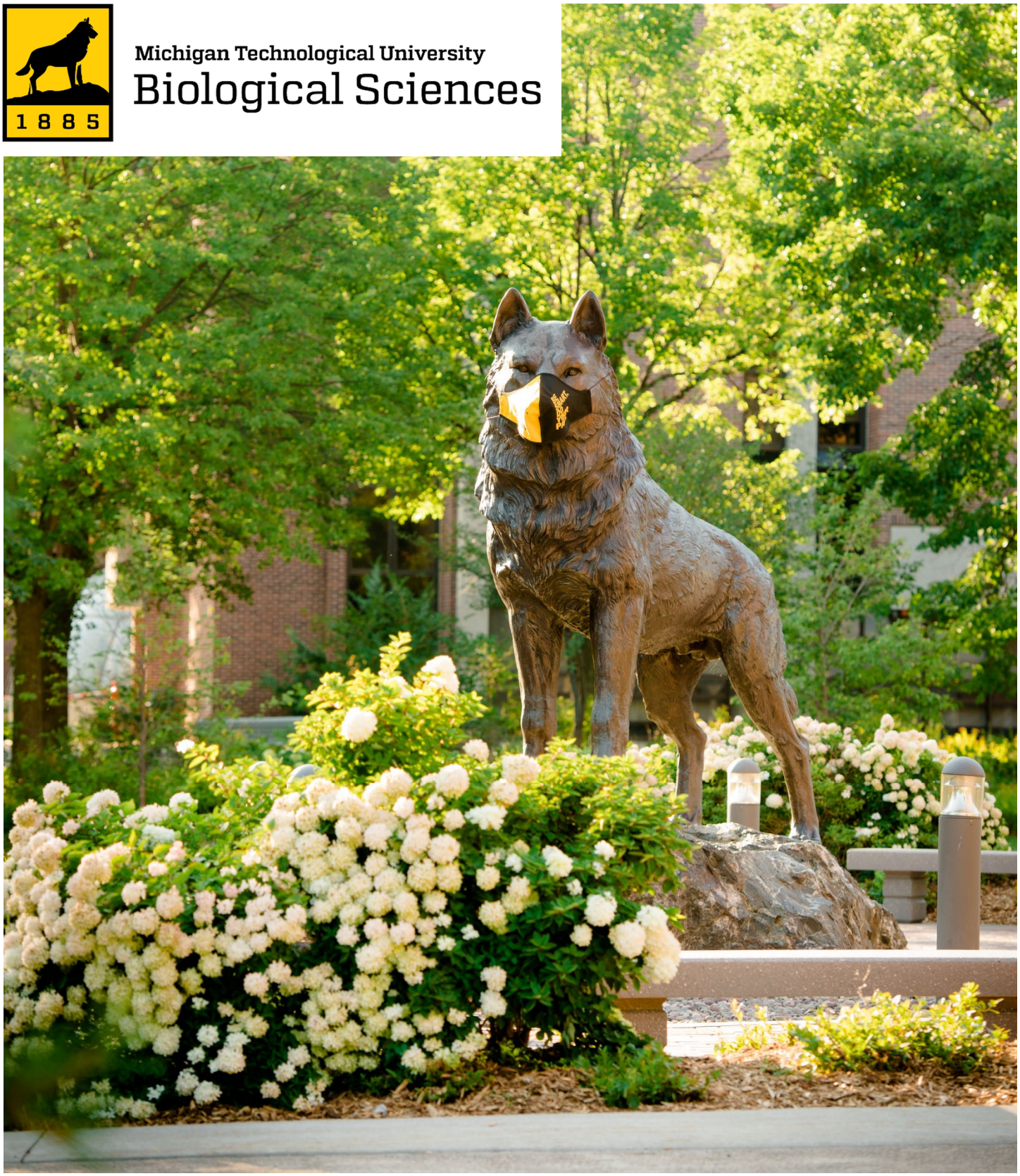
Michigan Technological University

Biological Sciences



Fall 2022 Newsletter

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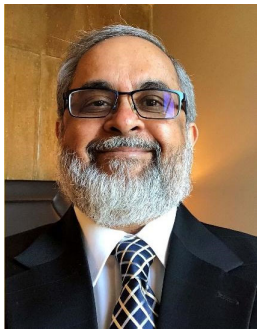
A Message from the Department Chair

What a year (or two)!

Greetings from the Department of Biological Sciences at Michigan Tech! It gives me great pleasure to share this bi-annual report of various ongoing activities and exciting accomplishments by our faculty, staff, and students during Spring 2020-Fall 2022.



In the spring of 2020, I was on sabbatical for one semester. The news of a possible COVID-19 pandemic broke out in February 2020 when I was in New Zealand. I immediately returned home, and Michigan Tech moved to a virtual mode of education in March 2020. Our faculty swiftly switched to this new mode in about a week, and all lectures and even remote labs became operational without severely affecting our educational mission. The semesters that followed were full of challenges, but I am glad to report that we somehow weathered this unprecedented storm, and the fall 2022 semester feels almost back to normal. The research labs were closed for over a semester in 2020, but as you can see from this report, research rebounded very quickly. The folks at the Biology department were also closely involved in setting up a COVID-19 testing lab, a unique undertaking as highlighted in this newsletter later on. Our faculty, staff, and students brought in over $9.9M in funding during this period and published over 90 peer-reviewed publications. The teaching mission has remained as strong as ever, with faculty and others winning state-wide and university-wide accolades. I hope you will enjoy reading about these and other highlights in this newsletter.

We would love to hear from you. Please call my office at 906-487-2738 or email me at cpjoshi@mtu.edu to let us know how you are doing. Please feel free to stop by Dow 740, and we would be happy to show you our research labs and newly upgraded teaching labs. The campus and overall surroundings are also looking very beautiful now, so please come back to the Keweenaw very soon!

Shekhar Joshi

Chandrashekhar Joshi, *Professor and Chair, Department of Biological Sciences*
Contact Dr. Joshi at cpjoshi@mtu.edu or 906-487-2738

We have graduated over 4,000 students since 1962!

Biological Sciences (BS, MS, and PhD)	2,627
Biochemistry & Molecular Biology (BS)	92
Biochemistry & Molecular Biology (PhD)	16
Bioinformatics (BS)	45
Ecology & Evolutionary Biology (BS)	5
Human Biology (BS)	18
Medical Technology / Clinical Laboratory Science / Medical Laboratory Science (BS)	1,178
General Science (BS)	75

New Major and Minor Programs

For several decades, the Department of Biological Sciences has offered four strong undergraduate major programs, namely, Biological Sciences (SBL), Biochemistry and Molecular Biology (SMBB), Bioinformatics (SBI), and Medical (Clinical) Lab Sciences (SML). We also offer four graduate programs leading to M.S. and Ph.D. degrees. Until recently, the SBL major had six concentrations: General biology (SBL1), Molecular Biology and Biochemistry (SBL2), Ecology (SBL3), Microbiology (SBL4), Pre-Professional Health (SBL5), Plant Sciences (SBL6), Secondary Education (SBL7), Fish Biology (SBL8). Of these, SBL2, SBL4, SBL6, SBL7, and SBL8 are no longer offered due to a variety of reasons. However, even though a pre-professional health concentration option (SBL5) has historically had the highest enrollment in the department and continued to attract students interested in medical professions, it was overly structured towards medical and professional health school requirements alone, and students interested in human biology without a desire to follow this medical pathway had fewer options. We wanted to build upon Michigan Tech's continued investment in human health sciences education and research to improve the quality and enrollment of our pre-professional concentration option. Therefore, we restructured the existing SBL5 concentration into a stand-alone Human Biology major (SHB) that would attract students who are broadly interested in Human Biology, including those who want to pursue health professions as well as those who wish to pursue careers in industry, academia, or graduate degrees in the Biological Sciences, health or other areas. We expect this program to better prepare students for continued education or employment with a focus on real-world experiences and skills through a series of capstone options. This proposal was approved in 2019 by the University Senate, and we have started enrolling students in this major from Fall 2020 onwards. Currently, in Fall 2022, we have 56 students enrolled in this major.

The Department of Biological Sciences also has a strong reputation for training students in biology with a solid ecological focus through our existing Biology B.S. with a concentration in Ecology (SBL3). While the SBL3 degree concentration well-served students interested in achieving a broad education in Biology with some more focused training in Ecology, the intense core in general natural science and general biology left little room in the student's degree training to deeply engage in coursework training in advanced Ecology and Evolutionary Biology. Moreover, limited required experiential learning placed these students at a partial disadvantage when they sought opportunities after they completed their undergraduate training. Therefore, we proposed a stand-alone Ecology and Evolutionary Biology (EEB) major in 2019. The new EEB major still provided core training in the basic sciences of biology, chemistry, and mathematics, which are essential for an integrative understanding of ecological and evolutionary patterns and processes, but it also provides opportunities for students to specialize in their training in molecular biology, genetics, field techniques, analysis of ecological and evolutionary data, and countless other topics through experiences in the classroom, laboratory, and field. This program was approved by the University Senate in 2019, and we started accepting students in this major from the Fall of 2020 onwards. Currently, in Fall 2022, we have over 30 students taking this major.

In 2019, we also proposed a minor in Pre-Health Professions offered through the Department of Biological Sciences intended for Michigan Tech students who are interested in graduate health programs, including medical, physician assistant, dental, veterinary, pharmacy, physical therapy, occupational therapy, podiatry, and chiropractic schools. Because graduate health programs do not require one specific major, students can choose any university major. Therefore, this minor is designed to complement any major a student chooses to better prepare them for applying to their desired graduate health program. This minor was approved and has been accepting students since the fall of 2020. Currently, we have 86 students taking this minor.

