, there's a shaking incubator for cell culturing. In his living room, you'll find two 3D printers and a genetically engineered tomato plant. Beside his computer in the bedroom, there's a PCR machine, a homemade bioprinter, and a dry bath incubator for studying and replicating DNA.

While his interior decor isn't something from your typical IKEA spread, White (B.S. Biochemistry '21) feels right at home in the Bay Area. Shortly after earning his degree, he landed a job with BluumBio, a startup with UC-Berkeley roots. As a synthetic biologist, White helps develop bioremediation technologies that rapidly clean soil, air, and water.

When he isn't working his day job, he's focused on getting his own startup company, Ourogami, off the ground. Using the power of synthetic biology, Ourogami aims to "upcycle" common plastics like PET into building materials, medicine, and other target compounds. Ultimately, this business model promotes a circular economy—one that uses products to their fullest potential and reduces waste to a minimum.

White co-founded Ourogami with his childhood friend and fellow alum, Kovic Odhiambo (B.A. Statistics '21), during his senior year at the University. White planned to do postgraduate research at Northwestern University, but COVID-19 put a damper on things. Like all good founders, he pivoted accordingly. With some funding from the Carlson School and the Acara Challenge—along with his own hard-earned money—he built his own research lab at home.

"I wanted to have a project and business idea to keep working on," says White. "At the time, I was playing with 3D printing, and I thought it would be so convenient to recycle the plastic waste that I was getting from those by designing organisms that could 'eat' plastic and turn it into useful things."

Along with plastics recycling, White hopes to incorporate 3D bioprinting into his business portfolio. This evolving field uses cells and biomaterials to create functional tissues. "There are tons of awesome ideas coming into the 3D bioprinting manufacturing space, not just for the biomedical industry, but for making new and affordable products such as electronics," he says.

White's interests are a great fit for BluumBio, where he's working to speed up natural processes that break down microplastics, heavy metals, and other contaminants. He's currently a full-time employee with the company, but in the next year or two, he hopes to relaunch Ourogami as his sole venture, through funding from a startup accelerator program like Y Combinator.

White's fascination with biochemistry started around seventh grade, in his hometown of Brooklyn Park, Minnesota. Back then, he taught himself how to code so he could make his own video games. One day, a genetic engineer visited his science class and brought along some glow-in-the-dark bacteria cells. "After class, I talked with the scientist and told him I was interested in computer programming. He made the analogy that DNA code is to an organism as computer code is to a PC. That just blew my mind."

PHOTO BY AARON FRAHER/AFRAY PHOTO

Fast forward to his junior year in college—and White used cutting-edge synthetic and structural biology techniques in the University's BioTechnology Institute. As a research associate in Claudia Schmidt-Dannert's lab, he characterized and assembled a toolbox of biocatalysts for chemical manufacturing. He also helped develop biodegradable nano-surface coatings for the manufacturing of biomaterials.

White says the college's emphasis on undergraduate research was vital to finding his niche. "The world of bioengineering is what I was looking for, but I didn't know exactly what it was or where to look. I'm very grateful to CBS for helping me make that connection."

—EVE DANIELS

ALUMNI EXTRAORDINAIRE

Each year, the college recognizes alumni in three categories: achievement, leadership, and service. Meet our 2022 recipients.

Alumni Achievement Award

FORUM KAMDAR

Dr. Forum Kamdar (B.S. Biology '04) is an assistant professor of medicine at the University of Minnesota Medical School. After completing her undergraduate degree, she went on to pursue her medical degree at the U of M and completed an advanced fellowship in cardiology at the Cleveland Clinic before coming back to the University. Dr. Kamdar has demonstrated excellence in research, teaching, and patient care. She was recognized with the American Society of Clinical Investigation Young Physician-Scientist Award and the International Society of Heart and Lung Transplantation Early Career Registry Award for identifying that patients with neuromuscular heart failure who receive heart transplants have similar outcomes to those patients who do not have neuromuscular disease. Dr. Kamdar co-founded the Neuromuscular Cardiomyopathy Clinic, which is one of a handful of clinics in the country that focus on evaluating and treating patients with neuromuscular disorders for cardiovascular disease.

