

# 2022 ANNUAL REPORT



COLLEGE OF BIOLOGICAL SCIENCES

UNIVERSITY OF MINNESOTA



## A NOTE FROM THE DEAN

It was a year of transitions in more ways than one. In August of last year, I stepped into the role of interim dean as we bid farewell to Dr. Valery Forbes after six years as dean of the college. This fall, incoming students were able to experience Nature of Life in person at Itasca Biological Station and Laboratories for the first time since the start of the pandemic.

While this is a period of transition for the college, it's also a time of growth in research funding, in enrollment, and 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 continued the push to improve the quality of our programs and the experience for our students as a whole.

One way we did that was by expanding the Dean's Research Program, which provides paid research opportunities for undergraduates in the college. Since launching the program in 2021, we've steadily grown the number of spots available and hope to continue to increase access in the years to come.

The college also attracted more research funding than ever before. Total expenditures were up 20 percent over the year before. This points to the incredible productivity of our students and faculty. There's so much good work happening across the college, and this is just one indicator.

We also ramped up a fundraising campaign focused on paid undergraduate research opportunities as well as transfer student scholarships. In our last campaign, which concluded in 2021, we increased the number of four-year scholarships from zero to more than 100. This fall, we awarded our first transfer student scholarships. Both of these initiatives are important for increasing access and ensuring students have what they need to achieve their full potential.

The college remained focused on advancing our diversity, equity, inclusion and justice efforts. We launched a DEIJ microgrants program, revised the faculty search process with an eye to reducing bias and breathed new life into our inclusive teaching efforts. The work continues.

All of this is possible because of the incredible generosity of the CBS community. That generosity takes many forms from the extra time a faculty member spends mentoring students to the dedication of our student scholars determined to use what they learn to make positive change in the world to the financial support of donors. Thank you for another great year.

David Greenstein

A handwritten signature in black ink, appearing to read 'David Greenstein'.

Interim Dean, College of Biological Sciences



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# 2022 HIGHLIGHTS

## A RECORD-BREAKING YEAR FOR RESEARCH

Research expenditures grew 20 percent in 2022. CBS faculty continue to attract research funding, propelling college research expenditures to a new high.

## INCREASING ACCESS AND OPPORTUNITY

The college welcomed its most diverse and second-largest incoming class to date in 2022. Ensuring that every student has access to an authentic research experience remained a high priority. The college continued to grow the Dean's Research Program with an eye to providing opportunities for paid research experiences for undergraduates.

## ADVANCING DIVERSITY, EQUITY, INCLUSION AND JUSTICE

CBS introduced a microgrant program to support grassroots efforts around diversity, equity, inclusion and justice across the college. Seventeen projects led by students, staff and faculty across the college received a total of \$75,000. In addition, the college revised the faculty search process to reduce bias and ensure fairness.

## EXPANDING OUR BIOTECHNOLOGY FOOTPRINT

Construction began on a new building to expand biomanufacturing capacity. The BioTechnology Institute named a new director who brings an ambitious vision for how the college and the University might increase their impact in this area. CBS is also poised to introduce a biotechnology minor in fall 2023 to better prepare students for roles in industry.

## STUDENT-FOCUSED FUNDRAISING

The college launched a new campaign to raise funds to increase access and equity focused on paid research experiences and supporting transfer students. This fall, CBS awarded its first transfer student scholarships and raised funds to support the Dean's Research Program to enable students to participate in research due to financial need.

# CBS SNAPSHOT

## BY THE NUMBERS

- 2,328 undergraduates
- 297 graduate students
- 222 staff
- 77 postdoctoral researchers\*
- 158 faculty members\*

## DEPARTMENTS

- Biochemistry, Molecular Biology and Biophysics\*\*
- Biology Teaching and Learning
- Ecology, Evolution and Behavior
- Genetics, Cell Biology and Development\*\*
- Plant and Microbial Biology

## ACADEMIC PROGRAMS

- 8 undergraduate majors
- 6 graduate programs

## FIELD STATIONS AND CONSERVATORY

- Cedar Creek Ecosystem Science Reserve
- Itasca Biological Station and Laboratories
- CBS Conservatory & Botanical Collection

## SIGNATURE PROGRAMS

- Nature of Life Program
- Foundations of Biology Active Learning Courses
- Dean's Research Program
- Petri Dish Science Conversation Series
- Market Science Community Engagement Program

## OPERATING BUDGET

The College's FY22 operating budget included \$103,373,971 in expenditures.

Largest sources of revenue:

- \$31,021,508 tuition and fees
- \$25,069,222 state appropriation
- \$8,823,968 indirect cost revenue related to sponsored grants
- \$3,179,058 private gifts and endowment income
- \$34,977,785 external faculty grants and contracts - sponsored

\* including faculty and staff in shared departments with Medical School appointments

\*\* departments shared with the Medical School

# UNDERGRADUATE STUDENTS

## TOTAL ENROLLMENT [Fall 2022]

**2,328**  
undergraduates  
enrolled

- 1,646 students from Minnesota (70.7%)
- 766 students of color (32.9%)
- 79 international students (3.39%)
- 632 first-year students (NHS Fall 2022)
- 68 transfer students (NAS Fall 2022)

## FRESHMAN STUDENTS [NHS, Fall 2022]

**632 students enrolled**

- 442 from Minnesota (70% of total)
  - 318 from Twin Cities metro (50% of total)
  - 124 from Greater Minnesota (20% of total)
- 438 female (70%)
- 194 male (30%)
- 113 first-generation college students (17.9%)
- 16 international students (3%)
- 231 domestic students of color (36%)
- 90.5% average high school rank

## TRANSFER STUDENTS [NAS, Fall 2022]

**68 students enrolled**

- 59 from Minnesota (87%)
- 37 female (54%)
- 31 male (46%)
- 22 first-generation college students (30.9%)
- 2 international students (2.9%)
- 25 domestic students of color (36.8%)

## Class of 2026 AT A GLANCE

**36%**  
are students of color

**50%**  
are from the Twin Cities

**70%**  
are from Minnesota

**90%**  
average high school rank



## RETENTION AND GRADUATION RATES

- First-year retention rates – 92.3% (UMTC Avg 90.4%)
- Four-year graduation rates – 82% (UMTC Avg 75.3%)
- Six-year graduation rates – 87.8% (UMTC Avg 84.7%)
- Four-year graduation rates for Pell-eligible students – 77.1% (UMTC Avg 65.5%)
- Six-year graduation rates for Pell-eligible students – 85.1% (UMTC Avg 75.9%)
- Four-year graduation rates for domestic students of color – 83.2% (UMTC Avg 69.9%)
- Six-year graduation rates for domestic students of color – 91% (UMTC Avg 80.8%)

**12%**  
amount by which the  
college's four-year  
graduation rate exceeds  
the University average  
for Pell-eligible students

## UNDERGRADUATE MAJORS

	Fall 2018	Fall 2019	Fall 2020	Fall 2021	Fall 2022
Biochemistry	429	406	389	411	400
Biology	831	851	849	948	962
Cellular and Organismal Physiology	9	46	87	99	85
Ecology, Evolution and Behavior	95	87	75	76	81
Genetics, Cell Biology and Development	256	245	244	235	230
Microbiology	136	118	101	89	78
Neuroscience	372	381	398	382	386
Plant and Microbial Biology	27	31	30	27	24