In 2021, we changed the name of our Bioinformatics major (SBI) program to Computational Biology (SCB). The rationale behind this change was to better educate students at the interface of biological sciences, computer science, and math, including applications in genomics, molecular biology, ecology, evolutionary biology, and human health. The name Computational Biology also accurately describes how computational approaches are being employed across biology and describes the core concepts of the degree program, which extend beyond the application of computational approaches to molecular biology. This name change would be more recognizable to prospective students and employers. We hope that this name change builds off the University's investments in the Tech Forward Initiative in the Data Revolution and Sensing and allows for further integration with the College of Computing. This name change proposal was recently approved, and students have started enrolling in SCB major from Fall 2022 onwards.

Faculty Promotions and Tenure

Congratulations to the following biological sciences faculty members who were promoted in the 2019-2022:

- **Dr. Erika Hersch-Green**, Assistant Professor, was promoted to Associate Professor with tenure (2020).
- **Dr. Steve Techtmann**, Assistant Professor, was promoted to Associate Professor with tenure (2021).
- **Dr. Amy Marcarelli**, Associate Professor with tenure, was promoted to Professor (2021).
- **Dr. Casey Huckins**, Professor, started serving as an associate chair (2022).

Welcome to New Faculty and Staff

Fall 2022

Yan Zhang, Ph.D., Research Assistant Professor, Biological Sciences

Dr. Yan Zhang joined the Department of Biological Sciences as a Research Assistant Professor in the Fall of 2022. She earned her Ph.D. in the Department of Pharmacology and Toxicology at the University of Missouri-Kansas City, where she investigated the molecular mechanisms of innate immune responses. She completed her postdoctoral training at the Jared Grantham Kidney Institute at the University of Kansas Medical Center, studying the pathological mechanisms and therapeutic targets of polycystic kidney disease. Her research lab will engage in defining the role of immune cells in the pathological microenvironment and the potential therapeutic effects of manipulating immune cells.

Sarah LewAllen, MS, MLS(ASCP)^{CM}, MLS Program Coordinator

Sarah LewAllen joined the Department of Biological Sciences as the MLS Program Coordinator in October of 2021. She earned her Bachelor's degree in Medical Laboratory Science and Exercise Science and a Master's degree in Biological Sciences from Michigan Tech. After graduation, she completed her clinical internship at Beaumont Health in Royal Oak, MI, and became a certified Medical Laboratory Scientist. Before returning to Michigan Tech, Sarah worked at Beaumont Health in Farmington Hills, MI as a generalist in the lab.

Fall 2021

Robert Larson, Ph. D., Assistant Professor, Biological Sciences

Dr. Robert (Rob) Larson joined the Department of Biological Sciences as an Assistant Professor of Human Biology in the Fall of 2021. Rob had recently joined Michigan Tech as the MLS Director in the Fall of 2020. He earned his MS and Ph.D. in the Department of Biological Sciences at Michigan Tech, studying neural-cardiovascular physiology in human subjects and animal models. He completed his postdoctoral fellowship in Cardiology at The University of Iowa Carver College of Medicine, where he studied cardiac sensory and sympathetic nerves in structural heart disorders. His research lab will examine the role of the autonomic nervous system in cardiovascular disease and seek to discover new treatment targets. Rob is a Medical Laboratory Scientist certified by the American Society for Clinical Pathology and has over 10 years of experience working in the Diagnostic Lab at Aspirus Keweenaw Hospital.

Claire Danielson MS, MLS(ASCP)CM: MLS Program Director

In the Fall of 2021, Claire Danielson joined the Department of Biological Sciences as the MLS Program Director and Lecturer. She previously worked as MLS Practicum Coordinator in the Biological Sciences department since January 2020. She is a Medical Laboratory Scientist certified by the American Society of Clinical Pathology and has worked in level-one trauma centers in Minneapolis and Colorado Springs. She also held the title of Microbiology Supervisor in a critical access hospital before obtaining her MS at Michigan Tech. Claire teaches many courses in the MLS program such as phlebotomy, immunohematology, and the medical bacteriology lab. Claire continues to work closely with our MLS students to be placed at clinical practicums and obtain their ASCP certification.

Travis Wakeham, MS: Lecturer of Human Biology and Undergraduate Academic Advisor

Travis Wakeham joined the Department of Biological Sciences as the Lecturer of Human Biology and Undergraduate Academic Advisor in the Fall of 2021. He has previously worked as a Laboratory Supervisor from 2016-2019 and as an Undergraduate Academic Advisor in the Biological Sciences department since 2019. Travis teaches many courses in our program, such anatomy and physiology, human pathophysiology, advanced human physiology, zoology, and introduction to biological sciences. He is dedicated to providing an inclusive learning environment for our students and supporting each of them to achieve their goals.

Lindsay Putman, Ph.D., Postdoctoral Research Associate

Lindsay Putman joined the Department of Biological Sciences as a Postdoctoral Research Associate in Stephen Techtmann's Lab in the Fall of 2021. She will characterize the composition and function of plastic-degrading microbial consortia. Lindsay earned her Ph.D. in Environmental Geosciences Microbiology and Molecular Genetics from Michigan State University, studying the microbial ecology and geochemistry of an alkaline groundwater system.

Fall 2020

Jill Olin, Ph.D.– Assistant Professor, Biological Sciences

Dr. Jill Olin joined the Department of Biological Sciences in the Spring of 2021 from a research scientist position at the Great Lakes Research Center. Jill is a trophic and food web ecologist, best known for her work quantifying species- and food web-level responses to environmental stressors, including hurricanes and oil spills in coastal ecosystems. She earned her BS in Marine & Freshwater Biology at the University of New Hampshire and her MS in Marine Science from Hofstra University. She earned her Ph.D. in Environmental Sciences from the University of Windsor in 2012. Her research aims to understand how habitat use and foraging decisions and environmental regimes, such as altered salinity and temperature gradients related to climate change, shape the distribution of predators and prey and how those interactions structure aquatic ecosystems.

Goodbyes

In the Fall of 2020, associate professor John Durocher joined Purdue University Northwest as Nils K. Nelson Associate Professor of Integrative Human Health. At Michigan Tech, John did extensive work in the fields of applied human physiology and exercise physiology. He also taught Anatomy and Physiology, and human pathophysiology courses and was nominated for the teaching award. Our best wishes for his new appointment.

Associate professor Ebenezer Tumban moved to Texas Tech University, School of Veterinarian Medicine, in the Fall of 2020. Dr. Tumban is a molecular virologist and vaccinologist, and in the past, he conducted research studies aimed at understanding the molecular determinants of arboviruses (such as dengue and Langat viruses) mode of transmission. He was also nominated for the teaching award at Michigan Tech. We wish him all the best in his new endeavors.

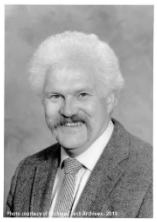
Professor W. Charles Kerfoot retired at the end of Spring 2020. Dr. Kerfoot's distinguished research career in the freshwater ecology of the Great Lakes spans over 47 years. At Michigan Tech, Dr. Kerfoot has served as the Director of the Lake Superior Ecosystem Research Center and Remote Sensing and Ecosystems Research Institute. Dr. Kerfoot received several accolades, such as Michigan Tech's Distinguished Faculty Research award in 2013, Lifetime Achievement Award by International Association for Great Lakes Research in 2014, and the Eugene P. Odum Gold Medal by the International Society for Ecological Communications in 2007. Dr. Kerfoot is credited for the creation of a new area of research, "Resurrection Ecology" and he is an internationally known authority on paleoecology. Dr. Kerfoot is continuing as an emeritus research professor in our department.

The Biological Sciences department would like to acknowledge and celebrate the retirement of Medical Laboratory Science (MLS) Program Director, Karyn Fay. Karyn was such a memorable addition to the Biological Sciences Department and will never be forgotten. Before teaching at Michigan Tech, Karyn worked in many disciplines over the years and in a variety of places. In Virginia, she worked as a generalist. In Florida, she worked in a plasmapheresis clinic and then in a reference laboratory working mainly in steroid chemistry and fluorescent microscopy. In Arizona, she did microbiology projects related to immunology and virology. Before coming to Michigan Tech, she was the Hematology Supervisor at Keweenaw Memorial Medical Center in Laurium, MI for several years. Karyn began teaching in Michigan Tech's MLS program in 2003. She later became the Program Director in 2013. Karyn officially retired in the spring of 2020. After retirement, she went on to help with the creation and development of the Michigan Tech COVID lab. Her efforts to help and support our students and the University as a whole were always tremendous. Throughout her years at Michigan Tech she educated and touched the lives of hundreds of students and left an indelible mark on the number of lives she came across. Her caring personality made her office a special place for students to talk and feel welcome. Karyn was instrumental in Michigan Tech's MLS program obtaining accreditation from NAACLS in 2018 and she also received a university-wide teaching excellence award in 2016 for her outstanding teaching contributions. Karyn will always be remembered in our department for her expertise in laboratory medicine, positive attitude, and warm presence. She truly cared for her student's success and will be dearly missed! We wish her a long and happy retirement.

Adjunct Professor Bob Stottlemyer Passes Away

Dr. John Robert (Bob) Stottlemyer, a faculty member at Michigan Tech from 1979-1990, died of natural causes on May 31, 2022, on a research expedition at a remote field site along the Agashashok River in northern Alaska. He remained an adjunct professor with the Department of Biological Sciences until his death. Dr. Stottlemyer's three decades of research at the Agashashok River site was just a small part of his remarkable career studying environmental issues in northern landscapes and his incredibly full life of eight decades. He majored in forestry at Pennsylvania State University, with summer jobs fighting wildfires as a smoke jumper in the Sierra Nevada Mountains of California and working as an interpreter in national parks. He studied forest ecology for his Ph.D. at Duke University under the supervision of Professor Bill Ralston, focusing on forest soils and water quality. His Ph.D. research at the Fraser Experimental Forest in the Colorado Rockies was one of the first to combine the hydrology of mountain streams with water quality and nutrient budgets, an approach that persisted in his research over the next five decades, providing some of the best long-term records of forests and streams in the world. At Michigan Tech, he focused on hydrology, chemistry, and processes influencing water quality in remote watersheds from Calumet to Isle Royale National Park, Denali National Park, and Noatak National Preserve. Dr. Stottlemyer's loss leaves an emptiness in many lives, but each time he comes to mind, we all find ourselves smiling with so many grand memories of our unique colleague and friend.