Emerging Leader Award

KYLE LAU

After completing his undergraduate degree, Dr. Kyle Lau (B.S. Biology '16) earned his medical degree from the University of Minnesota Medical School, where he received a Medical Student Leadership Award in 2020. While at the University, he launched Veggie Rx, an organization that dropped locally sourced vegetables to patients and their families each week, among other volunteer and leadership activities. He currently practices family medicine in Lancaster, Pennsylvania. As a physician, he served his local community throughout the pandemic including joining in the first mobile clinic to promote vaccinations in his area.

IHAB MIKATI

Ihab Mikati (B.S. Ecology, Evolution and Behavior '15) went on to complete a three-year fellowship with the Environmental Protection Agency (EPA) after completing his undergraduate studies. While at the EPA, he led a project on disparities in exposure to air pollution. Ihab went on to law school at New York University with an emphasis on environmental justice. Since beginning his legal career, he has worked as a law clerk for the Civil Liberties Defense Center, interned at the New York Lawyers for the Public Interest and the Legal Aid Society, and currently works to provide housing stability in New York City.

CBS Service Award

MOHAMED YAKUB

While still a graduate student, Dr. Mohamed Yakub (Ph.D. Plant and Microbial Biology, '16) helped launch Market Science, an outreach and community engagement program at local farmers markets. After completing his studies, he led the Minnesota Youth Insititute and outreach efforts for the College of Food, Agricultural, and Natural Resource Sciences. In his current role as scientific outreach manager at SciLine at the American Association for the Advancement of Science, he works with scientists to make scientific evidence and ideas available and accessible to reporters and other communicators. Dr. Yakub has demonstrated vision and leadership as a staunch advocate for public access to science.

Quick off the mar

Providing financial support to transfer students allows them to make the most of their time in the college.

CBS transfer students are some of our brightest and most dedicated scholars. They enter CBS with a driven and purposeful path toward a CBS degree. For students who start their studies at two-year colleges, making the transition to the University of Minnesota opens up a world of opportunities—from research to student leadership and professional networking. However, too often, these opportunities are missed due to lack of time and resources. One way to ensure that transfer students can take advantage of all the University has to offer is through increased financial support.

Before joining the College of Biological Sciences, I spent many years in advancement at Minneapolis College—Minnesota's most diverse two-year community and technical college. I had the chance to meet many students and witnessed first-hand their passions, talents, and also their challenges with navigating a science-based academic program while juggling multiple other responsibilities that often included a job (or two!).

I recently had the pleasure of meeting some of our transfer students and I was impressed to learn that they graduate on time at higher rates when compared to students across the University and when compared to incoming first-year students at CBS.

"Transfer students deserve all the support we can provide so they can reach their full potential."

Transfer students who enter CBS have worked hard to get here. The bar is high, and even more so for those facing obstacles—64 percent of CBS transfer students finance their education by working during the school year.

Your generosity and commitment to reducing financial pressure for incoming first-year students was the key reason we were able to increase the number of four-year scholarships from zero to nearly 150, as part of the Great Science at a Grand Scale campaign.

Before this fall the college had zero scholarships available for incoming transfer students in their first year. We are working to change that. The college is commitmed to increasing support for transfer students and hope your generosity will help us close this critical gap through support of the CBS Transfer Scholarship.

Transfer students deserve all the support we can provide so they can reach their full potential. CBS transfer scholarships will encourage prospective students to transfer into the college and apply their drive and work ethic toward their studies, research opportunities, and getting involved in campus life.

Encouraging and welcoming these students enriches the college experience for everyone.

REEDE WEBSTER
Chief Advancement Officer

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New display in the lobby of the Molecular and Cellular Biology Building recognize donors to the Great Science at a Grand Scale campaign, as well as past scholarships and fellowships.

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Give to the Max for transfer students this November 17

Transfer students have less time to take advantage of all the University and college have to offer. This fall, we're raising funds for the Transfer Student Scholarship fund on Minnesota's day of giving.

Gifts will be matched 1:1 until we reach $8,500!

Learn more about why transfer students deserve your support and make a gift at **z.umn.edu/cbsgtmd22**