## DEGREES AWARDED

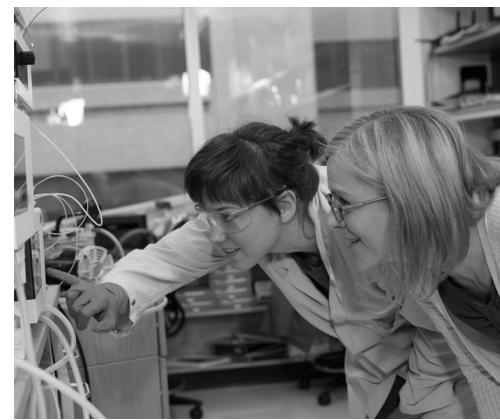
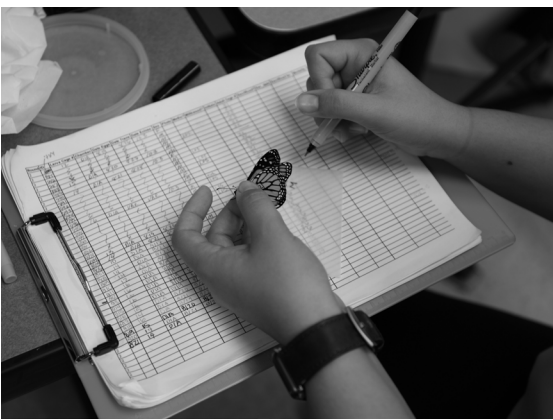
	2017-18	2018-19	2019-20	2020-21	2021-22
Biochemistry	86	92	87	85	79
Biology	204	176	188	173	158
Cellular and Organismal Physiology			2	15	23
Ecology, Evolution and Behavior	21	32	31	26	24
Genetics, Cell Biology and Development	72	70	74	71	76
Microbiology	30	38	32	27	32
Neuroscience	82	87	83	104	113
Plant and Microbial Biology	1	5	13	7	12
<b>Total</b>	<b>496</b>	<b>500</b>	<b>510</b>	<b>508</b>	<b>517</b>

## STUDENT SUPPORT [2021-22 academic year]

CBS Student Services includes 19 professional staff members each contributing to the shared responsibility of advancing the college's mission. Staff serve students in three functional areas: academic advising, career coaching and student engagement. CBS Student Services saw continued growth in student usage with a total of 4,146 student appointments and 870 drop-in appointments across academic advising, career development and learning abroad. Student Services continued to offer virtual appointments in response to changing needs of students following the pandemic.

## LEARNING ABROAD

As options began to reopen for students, 24 students studied abroad during the 2021-22 academic year.



## UNDERGRADUATE RESEARCH

In addition to course-based research, more than 250 CBS undergraduate students gained research experience working with research groups across campus.

### Directed research and UROP

CBS undergraduates worked with faculty and research groups in the college and beyond to design and carry out projects on a wide range of topics.

- ▶ 104 CBS student participated in directed research/studies projects
- ▶ 37 CBS students completed projects through the U's Undergraduate Research Opportunities Program (UROP).

### Dean's Research Program

The Dean's Research Program gives CBS students the opportunity to earn and learn by matching them with a University research lab in need of skilled employees. Students are paid \$15 an hour for up to 20 hours a week. Participation in the program doubled from the year before.

- ▶ 119 CBS students in 86 faculty research groups



### A colorful quest

Finding colored nectar sounds simple, and for pollinators it likely is. For humans, not so much. It takes close examination and an eye for detail. As part of a research project in Professor Clay Carter's lab, undergraduate Leah Hallett spent hours in the CBS Conservatory looking for these floral renegades. She found a half dozen and the search continues!



# GRADUATE STUDENTS

## ENROLLMENT

	2018	2019	2020	2021	2022
Biochemistry, Molecular Biology and Biophysics	81	90	90	88	90
Ecology, Evolution and Behavior	69	61	63	67	64
Genetic Counseling (M.S.)	20	20	21	22	23
Microbial Engineering (M.S.)	11	10	9	9	9
Molecular, Cellular, Developmental Biology and Genetics	51	53	56	54	63
Plant and Microbial Biology	41	45	47	47	48

## DEGREES AWARDED

	M.S.	Ph.D.
Biochemistry, Molecular Biology and Biophysics	2	12
Ecology, Evolution and Behavior	0	6
Genetic Counseling	10	n/a
Microbial Engineering	5	n/a
Molecular, Cellular, Developmental Biology and Genetics	3	12
Plant and Microbial Biology	0	10

N/A - not applicable

## EXTERNAL AND UNIVERSITY AWARDS

CBS graduate students received 109 fellowships, grants and awards, including a Smithsonian Fellowship, an NSF Graduate Research Fellowship and several DOE Office of Science Graduate Student Research Grants.

See the complete list of external, University and collegiate awards in the “In Detail” section at the end of this report.

## THESES AND DISSERTATIONS

Graduate students produced 61 theses and dissertations in 2022.

See the complete list of theses and dissertations in the “In Detail” section at the end of this report.

# FACULTY

CBS is home to field-shaping faculty widely recognized for their contributions to the sciences including nine\* National Academy of Sciences fellows.

## PROMOTIONS, NEW HIRES AND RETIREMENTS

### Promotions

- Hideki Aihara, promoted to full professor (Biochemistry, Molecular Biology and Biophysics)
- Frank Albert, promoted to associate professor with tenure (Genetics, Cell Biology and Development)
- Naomi Courtemanche, promoted to associate professor with tenure (Genetics, Cell Biology and Development)
- Melissa Gardner, promoted to full professor (Genetics, Cell Biology and Development)
- David Moeller, promoted to full professor (Plant and Microbial Biology)
- Tamar Resnick, promoted to teaching associate professor (Biology Teaching and Learning)
- Burckhard Seelig, promoted to full professor (Biochemistry, Molecular Biology and Biophysics)
- Anita Schuchardt, promoted to associate professor with tenure (Biology Teaching and Learning)

### New hires

- Theresa Edelman, teaching assistant professor (Biology Teaching and Learning)
- Sarah Hammarlund, teaching assistant professor (Biology Teaching and Learning)
- A. Kelly Lane, assistant professor (Biology Teaching and Learning)
- Mingzi Xu, assistant professor (Ecology, Evolution and Behavior)
- Michael Latham, associate professor (Biochemistry, Molecular Biology and Biophysics)\*\*
- Luiza Mendoca, assistant professor (Biochemistry, Molecular Biology and Biophysics)\*\*
- Thu Truong, assistant professor (Biochemistry, Molecular Biology and Biophysics)\*\*
- PingHsun (Benson) Hsieh, assistant professor (Genetics, Cell Biology and Development)\*\*
- Arslan Zaidi, assistant professor (Genetics, Cell Biology and Development)\*\*

### Retirements

Four faculty members retired: Mark Decker (Biology Teaching and Learning), Arkady Khodursky (Biochemistry, Molecular Biology and Biophysics), Michael Sadowsky (BioTechnology Institute), and Friedrich Srienc (Biotechnology Institute)

## FACULTY AWARDS AND RECOGNITION

In 2022, seven faculty and staff received major professional, University or collegiate awards.

See the complete list of faculty awards in the “In Detail” section at the end of this report.