Professor Bill (Dr. Wilbur H.) Campbell passed away



Emeritus Professor, Dr. Wilbur H. (Bill) Campbell passed away on January 30, 2022. Professor Campbell earned his Ph.D. in biochemistry from UW-Madison in 1972 and moved to the Keweenaw in 1985 to become a biochemistry professor at Michigan Tech. He was a brilliant scientist dedicated to his research. In 1993, Bill and his wife, Ellen decided to bring the discoveries of Bill's academic research out into the world with new products for testing water quality. NECi, in Lake Linden, was one of the first biotech companies in Michigan. NECi's products for nitrate testing won U.S. EPA method approval in 2017. These kits are made in Lake Linden and sold to customers worldwide. Dr. Campbell retired from Michigan Tech in 2003. He loved trees, birds, wildlife, cats, bears, and peace. The beauty of the area kept the Campbells here in the U.P., despite the winters.

Alumni and Friends of the Biological Sciences inducted into the CSA Academy

Dr. Steve Yang was inducted into the CSA Academy of Sciences and Arts on September 15, 2022. Dr. Yang is the Co-CEO of WuXi AppTec and a member of its board of directors. He is also WuXi AppTec's Head of WuXi Biology and Head of WuXi Testing businesses. His responsibilities include the management of multiple business units and commercial operations. WuXi AppTec provides a broad portfolio of R&D and manufacturing services that enable companies in the pharmaceutical, biotech, and medical device industries worldwide to advance discoveries and deliver groundbreaking treatments to patients. Dr. Yang received his Ph.D. in Pharmaceutical Chemistry from the University of California, San Francisco. He started his undergraduate study at Fudan University, China, and completed his B.S. degree (Summa Cum Laude) in biological sciences from Michigan Technological University. He co-founded the BayHelix Group, a non-profit global professional organization of Chinese life science business leaders, and served as the board's chairman for two terms. We are proud of all of Steve's achievements and welcome him back to engage with our students and curriculum improvements.

Professor James D. Spain, PhD. was inducted into the College of Sciences and Arts Academy on October 7, 2021. He is one of the founding members of the Department of Biological Sciences at Michigan Technological University who started our department in 1962 and also served as the first department head from 1962 to 1968. Dr. Spain played a major role in developing a strong curriculum in biological sciences at the B.S. level and helped offer M.S. and Ph.D. programs in biological sciences in 1965 and 1970, respectively. He also initiated interdisciplinary research in aquatic ecology. Dr. Spain was actively engaged in research in biochemistry with a special emphasis on chemical carcinogenesis. He was passionate about developing tools and offering courses in "Computer Applications in Biology". He received Michigan Tech's highly prestigious Faculty Research Award in 1965. Dr. Spain took early retirement from Michigan Tech in 1984 and continued his career, first at Eastern Michigan University as their director of Instructional Computing and later at Clemson University in South Carolina, where he directed the Chemistry Learning Center. Dr. Spain retired in 2010 and returned to the Copper Country. He rece ntly published his autobiography, Perusing for Pioneer Pathways. We are grateful to Professor Spain for all that he has done for our department, and the seed he planted in 1962 has now grown into this majestic tree that has witnessed the graduation of thousands of students since 1963.

2022 Provost's Award Winner Plans to Practice Rural Medicine

Christian Johnson, an upcoming senior, won the 2022 Provost's Award for Academics. He is pursuing a double major in Human Biology and English.

Johnson's goal is to go to medical school and become a primary care physician in a rural area.

A native of Detroit, he choose Michigan Tech because the small size of the university and community appealed to him, and he found the faculty in the College of Arts and Sciences so helpful. He visited Tech many times and participated in a Summer Youth Program. "I could see myself being part of Michigan Tech community," he says.

Johnson is pursuing a dual major in human biology and English. He worked with Greg Miodonski, a graduate student in Qinghui Chen's lab, on a research project studying the effect of exercise training on cardiovascular function in animals. Chen is a professor of Kinesiology and Integrative Physiology and an affiliated professor of Biological Sciences and Biomedical Engineering.

The research investigated how exercise impacts the function of small conductance calcium activated potassium (SK) channels in the paraventricular nucleus of the hypothalamus (PVN) of rodents. Its goal was to assess whether exercise could augment SK channel function in normotensive and hypertensive rats and consequently sympathetic nerve activity and blood pressure.

"Christian was an invaluable assistant, and his Cool Hand Luke demeanor will be missed," said Miodonski. "Working with rodents is challenging and can be intimidating, but Christian took to the rodents immediately. Unlike exercising humans, exercising rodents poses several challenges. Mainly, rodents are poor listeners and don't follow instructions too well. This means that exercising them requires diligence, focus and lots of patience. Christian exhibited all of these qualities. Some undergraduate assistants require a lot of mentoring and instruction before gaining autonomy, but not Christian. A quick study, he handled obstacles exactly how I would have and impressed me at every turn. Christian also aided me with recording blood pressures in conscious rodents. This is challenging and requires constant attention for many hours. Here again, Christian exceeded expectations."

In addition to research, Johnson immersed himself in many activities at Michigan Tech, including the Blue Key National Honor Society, Alpha Epsilon Delta—the National Health Pre-professional Honor Society, the Pavlis Honors College, the Pre-Health Association, and Sexual Assault and Violence Education. He also worked as a writing coach in the Michigan Tech W riting Center, served as a resident assistant and in various other mentoring roles. He found time to serve as an active volunteer for Dial Help and recently had a piece of his creative writing published.

This summer he studied at the University of Stirling in Scotland, where he took courses to fulfill major requirements for his English degree.

"When I heard that I received the Provost's Award, I was shocked," Johnson says. "Hearing all of the work I have been putting in and my accomplishments being read aloud; picking up the plaque; and shaking Dean Kampe's, Dean Southerland's, and President Koubek's hands is a moment I will never forget."

Johnson is currently applying to medical schools. Being from Detroit and living in Houghton, he has had the opportunity to see medical care in both urban and rural settings. Working with Dial Help particularly opened his eyes to the struggles that rural area residents face in accessing resources and being able to see a physician. "That experience made me want to serve rural areas and help with the primary care physician shortages in those areas," he says.

H-STEM Building Project Update

The H-STEM Complex will support Michigan Tech's integrated educational programs in health-related and human-centered technological innovations. In the H-STEM Complex, multidisciplinary teams will work together in shared, flexible, collaborative lab spaces to advance learning, develop new technologies, and prepare a skilled workforce for tomorrow. Construction is ongoing and you can view the progress live on our website!

mtu.edu/webcams/h-stem

2022 Graduate Found Her Passion in Medical Laboratory Science

Brooke Tienhaara graduated from Michigan Tech in May with a Bachelor of Science in Medical Laboratory Science. Now she's doing a 42-week internship at Ascension Health's St. Joseph's Hospital in Detroit.

Tienhaara, whose mother is a nurse, always knew that she wanted to work in the medical field. But she wasn't sure what career would capture her interest. Her sister, Taylor, who also graduated from Michigan Tech in Medical Laboratory Science, thought she would do well in that field too. So Tienhaara decided to give it a try.

A Calumet native, Tienhaara chose Michigan Tech because, she says, "If I went somewhere else, it felt like I would have missed an amazing opportunity to go to a great school that was close to everything and everyone I loved."

As she entered her junior year, when she would have gotten hands-on experience in the lab, the COVID pandemic hit. "I didn't do well with online labs," she says. "I need more structure than that." She found it hard to concentrate, to focus on her studies. The year before she was due to graduate, she dropped out of school, losing the semester she was in and her final semester.

Coming out of her depression was a slow and difficult process. "It was a team effort," she says. Her family, friends, therapy, and work at her job all supported her recovery, as well as a healthy helping of Finnish sisu.

"I wanted to get my degree," Tienhaara explains. "I knew I could do it."

So she re-enrolled at Michigan Tech, patiently retaking all the classes from the semester she dropped out and finishing her final semester.

She did so well that she was invited to speak at the May 2022 Commencement.

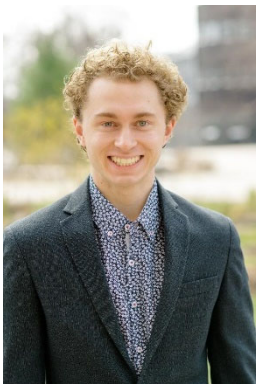
While she was at Tech, Tienhaara was active in the Health Occupations Students of America and Students of Medical Laboratory Science. She volunteered with the university's food pantry and worked with Autism Speaks, arranging and chaperoning events for children on the autism spectrum. "I really enjoy working with children," she says.

Tienhaara is excited about her medical laboratory internship in Detroit. "This internship will give me the real-life experience of working in a lab," she explains. "I'll be getting to try everything—microbiology, chemistry, hematology, blood banking. It will help me find out what I like best."

She hopes her future will include some research. "I wish I had gotten involved in research at Michigan Tech, but I didn't have the chance."

Tienhaara has some advice for incoming Michigan Tech students. "Take every opportunity that is presented to you. Don't waste your time here. My only regret is the stuff I didn't do."

2021 Provost Award Winner Says Research, Clinical Care Go Hand in Hand



Thomas Basala was the recipient of the 2021 Provost's Award for Scholarship. He graduated in May with a Bachelor of Science in Human Biology.

Basala, who plans to attend medical school, is spending the summer as a lead intern at the Minneapolis Heart Institute Foundation. He will stay there for the rest of this year as a research associate.

The Provost's Award for Scholarship recognizes a student who embodies Michigan Tech's scholarship value statement: We inspire world-class scholarship through academics, research, and continued learning. It is awarded annually to a rising senior who has demonstrated excellence not only in academics but also in research, levels of intellectual curiosity, creativity, and communication skills.

Each department is invited to nominate one undergraduate for the award. In 2021, Basala was the Department of Biological Sciences' nominee.

"Thomas is one of the most conscientious, reliable, and appreciative students I have met," says John Durocher, adjunct associate professor of biological sciences. Basala worked in Durocher's lab.

Basala says winning the Provost's Award caught him by surprise. "There are so many talented students at Michigan Tech," he explains.

A student in the Pavlis Honors College, he worked in the Clinical and Applied Physiology Lab throughout his years at Michigan Tech. He received two research grants while he was an undergraduate: a Michigan Space Grant Consortium young investigator award to study how nocturnal blood pressure relates to indices of cardiovascular risks such as arterial stiffness; and a Summer Undergraduate Research Fellowship (SURF) to investigate the efficacy of pre-sleep meditation on sleep in young adults. "They were both very enriching to me," he says.

Basala presented his meditation research at the 2022 Experimental Biology conference in Philadelphia. Additionally, he presented work on the impact of decentering—the ability to dissociate from emotional feelings—on nocturnal blood pressure patterns at the 2021 Experimental Biology conference. Both abstracts were published in the FASEB (Federation of Societies for Experimental Biology) Journal.

He fell in love with research under Durocher's mentorship. "He taught me the minute nuances of doing human research," Basala says. 'He helped me understand what it means to be a well-rounded researcher and active community member. "

Basala wants to become that kind of clinician/researcher. "I want research always to be part of the patient care I do," he says. "Research and clinical care inform each other and, in many cases, should not be separated."

Basala is from Stevens Point, Wisconsin. During his time at Tech, he served as president of the Triangle STEM (Science, Technology, Engineering, and Math) fraternity, a lieutenant with Michigan Tech EMS (Emergency Medical Services), and co-coordinator for the Global and Community Engagement Conference.

What Makes for a Healthy River

Graduate student Michelle Kelly is working with Professor Amy Marcarelli to develop new, predictive modeling techniques to identify the combination of factors best able to produce a healthy balance of energy and nutrients in rivers and streams.

A river ecologist, Kelly studies the energy and nutrient cycles in flowing water of varying sizes. She is working with large data sets from across the United States to model energy and nutrient cycles.

"People have metabolisms that break down the nutrients they take in to release energy," Kelly explains. "Rivers do the same thing." Organic matter and nutrients come into rivers from the watershed, and rivers contain organisms such as fish, plants, and micro-organisms that break that material down, recycling it.

Kelly investigates the relationships between those energy and nutrient cycles. She specifically looks at nitrogen, which is necessary for everything's growth. Has she found any wide-scale patterns? "It comes down to; it depends," Kelly says.

The size of the river determines what happens, she explains. In smaller, forested rivers, plant matter can get less light, and the amount of light changes the energy-nutrient cycle. In larger rivers, there can be more plants and other photosynthetic organisms, but the water might be deeper and quicker-moving, making it harder for plants to thrive.

Working with computer modeling, Kelly hopes to determine the combination of factors that produce a healthy balance of energy and nutrients in rivers. "We want to be able to say, in a healthy stream, the energy and nutrient cycles would look like this."

Kelly is also setting up experimental tanks to test some of her findings.

Graduate Student Finds a New Way to Treat Pancreatic Cancer

The traditional treatments for cancer are surgery, chemotherapy, or radiation. But these therapies damage healthy cells as well as cancer cells. Arslan Amer, a fifth-year Ph.D. student in biochemistry and molecular biology, is working to find a better way to stop cancer in its tracks.

Specifically, his research focuses on pancreatic cancer, looking at the metabolic differences that cause cancer cells to proliferate. Identifying those factors could lead to a more targeted, less destructive treatment approach.

“We want to find out what other genetic approaches we can use,” he explains. “This would be a very selective option.”

Working in Assistant Professor Mark Tang’s Laboratory of Cancer Metabolism and Functional Genomics, Amer studied the gene SEPP1, a selenium transport gene. He found that the cells with high SEPP1 were more resistant to depletion of the amino acid cysteine, which nourishes cancer cells. Also, the thioredoxin (TRX) pathway was upregulated in SEPP1-resistant cells. The TRX system affected by sepp1 works redundantly and makes cancer cells less dependent on cysteine residues in cells.

“We learned that blocking cysteine can help control cancer growth in some types, while others may need blocking of Sepp1 and the Trx system as well to make it happen,” says Amer.

Tang describes the work of his graduate student. “Arslan Amer joined my lab for cancer research with a Fulbright fellowship in 2017. His research is focused on identifying metabolic deregulations and developing novel therapeutic tools to target metabolic vulnerabilities in pancreatic cancer, an aggressive type of cancer with the highest mortality rate. Arslan found that blocking cysteine metabolism can kill some pancreatic cancer. He further identified that the selenoprotein Sepp1 regulates the efficacy of targeting cysteine therapy, and its inhibition can overcome drug resistance. His work is going to be published in a peer-reviewed journal.”

A native of Pakistan, Amer earned his bachelor’s and master’s degrees there. He won a Fulbright Fellowship to do his Ph.D. work at Michigan Tech.

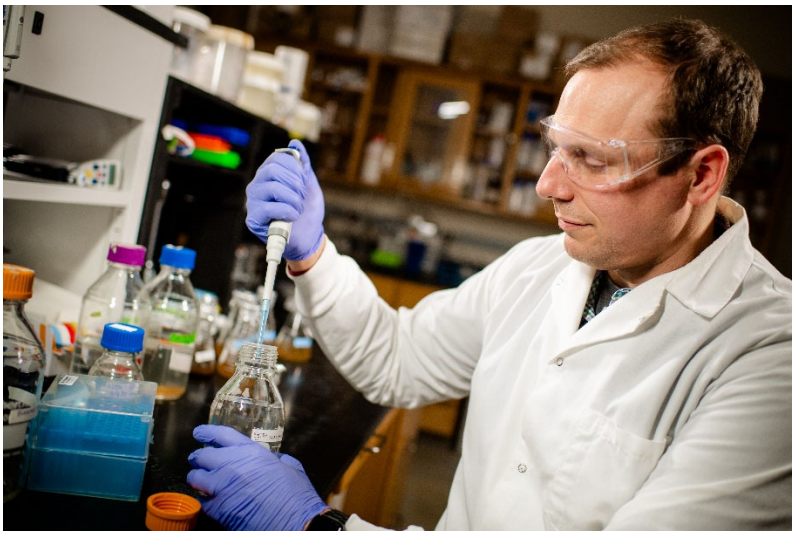
His ultimate goal is to return to Pakistan. “I want to apply the things I have learned to serve my community,” he says.

After his Ph.D., which he finished in July 2022, he is looking for a post-doctoral fellowship or another research opportunity. Eventually, he sees himself in academia.

“I love teaching: I love research,” he says. “I want to find an academic position in Pakistan where I can make a difference for my people.”

While at Michigan Tech, Amer served as president of the Muslim Student Association and social chair for the Graduate Student Government.

Steve Techtmann Wins Merck’s Future Insight Prize



Steve Techtmann, associate professor of biological sciences, won a $1 million Future Insight Prize — awarded for innovative research in health, nutrition and energy — for his work to convert plastic waste and inedible biomass into edible protein

Techtmann’s groundbreaking research has been awarded the 2021 Future Insight Prize by Merck KGaA, Darmstadt, Germany, along with research collaborator Ting Lu, professor of bioengineering at the University of Illinois Urbana-Champaign.

“We use natural and engineered organisms to break down the plastics and non-edible plant biomass to convert the wastes into food,” Techtmann said. “Nature has provided us with biological systems for coping with many environmental issues. My role in this project is to identify and grow bacterial communities from the environment that can use wastes like plastic, as well as discover novel enzymes to break down plastics and other wastes more efficiently.”

The research was initially funded by a Defense Advanced Research Projects Agency (DARPA) cooperative agreement award for $7.2 million over four years to refine a method of chemical and high heat (pyrolysis) deconstruction of plastic waste into protein powder and lubricants. Other researchers working on the project, titled BioPROTEIN (Biological Plastic Reuse by Olefin and Ester Transforming Engineered Isolates and Natural Consortia), are Michigan Tech chemical engineers Rebecca Ong and David Shonnard and materials engineer Joshua Pearce.

Getting the Lead Out Using Plants

There's lead in the soil around old houses where lead-based paint was commonly used. And it's making people—especially children—sick. Biological Sciences Professor Rupali Datta wants to fix that.

Datta, who joined the Michigan Tech faculty in 2009, is researching ways to use plants to remediate lead contamination of soil. Up to now, the only way to do that has been "dig and haul," digging up the contaminated soil and hauling it away. That is too expensive and difficult for most households, particularly in low-income areas where lead contamination is most common.

"Our goal is to use inexpensive, sustainable remediation methods that are easy to implement," she says.

With funding from the US Department of Housing and Urban Development, Datta and colleagues are studying the use of vetiver grass, a kind of grass that originated in South Asia. It is easy to grow, grows fast, and has a huge root system. Vetiver grass is tolerant of lead and can absorb it efficiently. "So you just plant the grass, let it grow, cut it and let it grow again," she says. "Each growing cycle, it removes more lead."

Datta and Smitha Rao Hatti, assistant professor of biomedical engineering, are also working on research using human cells to determine the effects of lead and arsenic contamination. There are three routes for heavy metal contamination to get into the body; she explains inhaling, touch and ingestion. The researchers are working with skin cells and cell lines from the intestinal lining. They hope to develop models for arsenic and lead uptake in humans.