\* Includes current and retired or historic faculty

\*\* Faculty in shared department with primary appointment in the Medical School

# RESEARCH

In 2022, five faculty members affiliated with the college were among the University of Minnesota faculty included in the Highly Cited Researchers list published annually by insight and analytics firm Clarivate Analytics.

## PUBLICATIONS

Faculty with primary appointments in the College of Biological Sciences authored or co-authored nearly 440 studies and articles in 229 journals, including :

- *Nature*: 21\*
- *Science*: 1
- *PNAS*: 11
- *Ecology Letters*: 5
- *Genetics*: 2

\*Including associated *Nature* journals

See the complete list of CBS faculty and staff publications.

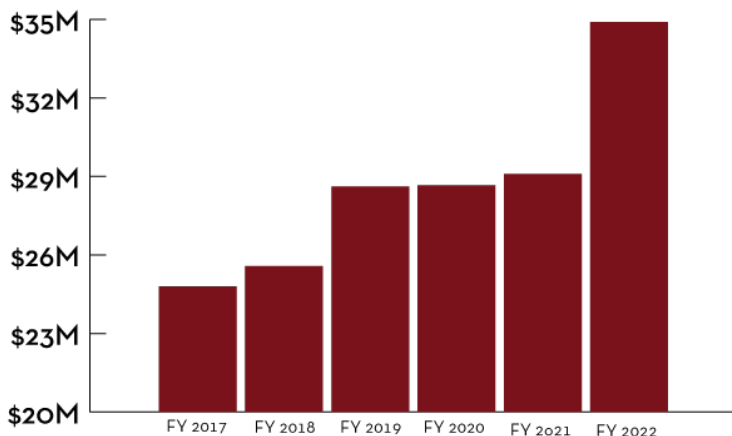
## ACTIVE GRANTS

The college had 264 active grants in 2022, including 101 exceeding \$100,000 in expenditures.

- \$34,977,785 (total sponsored research spend) an increase of \$5.9M or 20% over FY21
- \$13,204,421 NIH
- \$9,005,346 NSF
- \$5,470,351 Other federal agencies (DOE, DOD, DOI, USDA, etc.)
- \$714,680 LCCMR
- \$1,202,814 Other Minnesota state agencies

See the complete list of CBS faculty grants.

## TOTAL RESEARCH EXPENDITURES



## PAPERS OF NOTE

College of Biological Sciences faculty, staff and students do field-shaping research on a wide variety of topics at every scale. Here are a few of the standouts from 2022 with faculty contributors highlighted.

### Avoiding obstacles while intercepting a moving target: A miniature fly's solution

*Journal of Experimental Biology* | Fabian, S. T., Sumner, M. E., [Wardill, T. J.](#) and [Gonzalez-Bellido, P. T.](#)

### Novel Bruton's Tyrosine Kinase (BTK) substrates for time-resolved luminescence assays

*ACS Chemical Biology* | Naomi E. Widstrom, Minervo Perez, Erica D. Pratt, Jason L. Heier, John F. Blankenhorn, Lindsay Breidenbach, Hannah Peterson, and [Laurie L. Parker](#)

### Elements of disease in a changing world: Modeling feedbacks between infectious disease and ecosystems

*Ecology Letters* | [Elizabeth T. Borer](#), Lale Asik, Rebecca A. Everett, Thijs Frenken, Angelica L. Gonzalez, Rachel E. Paseka, Angela Peace, [Eric W. Seabloom](#), Alexander T. Strauss, Dedmer B. Van de Waal, Lauren A. White

### Identification of shared and disease-specific host gene-microbiome associations across human diseases using multi-omic integration

*Nature Microbiology* | Priya S, Burns MB, Ward T, Mars RA, Adamowicz B, Lock EF, Kashyap PC, [Knights D](#), Blekhman R.

### Traffic patterns, more than adjacent land use, influence element content of roadside forbs for insect pollinators

*Ecological Solutions and Evidence* | Alexander M. Shephard, Lauren Agnew, Annika Herdtle, Timothy S. Mitchell, [Elizabeth T. Borer](#), [Emilie C. Snell-Rood](#)

### Context matters: How an ecological-belonging intervention can reduce inequities in STEM

*BioScience* | [Sarah P Hammarlund](#), Cheryl Scott, Kevin R Binning, Sehoya Cotner

### Ubiquitin ligases and a processive proteasome facilitate protein clearance during the oocyte-to-embryo transition in *Caenorhabditis elegans*.

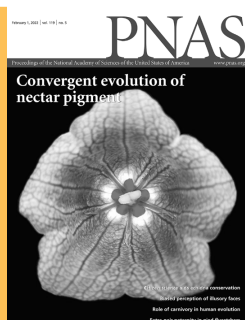
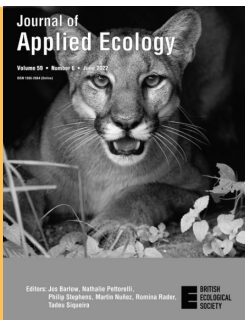
*Genetics* | Spike, C. A., Tsukamoto, T., & [Greenstein, D.](#)

### Determinants of trafficking, conduction, and disease within a K<sup>+</sup> channel revealed through multiparametric deep mutational scanning

*eLife* | Willow Coyote-Maestas, David Nedrud, Yungui He, [Daniel Schmidt](#)

### Octopus *bimaculoides*' arm recruitment and use during visually evoked prey capture

*Current Biology* | Bidel F, Bennett NC, [Wardill TJ](#)



### Picture perfect

Papers by CBS faculty members Meggan Craft and Clay Carter landed on the covers of journals in 2022!

Papers referenced: "Paradoxes and synergies: Optimizing management of a deadly virus in an endangered carnivore" and "Convergent evolution of a blood-red nectar pigment in vertebrate-pollinated flowers"

## Climate and hydraulic traits interact to set thresholds for liana viability

*Nature Communications* | Willson, A.M., Trugman, A.T., [Powers, J.S.](#) et al.

## Nitrogen deposition and climate: an integrated synthesis

*Trends in Ecology & Evolution* | [Elizabeth T. Borer](#), Carly J. Stevens

## Convergent evolution of a blood-red nectar pigment in vertebrate-pollinated flowers

*Proceedings of the National Academy of Sciences* | Rahul Roy, Nickolas Moreno, Stephen A. Brockman, Adam Kostanecki, Amod Zambre, Catherine Holla, Erik M. Solhaug, Anzu Minami, [Emilie C. Snell-Rood](#), Marshall Hampton, [Mark A. Bee](#), Ylenia Chiari, Adrian D. Hegeman, and [Clay J. Carter](#)

## Variation in ubiquitin system genes creates substrate-specific effects on proteasomal protein degradation

*eLife* | Mahlon A Collins, Gemechu Mekonnen, [Frank W. Albert](#)

## Diverse perspectives from diverse scholars are vital for theoretical biology

*Theoretical Ecology* | [Allison Shaw](#)

## Hunting alters viral transmission and evolution in a large carnivore

*Nature Ecology and Evolution* | Nicholas M. Fountain-Jones, Simona Kraberger, Roderick B. Gagne, Marie L. J. Gilbertson, Daryl R. Trumbo, Michael Charleston, Patricia E. Salerno, W. Chris Funk, Kevin Crooks, Kenneth Logan, Mathew Alldredge, Simon Dellicour, Guy Baele, Xavier Didelot, Sue VandeWoude, Scott Carver & [Meggan E. Craft](#)