Datta has recently received a new three-year grant from HUD, worth $699,916, to study chemical remediation. She is looking at amendments, such as rock phosphate, biochar, and compost, to see how well and for how long they bind lead in the soil.

Other research projects on her plate include arsenic uptake by plants, particularly rice, and mine contamination in the Navajo Nation in New Mexico.

Datta received her Ph.D. in life sciences with a concentration in plant biochemistry from the University of Hyderabad in India. She then did a fellowship in Japan and a postdoctoral fellowship at the University of Florida before taking a faculty position at the University of Texas at San Antonio.

She is committed to teaching as well as research. "Ultimately, my goal is training the next generation of students, encouraging them to seek careers in research and teaching, as I did," she says. "I want to inspire students and help society."

Paul Goetsch Receives NIH Grant to Study Cell Cycle Regulation

Assistant Professor Paul Goetsch received a $423,381 grant from the National Institutes of Health to study how the DREAM transcriptional repressor complex regulates the cell cycle of cellular progression and cellular quiescence.

Cellular division is extremely important as an organism grows to maturity, but just as important are the mechanisms that stop cells from dividing, because dysfunction in cellular quiescence generally leads to the development of cancer cells, Goetsch explains.

Working in the model system Caenorhabditis elegans, a 1 mm-long transparent nematode, the Goetsch lab is using CRISPR/Cas9-mediated genome editing to disrupt how the DREAM complex forms and test how that affects its function. "By exploiting advances in genomic editing and genetic tools in a tractable model system, we will gain new insights into how the DREAM complex protects cellular and organismal health," says Goetsch.

Another part of the grant supports bringing research directly into the classroom for Biological Sciences students in the second-year genetics lab. Goetsch and his colleagues are implementing Course-based Undergraduate Research Experiences (CUREs) to provide students a glimpse into research opportunities within the department.

In spring 2021, Goetsch and his student Emily Washeleski developed a unique experiment combining C. elegans genetics with environmental microbiology. "We are continuing to expand upon our CURE approach to provide students equitable access to research experience as a cornerstone of their professional development within the department," Goetsch says.

Michigan Sea Grant to Study Invasive Mussel Larvae

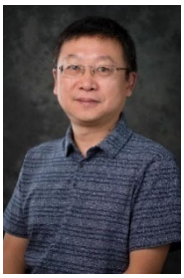
A research project led by Biological Sciences Assistant Professor Gordon Paterson, working with Assistant Professors Jill Olin and Trista Vick-Majors, and GLRC postdoctoral fellow Jim Junker, won a Michigan Sea Grant to study how invasive mussel larvae contribute to the flow of nutrients and energy in Lake Huron, particularly Saginaw Bay. Their grant was one of four awarded. The Tech researchers received just under $200,000.



"Zebra mussels and quagga mussels are an extensive problem throughout the Great Lakes Basin," said Paterson. "A major consideration with their life history is that the fate of much of the larval stage, known as veligers, that is produced during spring-fall spawning is largely unknown. Also, we do not know the nutritious quality of veligers and subsequently what food value they may represent to other aquatic species."

Sea Grant research program manager Michael Fraker said the projects were chosen because they "address topics identified by stakeholders as current areas of interest and need in the Great Lakes." Sea Grant is a cooperative program of the University of Michigan, Michigan State University, and the National Oceanic and Atmospheric Administration.

NIH Grant Helps Mark Tang Explore Cancer Mechanisms and Novel Treatments



Xiaohu (Mark) Tang's Laboratory of Cancer Metabolism and Functional Genomics is using a three-year $413,090 grant from the National Institutes of Health to find ways to optimize the efficacy of targeted cysteine therapy and broaden its application for the treatment of different subtypes of breast cancer. Haiying Liu, professor of chemistry, is a co-investigator on this project.

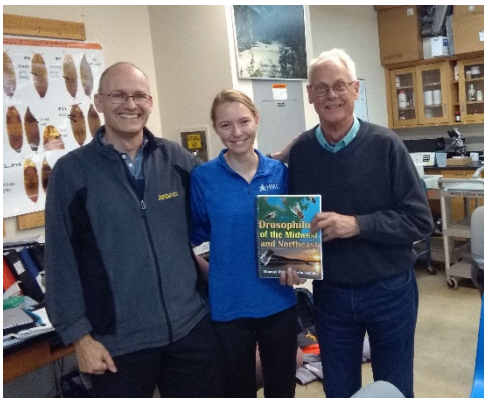
"Targeted cancer therapy is an emerging trend in precision cancer medicine," Tang explains. "It uses the specific genetic makeup of a patient's tumor to select the safest and most effective personalized treatment, instead of the traditional symptom-driven practice of medicine. Identifying and targeting metabolic vulnerabilities in cancer is a promising therapeutic strategy."

The NIH grant will also provide research-based training for undergraduates and graduate students in Biological Sciences and the Biochemistry and Molecular Biology programs. "The work will enable students to understand the complexity of cancer and motivate them to seek novel strategies to improve health issues," says Tang.

Tang's lab works to characterize deregulation of cancer metabolism and the role of nutrients during cancer initiation and progression. He is working to understand the underlying mechanisms of cancer to pursue workable alternative treatments for patients. He also hopes that a better understanding of diet-cancer interactions could establish a strategy for long-term cancer prevention. Tang is an assistant professor of biological sciences. He earned his Ph.D. at The Weizmann Institute of Science.

Thomas Werner Named One of Michigan's Distinguished Professors

Thomas Werner, currently associate Professor of Genetics and Developmental Biology won the state-wide Distinguished Professor of the Year Award in 2021. This award is given each year to three professors in the state of Michigan who represent the best in teaching and research-mentoring. This is also the first time that one of our biological sciences department faculty members has won this state-wide recognition in education. Werner has also won the Michigan Tech Distinguished Teaching Award twice during his tenure, a feat that only three other faculty members have accomplished in 70 years.



Since joining Michigan Tech in 2010, Werner has mentored 107 undergraduate and seven graduate students in his laboratory. He works on different biological questions in drosophilids ("fruit flies") and lepidopterans (butterflies and moths). He also discovered a new fruit fly species named for his student Tessa Steenwinkel who won nine research awards, including the Barry Goldwater and NSF Graduate Research Fellowship, a highly prestigious award. She published 15 articles/books under his mentorship and is now doing her Ph.D. at Baylor College of Medicine in Houston, Texas. Dr. Werner founded the open-access book series "The Encyclopaedia of North American Drosophilids", which serves the Drosophila research community, teachers, and students with currently two published volumes and nearly 10,000 worldwide downloads. These books transformed two campus libraries (U. of Rochester, NY, and Michigan Tech) into open-access book publishers, promoting science and education at no cost.

Saving the Brook Trout by Restoring their Spawning Habitat

Professor Casey Huckins has been studying the ecology of coaster brook trout for nearly 20 years. He started out investigating the population ecology and life history of these migratory fish. But due to human impacts on the watershed that affect the trout population, his research has turned to studying the movement patterns of coaster brook trout and ways to restore them and the habitat they need to spawn. Recently, with funding from the Michigan Departments of Environment, Great Lakes and Energy (EGLE) and the Department of Natural Resources, his lab has been actively restoring its critical habitat.

"Human actions have turned these iconic heritage species of Lake Superior into a conservation concern by overharvesting them and disturbing their habitat," Huckins explains.

His team is actively studying the two coaster brook trout populations still known to exist along the south-central shore of Lake Superior.

These migratory coaster brook trout live in Lake Superior but return to their rivers of origin to breed in the same spots where they were spawned. Their spawning habitat has been buried by disturbances in the watersheds, such as logging and road use that alter the critical dynamic of erosion and sedimentation, resulting in a buildup of fine sand. This sand covers larger sediment particles such as cobbles—small rocks that have been rounded by water flow—and pebbles that are needed as spawning habitat and are also home for the brook trout's food and aquatic insects.

With his recent state funding, Huckins says his goal is to restore the critical spawning habitat by removing excess sand and then to study the impacts that have on the habitat and the coaster brook trout population. His team has installed in-stream sand collectors that passively collect sand as it flows over them. The researchers then routinely operate pumps to move the sand out of the floodplain.

"We have determined that we can effectively conduct this restoration and that it appears to have positive impacts on the habitat and thus on the brook trout population," Huckins says. "After restoration, we see more young brook trout in the restoration site in the following year."

Huckins' team is now investigating whether the community of stream insects that are key food items for the brook trout also increases in abundance, diversity, and community structure. He is hoping to see a site similar to the natural, free-flowing cobble-based cold-water habitat was found at the site when he started studying it with his graduate students nearly two decades ago.

His next goal is to acquire additional funding to automate the sand collectors so that they operate independently, without the researchers having to spend time and fuel traveling to the site to manually pump the sand. They are also working to deploy this system in other streams and rivers, using their equipment to restore other rivers that have been and are becoming increasingly degraded by erosion from flooding, land use, or other actions that send sand flowing downstream. As our climate changes, we expect to see more extreme events that will have outcomes we need to address to restore and maintain these criticalaquatic ecosystems, Huckins says.

Erika Hersch-Green Receives NSF CAREER Award

Erika Hersch-Green, plant evolutionary ecologist and associate professor of biological sciences at Michigan Tech, received a $1.1 million National Science Foundation CAREER award to investigate how specific attributes of plants, such as their genome size, influence community biodiversity responses to increased nitrogen and phosphorus availability. Hersch-Green's approach combines molecular, cytological, physiological, and phylogenetic techniques.

Hersch-Green is conducting her research on three fronts. First, she is collecting new data and combining this with data from globally distributed experimental grassland sites that have plots with various nutrient amendments, to look at how response patterns are also dependent on climatic conditions. Second, she is conducting controlled greenhouse studies to better understand mechanisms that focus on two common grassland plants: fireweed and goldenrod, both of which she has studied before. Lastly, she developed a new research site at Churning Rapids, north of Hancock and south of McClain State Park. There she is extending her research to look at how disturbance patterns affect levels of biodiversity.

She is also exploring ways to improve students' scientific literacy and engagement in research. To accomplish this, she is incorporating students in grades 6 through 12 and undergraduates in research, enhancing research involvement in the classroom, facilitating effective scientific communication skills of graduate students, and promoting collaboration among undergraduate students and faculty in the Departments of Biological Sciences and Humanities. These students will produce video content that will be used to enhance education and public understanding of biological science and ecology.

To summarize, Hersch-Green aims to provide a system-level understanding of how nutrient eutrophication—the increasingly dense growth of particular plants at the expense of other species—and landscape disturbances are affecting individual organisms and multi-species communities by looking at their interactions.

Although she is passionate about her research, Hersch-Green is also deeply committed to the educational component of her CAREER award. Her educational goals are to increase both scientific literacy and engagement of high school and university students on critical topics related to nutrient eutrophication, biodiversity, evolutionary adaptation, and awareness of related STEM (science, technology, engineering, and math) career pathways.

Amy Marcarelli Receives NSF Grant to Explore How Microbes Process Organic Matter in Streams

Professor Amy Marcarelli and a multi-disciplinary team have received a two-year, $300,000 grant from the National Science Foundation to study the relationships between organic matter and micro-organisms in streams.

An ecosystems ecologist, Marcarelli is leading a team of ecosystem scientists, microbiologists, environmental chemists, and data scientists, all at Michigan Tech.

The researchers are conducting detailed laboratory experiments to gather data on how microbial communities work together to process complex mixtures of dissolved organic matter in streams. Steve Techtmann, associate professor of biological sciences and an environmental microbiologist, is doing all the microbial work on the project in his lab at Michigan Tech.

Dissolved organic matter comprises many different kinds of molecules that come from terrestrial and aquatic plants and microbes. The researchers expect different microbes that live in streams to be specialized to break down these different molecules.

“We expect the relationships to be extremely complicated,” Marcarelli says.

They are looking at rates of respiration, carbon breakdown, and energy release. They hope to discover how the characteristics of dissolved organic matter and stream microbes can explain rates of carbon dioxide emission from streams.

The researchers will use the data to develop machine-learning models. The relationships between the organic matter and micro-organisms might not be evident in simpler analysis methods,” Marcarelli explains.

The current work is the start of a much larger project. “We hope to build on the results of this project with a much bigger proposal for a large field project,” she says.

And why is this work important? “Although we, as a field, have studied carbon dioxide production and emission across many different streams, we can only predict a small amount of the variation we see based on environmental characteristics like temperature,” Marcarelli explains. “We think there is an important role of both microbes and organic matter structure that contributes to this variability, and understanding that is important for predicting these emissions in the future and response to global changes like climate and land use change.”

Marcarelli is the director of the Ecosystem Science Center at Michigan Tech.

Alumna Designs a Better Way for Doctors to Treat Patients

"When students head for medical school, their hearts are in the right place," Susan Skochelak says. "But medical school drains the humanity right out of them."

Skochelak, a 1975 graduate of Michigan Tech's Department of Biological Sciences, has spent her career working to change that.

With a Bachelor of Science in Medical Technology, a Master's in Public Health from the University of North Carolina, and an MD from the University of Michigan Medical School, she has served as a Robert Wood Johnson Clinical Scholar. She was in the inaugural class of the Executive Leadership in Academic Medicine (ELAM) Fellowship. In 2015, she was elected to the National Academy of Medicine.

After 10 years as a chief academic officer at the University of Wisconsin, heading doctoral programs in medicine and physical therapy, Master's programs in public health and physician assistant sciences, and the bachelor's program in clinical lab sciences, Skochelak's deep concern for the disconnects in medical education led her to work at the American Medical Association (AMA). There she served as a chief academic officer, group vice president for medical education, and director of the AMA Center for Transforming Medical Education.

She led the AMA's Accelerating Change in Medical Education Strategic Focus Area, developing a grant program to support transformative innovations in medical education. She pioneered new models for community-based and interdisciplinary medical education, focusing on patient-centered, team-based health care.

Medical schools were more than eager to work with Skochelak, who offered AMA partnerships with more than $40 million in grants for them. "Everybody is your friend when you're giving away money," she says with a smile.

In addition to working directly with medical schools, Skochelak edited a book called Health Systems Science, now one of the bibles of medical education.

Retired from the AMA a year ago, Skochelak still works with the organization part-time and consults with educational groups and health systems. "I can bring the opinions of the physician community to the people who are developing the tools to improve health care delivery," she explains. "My passion still remains to make health care the best it can be by training physicians to be their best," she says.

This year, she was the Geisinger Commonwealth School of Medicine's commencement speaker, where she received an honorary Doctor of Medical Arts. Skochelak served as the Michigan Tech commencement speaker in May 2015, receiving an honoris causa PhD from Tech. Her other honors include the University of Wisconsin Chancellor's Award for Distinguished Teaching, the Distinguished Service Award from the State Medical Society of Wisconsin, and the Patient Care Award for Innovations in Medical Education.

Skochelak credits her Michigan Tech education with giving her the leadership and problem-solving skills that underlie her success. "The hands-on learning was so beneficial," she says. "The lab exercises illustrated the concepts I was learning and supported the application of basic principles to real-world problems. Michigan Tech taught me to understand deep concepts and apply those concepts in practical ways. I did well in medical school because I had such a strong background in core sciences and applied problem-solving."

She especially remembers the Biological Sciences faculty fondly. "They were top-notch," she says. "I am very grateful that they were part of my life and enriched my education."

Now that she's retired, Skochelak has more time to indulge in another passion of hers: nature photography. She and her husband, Michael Fleming—also a Michigan Tech alumnus in biological sciences—are spending more time in their home in Bete Grise, when they aren't traveling the world.

"My goal is to see 100 countries in my lifetime," she says. She's checked off 50 already and planned to add several more to the list this summer on a sailing cruise from Croatia to Greece.

Skochelak has words of advice for today's biological sciences students. "You're in the right place to learn the problem-solving skills and understanding of core principles that can take you to any career you want. Keep your eyes open, stick with it, and look for your passion."

MTU Flex Helps Tech Navigate the COVID-19 Pandemic

Early in 2020, the COVID-19 pandemic swept across the world. In March of 2020, Governor Whitmer issued a “Stay Home, Stay Safe” order. Michigan Tech responded with its typical agility and moved to remote instruction, face coverings indoors, and limited personnel on campus. Group gatherings were prohibited, and common areas were closed. Visitors to campus were restricted to essential contractors, and university travel was discontinued. The Department of Biological Sciences, working with the Department of Biomedical Engineering and several other campus departments, began setting up a COVID testing lab.

On May 28, 2020, Michigan Tech initiated Step One of a three-step Return to Campus Plan and entered the final step on July 27, 2020. This marked the introduction of the MTU Flex plan and a transition to a Health and Safety Levels system, known as MTU Flex. These five levels were designed to enable the University to respond quickly and appropriately to COVID on campus and in the community with scientifically informed, practical, and targeted protocols.

The campus remained at Level Three until September 28, 2020, when it moved to Level Four through October 12, 2020, and then back to Level Three. During this time, most instruction remained remote with some limited on-campus classes. Face coverings and daily symptom monitoring were still required, and indoor gatherings remained limited. Some employees could return to campus if their unit decided it was necessary. Only essential travel was permitted, and COVID testing was available on campus through the testing lab.

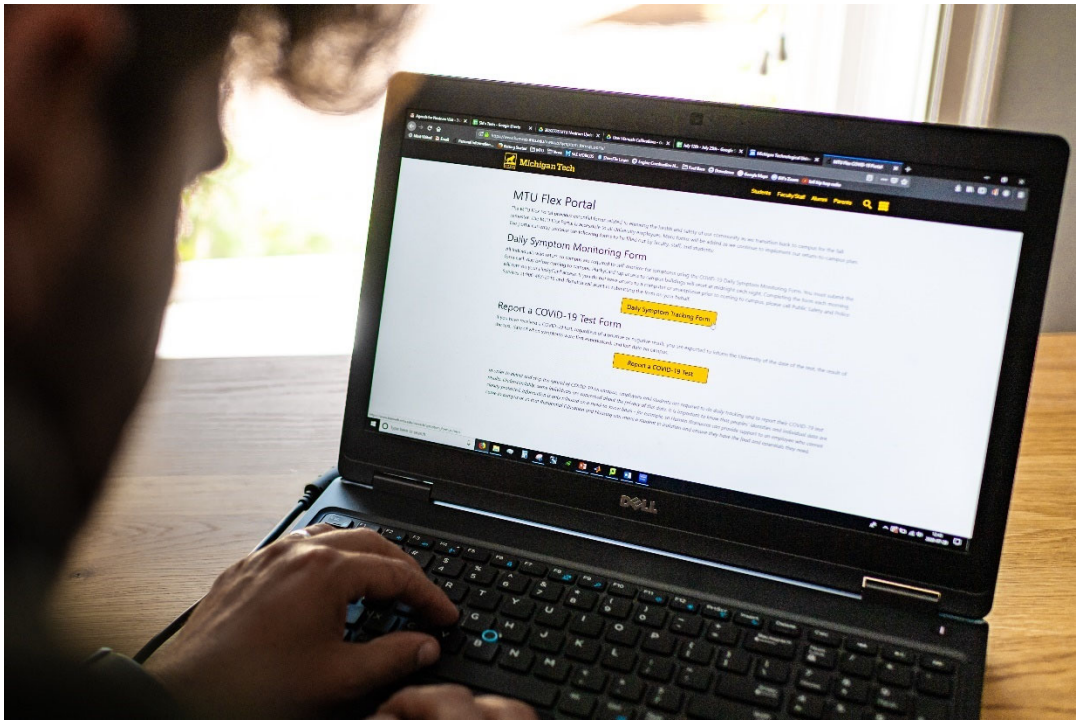
In November 2020, with COVID surging, the campus moved back to Level Five. By January 2021, the University was able to move to Level Three. At that level, in-person instruction was permitted, although online instruction remained an option. Face coverings and daily symptom monitoring were still required. Employees could come back to campus; visitors were permitted; common areas were mostly open, and travel was permitted. The COVID testing lab continued to offer symptomatic and asymptomatic testing.