## Identification of a S-(2-succino)cysteine breakdown pathway that uses a novel S-(2-succino) lyase

*Journal of Biological Chemistry* | Katie B. Hillmann, Madeline E. Goethel, Natalie A. Erickson, [Thomas D. Niehaus](#)

## Ancestral function but divergent epigenetic regulation of HAIKU2 reveals routes of seed developmental evolution

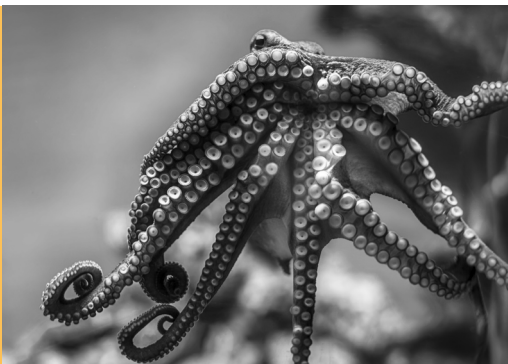
*Molecular Plant* | Wu, D., Wei, Y., Zhao, X., Li, B., Zhang, H., Xu, G., Lv, J., Zhang, D., Zhang, X., and [Ni, M.](#)

## Epigenetic features drastically impact CRISPR-Cas9 efficacy in plants

*Plant Physiology* | Trevor Weiss, Peter A Crisp, Krishan M Rai, Meredith Song, Nathan M Springer, [Feng Zhang](#)

## Imbalance of global nutrient cycles exacerbated by the greater retention of phosphorus over nitrogen in lakes

*Nature Geoscience* | Zhen Wu, Jincheng Li, Yanxin Sun, Josep Peñuelas, Jilin Huang, Jordi Sardans, Qingsong Jiang, [Jacques C. Finlay](#), Gregory L. Britten, Michael J. Follows, Wei Gao, Boqiang Qin, Jinren Ni, Shouliang Huo & Yong Liu



### Media mention

“How to Hunt Like an Octopus,” *The New York Times*

Ecology, Evolution and Behavior Assistant Professor Trevor Wardill and colleagues investigated whether octopuses preferred certain arms over others when hunting, rather than using each arm equally. A better understanding of how they use their arms will aid efforts to develop next-generation “soft” robots.

## **CBS SUPPORT FOR MULTI-COLLEGIATE INFRASTRUCTURE AND COLLABORATIONS**

The college provides critical financial and administrative support to shared research infrastructure and initiatives and multi-collegiate events that foster research collaborations. In 2022, the following interdisciplinary facilities and initiatives received over \$2.75M in annual CBS support:

- Cedar Creek Ecosystem Science Reserve
- Itasca Biological Station and Laboratories
- BioTechnology Institute
- MnDRIVE Environment (administrative support and space)
- Center for Mass Spectrometry and Proteomics
- Characterization Facility
- University Imaging Centers
- University of Minnesota Genomics Center
- Developmental Biology Center
- Center for Genome Engineering
- Microbial and Plant Genomics Institute
- Center for Plant Precision Genomics
- Lewis-Burke Federal Government Relations
- University of Minnesota Lion Center

In addition, the college provides space for:

- Electronic Instrumentation
- Machine Shop
- Biotechnology Resource Center
- Caenorhabditis Genetics Center
- Chlamydomonas Resource Center
- University Imaging Center
- Bell Museum collection

In 2022, the college distributed more than \$100,000 to support interdisciplinary collaborations, events and symposia, including the Norwegian Centennial Chair Collaboration, Emerge BioScience Program, Moos Family Speaker Series on Water Resources and the Institute for Molecular Virology Symposium

## **RESEARCH AND LEARNING TECHNOLOGIES**

RLT launched non-credit course registration for CBS through the DestinyOne Registration System (DORS). DORS is integrated into the University's financial, learning management and other computing systems to create a more seamless and easily repeatable process for engaging communities outside of the University. RLT is supporting multiple non-credit courses, workshops and conferences and is now ready to work with others.

# DIVERSITY, EQUITY, INCLUSION AND JUSTICE

The college continued to work toward implementing recommendations in the areas of recruitment and retention, incentives and recognition, and inclusive teaching. The CBS DEIJ Community of Practice (DCoP) continued into its second year, welcoming new members and meeting regularly to discuss departmental DEIJ goals, lessons learned, progress and challenges.

- **Inclusive teaching.** Over 2022, the college laid the groundwork for the re-introduction of the Faculty Fellows for Inclusive Science Education program in spring 2023. The program provides training for faculty in inclusive teaching. CBS also continues to strengthen relationships with University partners in this critical area.
- **Recruitment and retention.** Implicit bias training has been a prerequisite for search committees for a number of years. With recent faculty searches, the college introduced additional steps including anonymizing applications and making sure job descriptions included language around DEIJ, clearly articulating expectations.
- **Incentives and recognition.** The college reviewed and revised eligibility criteria and the nomination process ahead of the spring 2023 call for nominations for collegiate awards and increased communication to ensure all members of the community are aware of the opportunity.

## CBS DEIJ MICROGRANTS

In 2022, the CBS DEIJ Community of Practice awarded the inaugural round of microgrants with \$75,000 provided by the CBS Dean's Office. In sum, 17 groups received funding in varying amounts. The grants support efforts across the college and include programs and projects led by graduate and undergraduate students, faculty and staff. The microgrant program is expected to continue on an annual basis.

- Field Guides: Student mentoring and career development program
- Bringing Native perspective to the MN Ecology Walk
- Teaching about fresh water at Cedar Creek
- Expansion of Grass-Roots Advancement of STEM Professions (GRASP) MN Program
- Mentorship, DEI, and science workshops in area high schools
- Co-mentoring community-building (CoCo Café)
- Setting a foundation for sustainable JEDI advancement in genetic counseling and beyond
- Research experiences for underrepresented undergraduates
- Examining gender in science
- Developmental Biology Center Undergraduate Summer Research Scholarship
- CBS LGBTQ+ student experience in learning sex, gender and reproduction
- Intergenerational workshop for Dakota wico 'a of tatanka|pte knowledge at Cedar Creek
- BIOL1009 learning assistants
- Expansion of Queer Science programming
- Supporting teaching assistants in LGBTQ+ inclusive teaching of biology
- Transportation accessibility for CBS Researchers at Cedar Creek Ecosystem Science Reserve
- Exploring the historical and contemporary relationship between STEM fields and social issues

## STUDENT AFFINITY GROUPS

Over the course of 2022, CBS offered a variety of affinity opportunities for CBS students who identify as BIPOC, LGBTQ+, women, and international students. A total of about 30 students engaged in these spaces with many opting to attend on a recurring basis. Each group met in-person once a month and offered students an opportunity to connect with their CBS peers and be in a community around shared identities. In addition to ongoing affinity groups, affinity sessions were offered during CBS College Day to support LGBTQ+ and BIPOC students in their transition to college and to connect them with peers who held similar identities. We also offered a virtual White Accountability Group in which white students in CBS met to discuss developing and integrating an antiracism lens to their lives.