In May 2021, Tech moved to Level Two. Face-to-face instruction returned as the norm. Employees came back to campus; common areas were open; visitors were permitted; group gatherings were allowed if they met state rules for numbers, and travel was permitted. Face coverings were still required indoors.

But in September 2021, in response to another COVID surge, the University fell back to Level Three. That only lasted a month, with Tech returning to Level Two late in October.

In February 2022, the campus was able to move to Level One, where face coverings are not required, common areas are open; there are no restrictions on the size of group gatherings; visitors are permitted, and travel operates under normal procedures.

President Rick Koubek wrote in a letter to the campus in February 2022, “With the wide availability of the COVID-19 vaccine, low hospitalization rates, and the accumulated knowledge and processes in place to fight future outbreaks if needed, it is now appropriate to move to longer-term solutions. Thank you for the responsiveness, respect, and collective concern each of you has exhibited over the past two years.”



The MTU Flex team made a special effort to keep students, faculty and staff informed during this time. They sent out weekly emails with updates on the COVID situation and campus response. Having reached Level One, the Flex team disbanded and handed this healthcare issue back to the professionals, including all testing and monitoring

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Michigan Tech Steps Up to Offer COVID Testing for Campus and Community

As the COVID pandemic swept the nation in early 2020, healthcare facilities everywhere quickly ran out of COVID tests. And remote, rural areas like ours were among the hardest hit. Michigan Tech quickly stepped up to help meet the need.

By mid-April 2020, Tech had a testing lab set up and operating. Partnering with local hospitals, the lab began testing for possible COVID infection in the university and community. Initially, the lab could run 40 tests per hour on two machines with six staff.

Faculty from all over Michigan Tech contributed their expertise. The interdepartmental effort was led by Caryn Heldt, professor of chemical engineering, and David Dixon, director of biological laboratory operations. Their team included Biological Sciences faculty Steve Techtmann, Ebenezer Tumban, Karyn Fay, Claire Danielson, Brigitte Morin, and Guiliang Tang; College of Forest Resources and Environmental Sciences faculty and staff Kristin Brzeski, Carsten Kulheim and Jennifer Sanders; Sean Kirkpatrick, chair of Biomedical Engineering, and Julie Seppala, associate vice president for finance.

State Rep. Greg Markkanen and Senator Ed McBroom, who advocated for test sites in the UP., praised Tech for its quick response. “The Michigan Tech testing facility eases the strain on small communities’ health resources,” said Markkanen. He called Michigan Tech’s response to the need for a testing lab a “Herculean effort.”

The test to confirm a COVID-19 case has two parts. It relies on finding the genetic fingerprint of the virus among the skin cells, mucus, and microbes collected by a nasal swab. The genetic code is pulled out of the sample by RNA extraction. Then the extracted sample is run through a polymerase chain reaction (PCR) machine that amplifies the genetic code. Using reagents, the PCR machine produces a positive or negative test result.

The lab started small but expanded quickly to meet the growing demand for testing. A $142,359 grant from the Portage Health Foundation allowed the university to buy a KingFisher Flex System RNA extractor that nearly doubled the lab's sampling capacity while lowering staffing requirements.

Tech’s testing lab operated for 20 months, ultimately expanding its capability to do 50 tests an hour on one machine with only two staff. Over its lifetime, the lab ran more than 40,000 COVID tests, ceasing operation when the Western UP Health Department opened its testing facility in the fall of 2021.

In January 2022, Michigan Tech was one of four universities in the state to receive $18.5 million from the Centers for Disease Control and Prevention grant. Tech’s share of the grant was $4.3 million. The funds are being used to improve timely genomic surveillance by expanding sequence generation and analysis and building bioinformatics capabilities including analysis, data processing, storage, sharing, and data interpretation and analytics of the generated sequence data.

Two College of Computing faculty members joined the genomic surveillance team. Dukka KC, associate dean of research and associate professor of Computer Science, and Guy Hembroff, associate professor of Applied Computing and director of the Health Informatics graduate program, are working to develop a robust computational infrastructure and a bioinformatics workflow pipeline for genomic surveillance.

“Michigan Tech continues to be a leader in the Upper Peninsula for providing community resources during the COVID-19 pandemic,” said Caryn Heldt, director of the university’s Health Research Institute. “For 20 months, the university provided community and campus testing for the virus. Now, with support from the state and federal government, we will develop the infrastructure to provide sequencing capacity for state health agencies. We are excited to help the state scale its capacity and continue to support our community in response to the COVID-19 pandemic and in addressing future health threats.”

Michigan Tech’s COVID-19 testing laboratory was recognized in a special tribute on April 30 by both houses of the Michigan Legislature and by Gov. Gretchen Whitmer and Lt. Gov. Garlin Gilchrist II for its contributions to community health and safety.

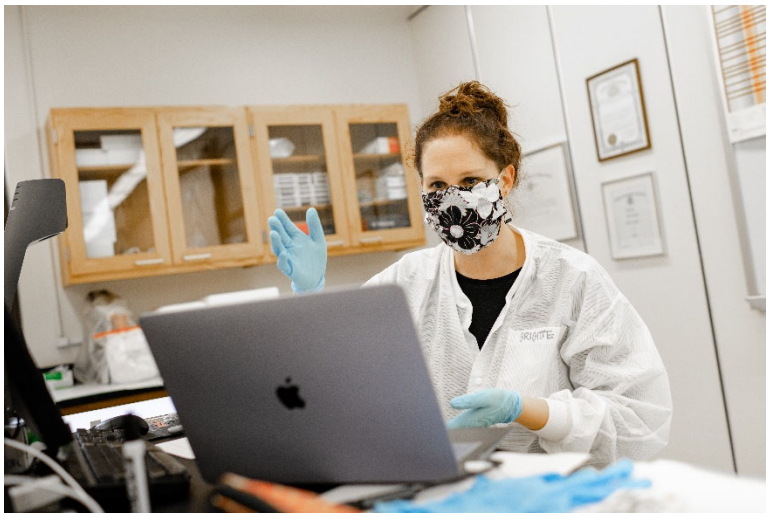
The special tribute commends the lab for “its rapid implementation at the start of the pandemic with the ability to perform high-volume COVID-19 testing with rapid turnaround results. The lab has had a dramatic and significant impact on the health and health care of residents in the Upper Peninsula of Michigan.”

If you are interetsed in more details, our previous MLS director and COVID-19 Liason, Karyn Fay has published a five part series in Critical values journal (criticalvalues.org) from July 2022 to November, 2022.

“SERIES: Meeting the Needs of a Rural Community During the COVID-19 Pandemic: The Ups and Downs of Starting a University Based Clinical Lab for COVID-19 Testing, From Idea to Final Completion” in July 2022, August 2022, September 2022, October 2022 and November, 2022.

Teaching Online: A Challenge and an Opportunity

The pandemic struck with a vengeance. All of a sudden, teaching online replaced lecture halls and labs. How did the Biological Sciences faculty deal with that?



For some, it brought new opportunities. For most, it was a challenge. And for a few, it was a horror just to be endured.

Assistant Professor Trista Vick-Majors gave herself a moment to panic. Then, she says, she stopped and made a plan.

"I knew that I could transition most of my materials to either video lectures or online discussion boards in our already-existing online platform—Canvas—which I was already using for the course," she says. "But the most important piece was going to be communicating with the students, so I did that first. In times of instability, the most important thing is clear communication. I let them know immediately that I was working on the transition and that they would hear from me as soon as I had the details in place. I didn't want them to have to wonder about what was going on."

Vick-Majors says one of her biggest challenges was transitioning the lab portion of her limnology course. She had been planning to take the class out to do some field work. "Luckily, I was able to find some great online resources that allowed the students to work with real limnological data," she says. She also used the interactive SimBio program that enabled her to demonstrate ecological principles relevant to the course.

Overall, she feels that the experience helped her better organize her future courses. "I learned that delivery methods need to be adjusted for online learning. Full-length lectures don't translate well to video, so putting things in more bite-sized pieces is important."

Vick-Majors sees a valuable place for integrating online learning into the Biological Sciences curriculum. "The flexibility it provides for both teachers and learners can help reach a broader diversity of students," she says.

Professor Thomas Werner found online teaching extremely nerve-wracking at first. "But I told my students how I felt about it, and they probably felt the same, so we had something in common," he recalls.

"Zoom wouldn't record some of my lectures," Werner says. "Zoom would crash when too many people streamed their cameras. My kids were slamming doors all day while I was teaching from the attic."

Did Werner find any unexpected benefits to teaching online? "Not at all," he says.

Should teaching be incorporated into the curriculum in the future? "Absolutely not," Werner replies. And what did he learn from the experience? "That I never want to teach online again."

Senior Lecturer Brigitte Morin has a different take on it. "This was hard. This was messy. This was imperfect," she says. "But to ignore the opportunities rooted in hardship is to pass up the chance to evolve."

So evolve she did. With her biggest classes—anatomy and nutrition—Morin realized that she could not interact with students effectively online. So she chose to prerecord lectures and provide a schedule of assignments using iClickers, an online platform that allows students to text questions and types numerical values in answers.

With the online format, though, she found she did lose touch with students. "And I don't like that," she says.

Things went better with her Medical Laboratory Science classes. "These are students I know well," she explains. "I was able to do synchronous Zoom classes, where we are both on the screen doing live dialogues. We learned how to use breakout rooms together, and they'd offer me technical tidbits when I struggled. The engagement was easier to do."