## UNIVERSITY-WIDE RECOGNITION

The Office of Equity and Diversity awarded its Outstanding Unit Award to the college's Department of Biology Teaching and Learning. The award honors exemplary campuses, colleges, departments or units that demonstrate leadership in equity and diversity work.

## EQUITABLE PATHWAYS PLANNING GRANT

The University of Minnesota, Morris (UMM) and the College of Biological Sciences received a planning grant from the Alfred P. Sloan Foundation to explore ways to attract more Native American students to graduate programs in the biological sciences and, ultimately, careers in STEM fields. The first phase of the year-long initiative will focus on gathering as much information as possible from current undergraduates at UMM about how they view STEM careers, the barriers that they have encountered that inhibit them from pursuing graduate education, as well as their needs and plans for the future.

## CBS SUPPORT FOR EXTERNAL DEI ACTIVITIES

CBS provides financial and volunteer support to a number of University-wide events and symposia including:

- The University's first Juneteenth celebration (financial sponsorship, day-of event support from CBS community members)
- An event featuring Robin Wall Kimmerer, bestselling author of *Braiding Sweetgrass: Indigenous Wisdom, Scientific Knowledge, and the Teachings of Plants* (financial sponsorship)
- 2022 Nibi Manoomin Symposium hosted by CFANS and a tribal partner every other year. The symposium is a partnership between reservation communities of the upper Midwest and the University of Minnesota. The group works to build understanding within the University of the significant role that wild rice (manoomin, *Zizania palustris*) plays within the communities of the Anishinaabe people of the upper Midwest and Cree of Canada, and the threats to wild rice in the future. (financial sponsorship)
- Keeping our Faculty of Color Symposium (financial sponsorship)



### Native perspectives

Students at St. Francis High School worked with Dakota and Anishinaabe elders and Cedar Creek staff to create new signage and a trail guide for the Minnesota Ecology Walk. The signs include Native names for plants along the walk along with information about their traditional and contemporary uses.



# FIELD STATIONS

The college's field stations play an integral role as hubs for research and education. In 2022, field biology courses and research thrived at Itasca Biological Station and Laboratories. Cedar Creek Ecosystem Science Reserve celebrated its 80th anniversary while making progress across its mission.



## CEDAR CREEK ECOSYSTEM SCIENCE RESERVE

Cedar Creek's mission is to find sustainable solutions to the world's environmental challenges through research, conservation, education and community engagement. In 2022, the field station celebrated its 80th anniversary and made strides in all of those areas.

**Research:** Long-term research continued across Cedar Creek's most well-known experiments, including the Big Biodiversity plots, the BioCON global change plots, the Nutrient Network experiment and the Forests and Biodiversity experiment. In these and other major projects, Cedar Creek harvested 3.23 miles of plant biomass, collected 384 gallons of root cores, and measured percent cover on more than 3,800 individual plots! Additionally, 15 new projects were launched. New work included studies of breeding birds, lichen, fungi, streams and species turnover, to name a few. The station employed more than 60 undergraduates and recent graduates on research projects and more than a third of them completed mentored independent research of their own. Researchers published more than 50 peer-reviewed papers, and brought in funding from state, federal and private sources. Dr. Maowei Liang also joined the station as the new site research scientist in fall 2022.

**Conservation:** After a COVID-induced hiatus, the station restarted fire work, successfully burning nearly 500 acres of experiments, prairies and oak savannas, continuing management, research and conservation work that started in the 1960s. With support from Anoka County Conservation District and funding from the Lessard-Sams Outdoor Heritage Fund, Cedar Creek improved fire breaks and made progress on removing and mitigating the effects of invasive species. The station also continued studies of bison and red-headed woodpeckers, two charismatic and impactful species in the oak savanna ecosystem.

**Education:** Cedar Creek's K-12 programs went through a transition in 2022, with former education coordinator Caitlin Barale Potter moving into the role of associate director early in the year and new coordinator Kara Baldwin beginning work in in the late summer. Despite this transition, the station continued to welcome students from across the state to the reserve for hands-on science field trips and in-classroom programs. Cedar Creek staff served 3,432

K-12 students and their teachers, including both first-time visitors and long-time partners. Cedar Creek provided internships for two Native American high school students, and built out new options for older learners. The station's undergraduate programs also were successful, with 854 college and university students visiting on course field trips and hundreds more working with Cedar Creek data in their classes.

**Community Engagement:** During the summer 2022 – a prime time for community engagement work at the reserve – Cedar Creek reached nearly 5,000 community members through its programming. This included the popular bison gazebo weekends, a presence at the MN State Fair, monthly Lunch With a Scientist lectures, and small-group guided tours and hikes. Cedar Creek also continued our artist-in-residence program, hosting three artists working on paintings, data visualization, and creative writing.

## ITASCA BIOLOGICAL STATION AND LABORATORIES

In 2022, Itasca Biological Station and Laboratories (IBSL) ramped up activity across all areas of its mission and hosted a record number of students, researchers and visitors – more than 7,000 overnight stays in all. In the spring, the largest cohort of field biology students in at least a decade made their way to Itasca. The station also hosted seven sessions of Nature of Life and 10 graduate student retreats. A core group of researchers returned to the station for field season. IBSL continued to partner with Itasca State Park to offer programming to park visitors, as well.

**Research:** The station continued building research activity in 2022 with a core group returning to the station as well as some new faces, including several graduate research fellows. Researchers came from the University of Minnesota and other areas of the midwest, and visited from other areas in the country such as Woods Hole. Teams from Japan, Norway, and France also initiated work at Itasca. Their areas of inquiry spanned limnology, biogeochemistry, mycology, ornithology, animal behavior and ecology. The station awarded research fellowships and continued its Seed-to-Roots research program, designed to provide researchers with funding to start projects in and around IBSL.

**Education:** Last May, more than 60 students enrolled in field biology courses at the station, the largest course cohort in at least a decade. The station offered five courses – mycology, microbiology, ornithology, mammalogy and animal behavior. From late June through July, the station hosted seven sessions of the college's Nature of Life program, up from six sessions when it was last hosted at Itasca in 2019 before the pandemic halted in-person programming. In August and September, Itasca welcomed 10 graduate student retreats. Interspersed were ten multi-day workshops and conference gatherings, beginning the season with the Plant Breeding Center and ending the season in October with the Rural-Urban Exchange (RUX).

**Community Engagement:** In 2022, a group of field biology alums formed the Itasca Booster Club with an eye to promoting the station and field biology courses. Itasca has a baseline community of regular users who know first-hand that Itasca is special. IBSL continued to partner with state park staff to provide programming for park visitors and has managed several grants enabling rural-urban community building and arts-with-sciences cohorts. In addition, the station hosted a seminar series and had a new volunteer "wilderness accessibility guide" program to lower barriers and optimize the remote and rural, field station experience.

# ENGAGEMENT AND OUTREACH

After a couple of challenging years for in-person programming, 2022 was a banner year for the college's engagement and outreach programs. CBS has established itself as an institutional leader in public engagement and continues to expand its portfolio of work through strategic partnerships within and beyond the University.

**2,000**

number of students who participated in the college's SciSpark Scholars program

**5,000**

number of student contact hours provided by scientists as part of SciSpark Scholars

**12,000**

number of community members engaged through Market Science programming

## K-12 OUTREACH

With continued support from the Richard M. Schulze Family Foundation and the Boston Scientific Foundation, SciSpark Scholars continued to expand its K-12 engagement programming focused on creating more equitable and supported pathways into science for underrepresented students. CBS works with units across the University of Minnesota (including the Medical School, College of Science and Engineering, College of Education and Human Development, and Office for Equity and Diversity) to develop a holistic approach for the recruitment, retention and training of underrepresented students (BIPOC, women, LGBTQIA and other marginalized identities) in STEM fields through SciSpark Scholars. The SciSpark Scholars program partners with K-12 schools with majority non-white student populations where high percentages of students qualify for free and reduced lunch, to provide hands-on, inquiry-based, science activities. The 2022 key outcomes include:

- **2,000** - Number of students who participated in SciSpark Scholars
  - >60% Non-white students
  - >50% Qualify for free or reduced lunch
- **5,000** - Student-contact hours provided by scientists
- Paid outreach assistant positions for 25 CBS students
- **25** - St. Paul Public Schools students served through summer research camp collaboration with ATP-Bio Engineering Research Center
- **2** - Research Experiences for Teachers mentored with Caitlin Potter; funding provided by NSF Supplement to the CCESR LTER grant
- **\$35,000** - Grant from Richard M. Schulze Foundation (\$185K since 2014)
- **\$25,000** - Grant from Boston Scientific Foundation (\$50,000 since 2021)

## INFORMAL SCIENCE EDUCATION

Launched in 2013 as a CBS graduate student initiative, Market Science has grown into the college's premier informal community science education program. Market Science is a collective of undergraduate and graduate students sharing science through hands-on learning activities for kids, answering scientific questions for market goers, and creating conversations between researchers and their communities. In particular, Market Science provides much-needed infrastructure that allows CBS faculty

to disseminate their research to the broader community, essential for fulfilling the public service and outreach mission of the University. The 2022 key outcomes include:

- **12,000** - Community members engaged in Market Science
- **65** - Market Science events held throughout Minnesota
- **11** - Days that CBS presented at the MN State Fair, facilitated and organized through the Market Science Team
- Broader impacts programming integration in three funded NSF proposals, providing ~\$20K in program funding

## PUBLIC EVENTS

The college continued to engage the community through informal science-themed events highlighting research and faculty areas of expertise.

- Petri Dish: A matter of fate: The long tail of chemicals in the environment
- Petri Dish: Better living through biology?
- Petri Dish: Food for thought: Is it time for a new “green revolution” in agriculture?
- Petri Dish: Making moves: Should we help plants and animals migrate?
- SciSpark 2022: Women in science
- Probable Meets Possible: Conservation in real time
- Author talk and Q&A with Marlene Zuk



### Full STEAM ahead

CBS senior Chino Nwakama was recognized for his efforts to reach students underrepresented in science. He launched 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. “I simply wanted to share a different side of science,” he said. “The side of science that captured me,”

# ADVANCEMENT

In 2022, the college embarked on the CBS Dean's Targeted Initiatives campaign, which focuses on raising funds for the Dean's Research Program and Transfer Student Scholarships.

- The Dean's Research Program gives CBS students the opportunity to earn and learn by matching them with a research lab. Students earn \$15 an hour for real-world applications of their education in skilled research work.
- CBS welcomes 60–65 students every year that transfer from other higher education institutions, typically a two-year college. Prior to fall 2022, none of the college's scholarship opportunities were available to incoming transfer students.

## DEVELOPMENT

Nearly \$2.63M was raised in 2022, from 509 donors. Below is a breakdown of our gifts:

- 4 gifts of \$250K–\$999K
- 2 gifts of \$100K–\$249K
- 10 gifts of \$50K–\$99K
- 13 gifts of \$10K–\$49K
- 69 gifts of \$1K–\$9.9K
- 411 gifts of less than \$1K

## SCHOLARSHIPS AND FELLOWSHIPS

Thanks to our generous donors, the college awarded more than \$810,000 in scholarships and fellowships including 151 scholarships (54 four-year freshman awards among them) and 63 graduate fellowships in 2022. It also awarded the first round of two-year CBS Transfer Student Scholarships.

## ALUMNI

The college continued to increase engagement through opportunities to participate in student-focused career panel discussions, alumni profiles, social events and publications. Here's a snapshot of the CBS alumni community in 2022:

**18,810**  
total living  
alumni

- Alumni with B.S. degrees: 15,834
- Alumni with M.S. or PhD degrees: 4,498
- Alumni living in Minnesota: 10,652

### Alumni recognition

- UMN Outstanding Achievement Award: Dr. Cheryl Quinn
- CBS Alumni Achievement Award: Dr. Forum Kamdar
- CBS Emerging Leader Award: Ihab Mikati
- CBS Alumni Service Award: Dr. Mohamed Yakub



### A CBS standout

Dr. Cheryl Quinn (B.S. Biochemistry and Microbiology, '85) received a 2022 UMN Alumni Achievement Award – one of the University's top honors – in recognition of her many contributions to her field and the community as a biotechnology leader.

# IN DETAIL

## GRADUATE STUDENT AWARDS AND RECOGNITION

### EXTERNAL AWARDS

- DOE Office of Science Graduate Student Research WDTs Grant - Leslie Day (PMB)
- DOE Office of Science Graduate Student Research WDTs Grant - Nathan Lewis (PMB)
- NSF Graduate Research Fellowship - Duha Vang (MCDB&G)
- NSF Graduate Research Fellowship - Honorable Mention - Anahi Cantoran (PMB)
- Smithsonian Fellowship Internship - Dongmin "Dennis" Kim (EEB)

### UNIVERSITY AWARDS

- Bell Museum Dayton Fellowship - Brie Ilarde (EEB)
- Bell Museum Simons Fellowship - Sean Keogh (EEB)
- Bell Museum Natural History Award - Brooke Kern (PMB)
- Bell Museum Natural History Award - Talia Michaud (PMB)
- Bell Museum Simons Foundation Fellowship - Aidan Harrington (PMB)
- Interdisciplinary Center for the Study of Global Change Fellowship - Joan Barreto Ortiz (PMB)
- MnDRIVE Fellowship - Kelsey Peterson (PMB)
- MnDRIVE Fellowship (UMII) - Leslie Day (PMB)
- MnDRIVE Fellowship (UMII) - Angela Ricono (PMB)
- UMII-MnDRIVE Graduate Assistantship Award - Molly Kuhs (EEB)
- UMN Doctoral Dissertation Fellowship - Ariadna Mondragon Botero (PMB)
- UMN Doctoral Dissertation Fellowship - Thomas Lake (PMB)
- UMN Doctoral Dissertation Fellowship - Joseph Rabaey (EEB)
- UMN Doctoral Dissertation Fellowship - Alexander Shephard (EEB)
- UMN Doctoral Dissertation Fellowship - Krisna Van Dyke (MCDB&G)
- UMN Doctoral Dissertation Fellowship - Amy Waananen (EEB)
- UMN Doctoral Dissertation Fellowship - Trevor Weiss (PMB)