Sometimes Morin's online efforts flopped. "I wanted to adapt a lesson I normally do in person with students using sticky notes," she says, "so I tried using virtual sticky notes. It wasn't very good. About halfway through, I had to admit it wasn't working."

What did Morin learn from these experiences? Flexibility is the key, she says. "We have to let go of what we can't control. We need to ask, what do I have the ability to change and make choices about right now?"

Vick-Majors, Werner, and Morin all agreed that the transition to teaching only online was a challenge, but they say that they learned and evolved.

Anatomage Table: A New Educational Tool, is a true game changer for our students.

We are very happy to report that with the generous support from our alumni and friends, we were able to purchase a virtual human cadaver dissection table from Anatomage (https://www.anatomage.com/). The table cost was about $72,000. Our Anatomy and Physiology students have been excited to use this equipment since the Fall of 2021, and this table is slated to be moved to our new H-STEM building when that project is complete.

This 7.2-foot-long iPad-like table allows eight students to simultaneously learn and experience medical sciences in a way they have never done before! We would greatly appreciate it if you could contribute to Anatomage Michigan Tech Fund #3454 (https://www.mtu.edu/givenow/?code=BIO3) to purchase a second Anatomage table that would allow instruction 16 students at the same time. We are already halfway there!

The Anatomage Table is one of the most technologically advanced virtual dissection platforms for anatomy education. The Table's interactive, life-sized display is now available for our undergraduate students to utilize within the Anatomy & Physiology Teaching Laboratory! The Table has expanded our ability to provide ultra-high-quality visualization for students to view photorealistic anatomical structures. Students have been amazed by the level of detail within each virtual human cadaver and the value of comparing models and textbook images to actual medical images. The Table includes a robust library of histology scans, CT and MRI scans, clinical cases, and physiology simulations.

MLS Teaching Lab Improvements

Updates to the teaching lab ensure that our students learn the latest clinical techniques. We recently implemented the Ortho gel card system for our immunohematology students, which gives our students experience using the technology on campus before entering their blood bank rotation. We also implemented a Laboratory Information System (LIS) in our student teaching lab. The LIS is interfaced with our hematology analyzer and allows students to order tests, print labels, and see results cross over just like they would in a real lab. In phlebotomy, they utilize the LIS to practice the prevention of pre-analytical errors and enhance the in-lab experience. The addition of a new phlebotomy station and more fake arms to practice blood drawing techniques ensures our students get plenty of practice. We also added additional Cliniteks to process urine specimens in our urinalysis class.

Continued Student Success

Thanks to our faculty and staff, Michigan Tech's MLS program continues to be phenomenal. Our students see 100% job placement after completing a clinical practicum. You can see our student success stories on Instagram @michigantech_mls and Facebook @MichiganTechMLS.

There is a critical national shortage of medical laboratory scientists. The U.S. Bureau of Labor Statistics estimates there will be 25,900 available jobs in the field every year during the next decade—a growth rate 3 percent higher than other occupations. We are helping to fill the gap!

Awards:

The Biological Sciences students win several scholarships, fellowships, and awards every year. Here is a list of all the winners during 2019-2022

Student Leadership Awards

Every Spring, the annual Student Leadership Awards event at Michigan Tech celebrates and rewards the individual and group efforts of students involved in organizations across the MTU campus. There are awards for student employees, student organizations, programs, and more. Congratulations to all of the winners!

Spring 2020:

Due to COVID-19, the event was held online in 2020. Several students in our department were recipients in recognition of their truly incredible accomplishments! Here is a list of winners from the Biological Sciences department:

President's Award for Leadership:

- Zachary Smith, Biochemistry & Molecular Biology

Department Scholar:

- Aurora Kuntz, Biological Sciences

Dean of Students Award for Service:

- Dana Anderson, Biochemistry & Molecular Biology

Exceptional Enthusiasm as a Student Leader:

- Lucinda Hall, Biochemistry & Molecular Biology

Spring 2021:

The Provost's Award for Scholarship:

- Thomas Basala, Human Biology

Fraternity Member of the Year:

- Thomas Basala, Triangle

Department Scholar:

- Thomas Basala, Human Biology

Spring 2022:

The Provost's Award for Scholarship:

- Christian Johnson, Human Biology + English with a Pre-Health minor

William and Josephine Balconi Community Service Award:

- Bella Menzel-Smith, Human Biology

Department Scholar:

- Tessa Tormoen, Ecology and Evolutionary Biology with a minor in Fish Biology

Songer Awards

The Songer Award for Human Health Research supports one undergraduate ($4,000) and one graduate student ($6,000) each year doing health-related research in the College of Sciences and Arts (CSA). Supported by the generosity of Matthew Songer (biological sciences '79), Laura Songer (biological sciences '80), and matching funds from CSA, the program has been supporting four students annually since 2018. Here are the winners from our department in recent years!

2020:

Graduate awards ($6,000):

- Aditi Vyas (Advisor: John Durocher) for "Physical activity or sleeping-in: what is the best strategy to improve decentering, anxiety and sleep quality after a busy working day in young vs midlife adults?"
- Manas Warke (Advisor: Rupali Datta) for "Developing a cell culture model to understand the effects of soil-Arsenic"

2021

Graduate awards ($6,000):

- Zhihong Wang (Advisor: Xiaoqing Tang) for "microRNA-483 protects beta-cells and prevents diabetes development."

Undergraduate awards ($4,000):

- Samantha Siefert (Advisor: Paul Goetsch) for "Evaluating cell cycle quiescence in ovarian cancer"
- Morgan Smith (Advisor: Thomas Werner) for "Supplementing the gut microbiome in obesity."

2022:

Graduate awards ($6,000):

- Emily Washeleski, advised by Paul Goetsch for "Investigation of oncoprotein disruption of the DREAM transcriptional repression complex."

NSF Graduate Fellowship Awards

- Tessa Steenwinkel (Biochemistry & Molecular Bio, '20, '21)
- Megan Guyer (Biochemistry & Molecular Biology, '23)

Graduate School's Doctoral finishing fellowships:

Each semester, the Graduate School anticipates awarding Finishing Fellowships that provide support to Ph.D. candidates who are close to completing their degrees. These fellowships are available through the generosity of alumni and friends of the University. They are intended to recognize outstanding Ph.D. candidates who need financial support to finish their degrees and are also contributing to the attainment of goals outlined in The Michigan Tech Plan. The Graduate School anticipates funding fellowships each semester with support ranging from $2000 to full support (minimum stipend + tuition).

- Summer 2020: Kevin Nevorski (Advisor: Amy Marcarelli)
- Spring 2021: Rashi Yadav (Advisor: Ebenezer Tumban) and Mujeeb Shittu (Advisor: Thomas Werner)
- Fall 2021: Erin Eberhard (Advisor: Amy Marcarelli)
- Spring 2022: Aditi Vyas (Advisor: John Durocher) and Zhihong Wang (Advisor: Xiaoqing Tang)
- Summer 2022: Manas Warke (Advisor: Rupali Datta)

Bioathlon

To stimulate an avid interest in biology, the Department of Biological Sciences at Michigan Technological University has sponsored a single-day, hands-on, problem-solving competition known as the Bioathlon in each May since 1989. As many as 20 high schools from across the Upper Peninsula have been participating in a day-long competition, using their skills and knowledge to solve biological problems along the way. Many high school teachers use the team selection process (four sophomores per school) as a means to motivate their students throughout the school year. In the summer of 2020, this event was canceled due to the Covid-19 pandemic. However, in summer 2021 and summer 2022, we held the Bioathlon in a novel way as follows:

2021: This was the first year when we sent the competition kits to schools to participate in two projects:

Asynchronous Virtual Case Study: Students will work through a case study to help them understand the basics of blood typing using the standard ABO systems and the Rhesus factor. Then they will apply that information to understand the findings of a publication that possibly links blood type to COVID-19 susceptibility. Students will be graded on their knowledge of blood typing and their ability to critically assess findings from scientific manuscripts.

Hands-On Dissection: Students will be sent a preserved vertebrate animal and must identify a list of organs and other anatomical structures while following their high school's safety protocols. Students will complete the dissection under the supervision of their teacher at school but will not have access to any dissection guides or other assistance. Students will be graded on the quality of their dissections and the number of correct identifications by submitting images to an online form.

Results:

1st Place: L.L. Wright (Ironwood)

2nd Place: A.D. Johnston (Bessemer)

3rd Place: Calumet

2022: Four schools participated in the 2022 Bioathlon: A.D Johnston/Bessemer, Lake Linden, Calumet High School, and West Iron County High School. A.D. Johnson came in first place, Calumet High School earned second place, and West Iron County High School achieved third place. The activities were an ecological scavenger hunt, a mitosis/meiosis modeling event, and a dissection and identification (brain and heart) activity.

For the dissection activity, the students identified many parts of the brain and heart. For the Ecology/Food web scavenger hunt, the students were asked to find and collect specimens and ID their part in a food web (e.g., primary consumer, secondary consumer, decomposer), diagram a food web with the collected specimens, and calculate the energy dynamics at different trophic levels of the stated food web. Lastly, the students were asked to construct models (using magnets and beads) of each phase of Mitosis and Meiosis within the "Chromosome Simulation" exercise. Participating groups had no more than 60 minutes to complete each activity, and the total time taken was used as a tiebreaker if multiple schools had the same total point score.

Biological Sciences by the numbers

18	Biological Sciences Faculty
5	Biological Sciences Staff
149	Undergraduate Students that graduated 2019-22
42	Graduate Students that graduated 2019-22
240	Undergraduate Students currently enrolled
42	Graduate Students currently enrolled
$9.9M	New grants from Spring 2020 to Summer 2022

The Department of Biological Sciences provides students with the greatest possible opportunity to succeed. However, we cannot provide the best education for our students without the best faculty, staff, equipment, and facilities. Your generosity helps us make our goal of providing the best undergraduate and graduate experiences a reality.

mtu.edu/biological/giving