## COLLEGE OF BIOLOGICAL SCIENCES FELLOWSHIPS

### Biochemistry, Molecular Biology and Biophysics

- Armstrong-Pothaprgada Fellowship - Casey Eddington
- Armstrong-Pothaprgada Fellowship - Monica Sauer
- Armstrong-Pothaprgada Fellowship - Cher Ling Tong
- Arnold H. Johnson Biochemistry Fellowship - Erynn Johnson
- Bacaner Award - Yimao Huang
- Barnum Award - Maxime Bonez
- Barnum Award - Nate Feltman
- Bollum Award - Robert Connacher
- Bollum Award - Megan Schmit

- Bollum Award - Yi-Cheng Sin
- Cargill Fellowship - Yimao Huang
- Carr-Peterson Award - Ya-Chu Change
- Carr-Peterson Award - Mahima Devarajan
- Edith Walters Jones and Robert Jones Fellowship - Kun-Hwa Lee
- Gilliam Award - Sofia Moraes
- Graduate Student Leadership Award - Jonas Alvarez
- Graduate Student Leadership Award - Santiago Martinez Cifuentes
- Hogencamp Award - Kitty Sompiyachoke
- James Koerner Award - Colin Pierce
- PNI Fellowship - Daniel Schilling
- Ross A. Gortner Fellowship - Sze Cheng
- Ross A. Gortner Fellowship - Kathryn Crone
- Ross A. Gortner Fellowship - Maria Ramírez López
- Thomas A. Reid Award - Colette Rogers
- Thomas A. Reid Award - Wakana Sato
- Thomas Reid Fellowship - Jolene Duda
- Thomas Reid Fellowship - Elise Dunshee
- Thomas Reid Fellowship - Louise Pitcher
- Thomas Reid Fellowship - Andrew Rajczewski
- Thomas Reid Fellowship - Damien Rasmussen
- Thomas Reid Fellowship - Fredrik Sadler
- Thomas Reid Fellowship - Adam Smiley
- Thomas Reid Fellowship - Adam Sychla
- Thomas Reid Fellowship - Naomi Wdistrom
- Victor A. Bloomfield Fellowship - Michael Anderson
- Victor A. Bloomfield Fellowship - Evan Kalb
- Victor A. Bloomfield Fellowship - Marcus Kelly
- Victor A. Bloomfield Fellowship - Matthew Pawlak
- Victor A. Bloomfield Fellowship - Adam Smiley
- Warner Fellowship in Molecular Biology - Adam Huber

### **Ecology, Evolution and Behavior**

- Carol H. and Wayne A. Pletcher Graduate Fellowship - Abby Guthmann
- Carol H. and Wayne A. Pletcher Graduate Fellowship - Honorable Mention - Abigail Meyer
- CBS Provost's Recruiting Fellowship - Ana Favaro
- Charles Peter Sigerfoos Graduate Fellowship - Abby Guthmann
- Charles Peter Sigerfoos Graduate Fellowship - Alyssa Gooding
- Charles Peter Sigerfoos Graduate Fellowship - Rachael Kaspar
- Darby and Geri Nelson Environmental Scholar Award - Hanan Farah
- David Tilman Fellowship in Ecology and the Environment - Taz Mueller
- David Tilman Fellowship in Ecology and the Environment - Geoff Miller
- David Tilman Fellowship in Ecology and the Environment - Sally Donovan

- Donald and Elizabeth Lawrence Research Scholarship - Maggie Anderson
- Donald and Elizabeth Lawrence Research Scholarship - Maria Park
- EEB Excellence Fellowship - Catherine Polik
- EEB Excellence Fellowship - Laura Ostrowsky
- EEB Diversity Fellowship - Jose Vasquez
- EEB Diversity Fellowship - Maya Enriquez
- Elmer C. Birney Fellowship - Lata Kalra
- Florence Rothman Research Fellowship - Lang DeLancey
- Florence Rothman Research Fellowship - Aarcha Thadi
- Florence Rothman Research Fellowship - Christopher Wojan
- Ray Anderson Zoology & Genetics Fellowship - Rachel Pain
- Richard and Judi Huempfer Research Fund - Lauren Agnew
- Richard and Judi Huempfer Research Fund - Simone Maddox

### **Itasca Biological Station and Laboratories**

- Itasca Director's Research Fellowship - Siddhant Pusdekar

### **Molecular, Cellular, Developmental Biology and Genetics**

- Bryant Keller Award - Jo Haneul
- Carol H. and Wayne A. Pletcher Graduate Fellowship - Honorable Mention - Shetty Anala
- Margaret A. Titus Award - Heather Hanson
- Perry B. Hackett Award - Christopher Sipe
- Robert K. Herman Award - Renganaath Kaushik

### **Plant and Microbial Biology**

- Bernard and Jean Phinney Graduate Fellowship in Plant Molecular Biology - Erika Magnusson
- Carol H. and Wayne A. Pletcher Graduate Fellowship - Taylor Price
- CBS Dean's Distinguished Graduate Fellowship - Aidan Harrington
- CBS Provost's Recruiting Fellowship - Elena Ayala
- CBS Provost's Recruiting Fellowship - Aiyem Bakytbaikyzy
- CBS Provost's Recruiting Fellowship - Joan Barreto Ortiz
- CBS Provost's Recruiting Fellowship - Adity Biswas
- CBS Provost's Recruiting Fellowship - Christopher Hansen
- CBS Provost's Recruiting Fellowship - Achala Narayana
- CBS Provost's Recruiting Fellowship - Abraham Steinberger

## **THESES AND DISSERTATIONS**

### **Biochemistry, Molecular Biology and Biophysics - Ph.D.**

- Jonas Alvarez | Advisor: Douglas Mashek | "Development of novel circadian reporter"
- Morgan Brisse | Advisors: Hinh Ly and Yuying Liang | "Pichinde virus infection of outbred Hartley guinea pigs and mice as small animal models of human Lassa fever"
- Ya-Chu Chang | Advisor: Anja Bielinsky | "Understanding replisome dynamics by proteomics and functional genomics"



- Cody Fisher | Advisor: Deborah Ferrington | “Mitochondrial dysfunction in retinal pigment epithelium with age-related macular degeneration”
- Nathaniel Gaut | Advisors: Kate Adamala Aaron Engelhart | “Expanding the synthetic cell toolkit: Programmable fusion for complex genetic circuits and a synthetic cell cycle”
- Qiyuan Han | Advisors: Natalia Tretyakova and Joshua Baller | “DNA epigenetic marks in the development of inflammation associated cancers and Alzheimer’s Disease”
- Yimao Huang | Advisor: David Bernlohr | “The role of macrophage inflammation and adipocyte secretion in obesity and diabetes”
- Aman Imani | Advisor: Michael Freeman | “The biosynthesis and biological roles of alpha-M-methylated peptides”
- Andrew Rajczewski | Advisors: Timothy Griffin and Natalia Tretyakova | “Mass spectrometry-centered multi-omic applications in the analysis of inflammation and exposure”
- Maria Ramirez | Advisors: James Ervasti and Wendy Gordon | “Molecular and cellular forces involved in the pathogenesis and therapy of Muscular Dystrophy
- Colette Rogers | Advisors: Eric Hendrickson and Anja Bielinsky | “Genetic analyses of pathways that prevent genomic rearrangements in human somatic cells”
- Daniel Schilling | Advisor: Louis Mansky | “Establishment of human retrovirus particle assembly sites”
- Megan Schmit | Advisor: Anja Bielinsky | “The elucidation of MCM10’s role in human disease”
- Naomi Widstrom | Advisor: Laurie Parker | “Development of synthetic peptide substrates to study tyrosine kinase activity”

#### **Ecology, Evolution and Behavior – Ph.D.**

- George Furey | Advisor: David Tilman | “The plant ecology of soil nutrient supply from species to ecosystems”
- Josie Griffin | Advisors: Michael Travisano and Suzanne McGaugh | “The hidden costs of rapid adaptation: Experimentally assessing the effects of standing variation on the pace and trajectory of evolution”
- Sarah Hammarlund | Advisor: William Harcombe | “Context-dependence, coexistence, and community structure in microbial cross-feeding mutualisms”
- Amanda Muehlbauer | Advisor: Ran Blekhnman | “Untangling the dynamics of host-microbiome interactions”
- Naomi Rushing | Advisor: Ruth Shaw | “Seed sourcing for ecological restoration in an era of climate change: Impacts of source latitude and hybridization”
- Samuel Weaver | Advisors: Kenneth Kozak and Suzanne McGaugh | “Evolution and the climatic niche: Using genomics and niche modeling to explore how climate impacts evolutionary processes”

#### **Genetic Counseling – M.S.**

- Caroline Aragon | Advisors: Lihsia Chen and Heather Zierhut
- Caroline Brown | Advisor: Ian MacFarlane
- Alisha D’souza | Advisor: Ian MacFarlane
- McKayla Gourneau | Advisor: Ian MacFarlane
- Stephen Hays | Advisor: Heather Zierhut
- Greta Henry | Advisor: Krista Redlinger-Grosse
- Dhriti Jagannathan | Advisor: Heather Zierhut
- Andrea Jarratt | Advisor: Ian MacFarlane
- Susan Schowalter | Advisor: Krista Redlinger-Grosse
- Sabrina Southwick | Advisor: Ian MacFarlane
- Alexandra Tsai | Advisor: Ian MacFarlane

## Microbial Engineering – M.S.

- Joseph Bravo | Advisor: Mikael Elias | “Engineering of the quorum quenching lactonase GcL for altered substrate specificity by rational design”
- Madison Bygd | Advisor: Lawrence Wackett | “Microbial degradation of polyfluorinated chemicals and detection of fluoride via a colorimetric assay”
- Eric Hernandez | Advisor: Kyle Costa | “Exploring anaerobic fluorescence in *Methanococcus maripaludis* with the fluorescence-activating and absorption-shifting tag”
- Carolann Knutson | Advisor: Brett Barney | “Sustainable hydrogen, ammonium, and biofuels production”
- Xianyi Xiong | Advisor: William Harcombe | “Spatial structure modulates persister formation in a synthetic cross-feeding bacterial community”

## Molecular, Cellular, Developmental Biology and Genetics – Ph.D.

- Caroline Aragon | Advisors: Lihsia Chen and Heather Zierhut
- Lauren Aufdembrink | Advisor: Aaron Engelhart | “Detection technologies employing fluorescent aptamers”
- Elizabeth Hitch | Advisor: Linda McLoon
- Natalya Goloviznina | Advisor: Michael Kyba | “Modeling facioscapulohumeral muscular dystrophy using primary and patient-derived induced pluripotent stem cells”
- Callie Gustafson | Advisors: Romas Kazlauskas and Laura Gammill | “Signaling extraordinaire: Extracellular vesicles in cranial neural crest migration”
- Woo Seuk Koh | Advisor: Hiroshi Nakato | “Chondroitin sulfate is required for the organ development and maintenance in *Drosophila*”
- Kanut Laoharawee | Advisor: Branden Moriarity | “Engineered immune cells to treat enzymopathies and cancers”
- Changwei Peng | Advisor: Stephen Jameson | “Should I stay or should I go: The role of costimulatory signals and StP receptors in CD8+ T cell trafficking”
- Annie Shao | Advisor: Peter Igarashi | “The role of hepatocyte nuclear factor 1 beta in kidney development and disease”
- Laura Sherer | Advisors: Naomi Courtemanche Melissa Gardner | “Interdependence of nucleation, elongation, and bundling in the assembly of crosslinked actin structures”
- Javier Sierra Pagan | Advisor: Daniel Garry | “Epigenetic regulatory mechanisms that govern cardiovascular development”
- Miles Smith | Advisor: Scott McIvor | “Preclinical evaluation of an ex vivo gene therapy for Hunter syndrome and development of an immunodeficient mouse model of the disease”
- Daniel Sorensen | Advisors: Jop van Berlo and Yasu Kawakami | “Myocardial endoglin regulates cardiomyocyte proliferation and cardiac regeneration”
- Lauren Sundby | Advisor: Jim Ervasti | “Nucleotide- and protein-dependent functions of the mammalian cytoplasmic actins”
- Matthew Zinselmeier | Advisors: Daniel Voytas and Michael Smanski | “Engineering gene expression in plants with programmable transcriptional activators”

## Plant and Microbial Biology – Ph.D.

- Anastacia Bennett | Advisor: Trinity Hamilton | “The biogeography, ecophysiology, and functional potential of phototrophic Chloroflexi in alkaline hot springs: From marker genes to metagenomes”
- Clemon Dabney III | Advisor: George Weiblen | “Molecular genetics, genomics, and quantitative genetics of specialized metabolites in *Cannabis sativa L.*”
- Evan Ellison | Advisor: Daniel Voytas | “Development of RNA viral vectors for plant genome engineering”
- Joleen Khey | Advisor: Michael Travisano | “Genotypic and phenotypic evolution in experimental microbial populations: Causes and consequences of an evolutionary reversal across a major transition”
- Kelsey Peterson | Advisor: Yaniv Brandvain | “Evaluating the utility of wild populations in the domestication of *Silphium integrifolium*”
- Katherine Sammons | Advisor: Adrian Hegeman | “Ploidy, genetics, and metabolomics of Achillea, a venerable and variable medicinal plant”
- Anthony Schmitt | Advisor: Clay Carter | “Insights into the hormonal regulation of nectar production and the biochemical characteristics of antimicrobial nectar proteins”
- Qian Tang | Advisor: Jerry Cohen | “New protocols for exploring the auxin metabolic network”
- Laura Toro | Advisor: Jennifer Powers | “Is fertilization essential for taking care of the next generation of tropical trees?”
- Trevor Weiss | Advisor: Feng Zhang | “Improving plant genome editing: CRISPR meets epigenetics”

## FACULTY AND STAFF AWARDS AND RECOGNITION

In 2022, seven faculty and staff received major professional, University or collegiate awards.

### American Association for the Advancement of Science Fellow

Susan Jones, Professor, Ecology, Evolution and Behavior

Peter Tiffin, Professor, Plant and Microbial Biology

George Weiblen, Professor, Plant and Microbial Biology

### Distinguished McKnight University Professor

Elizabeth Borer, Professor, Ecology, Evolution and Behavior

### Outstanding Contributions to Graduate and Professional Education

Sharon Jansa, Professor, Ecology, Evolution and Behavior

### Stanley Dagley-Samuel Kirkwood Undergraduate Education Award

Sarah Hobbie, Professor, Ecology Evolution and Behavior

### John S. Anderson Leadership Award

Nikki Letawsky Shultz, Assistant Dean, Student Affairs and International Programs