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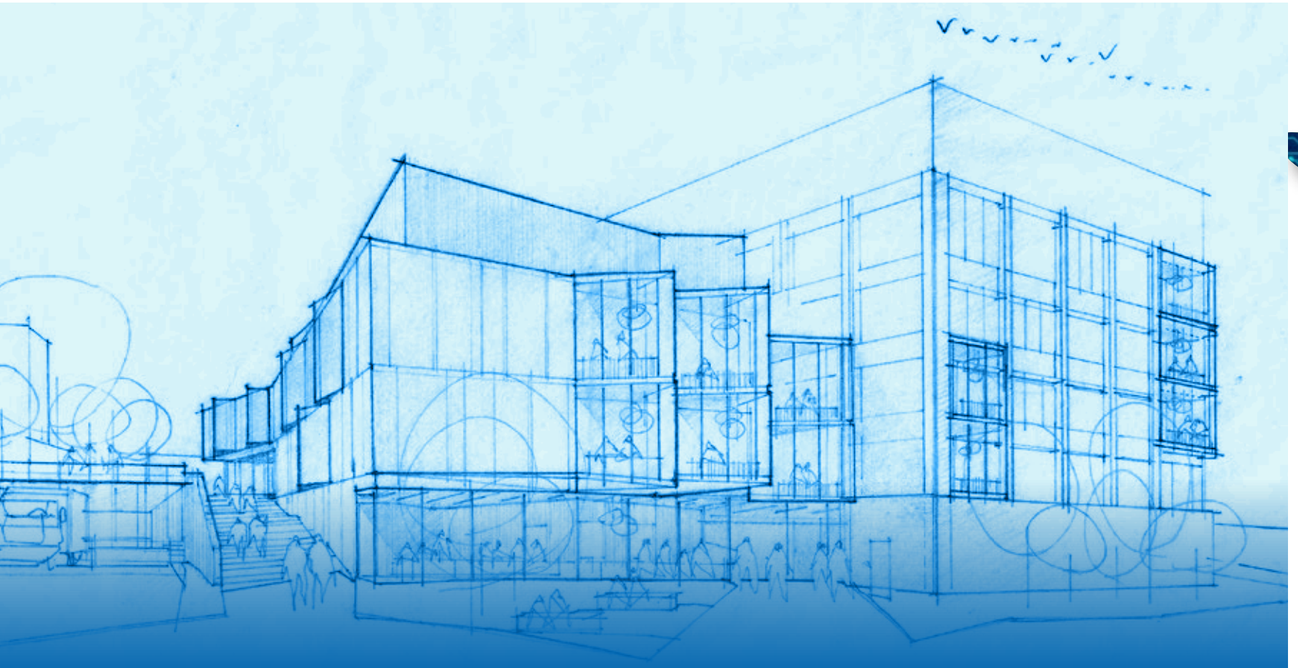


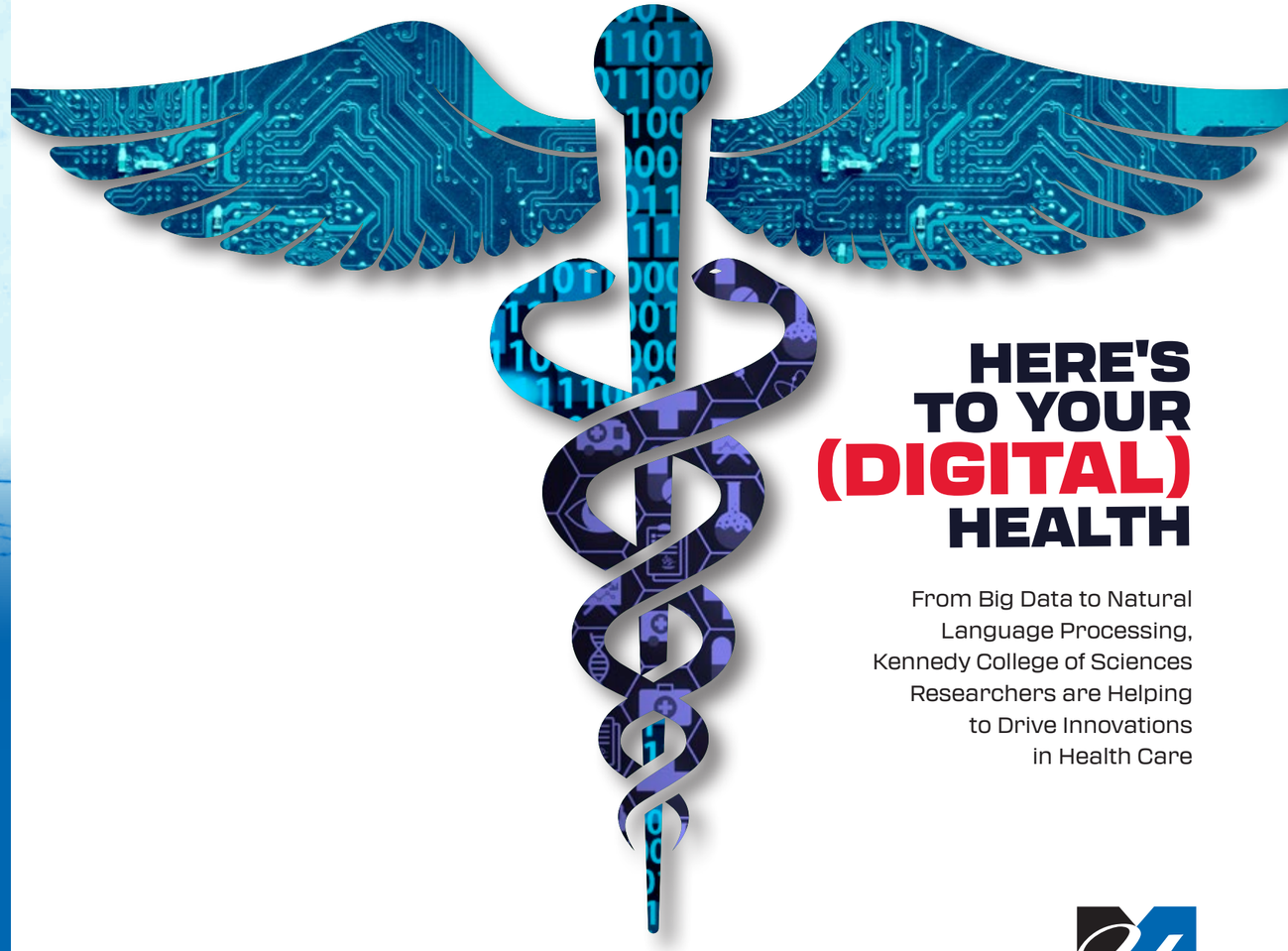
PARTING SHOT

Plans are moving forward for the renovation of the Olney Science Center, which will include revitalized instructional space for the departments of Environmental, Earth & Atmospheric Sciences, Chemistry and Physics.

SPRING 2023

A PUBLICATION OF THE KENNEDY COLLEGE OF SCIENCES

ELEMENTS OF SCIENCE



HERE'S TO YOUR (DIGITAL) HEALTH

From Big Data to Natural Language Processing, Kennedy College of Sciences Researchers are Helping to Drive Innovations in Health Care

THE UNIVERSITY OF MASSACHUSETTS LOWELL

UMASS LOWELL

A LETTER FROM THE DEAN

Dear Alumni, Colleagues and Friends:

It's hard to believe we are publishing the fifth issue of Elements of Science!

As the dean of the Kennedy College of Sciences, I want to update you on the exciting things happening within the college, and we hope that what you read within this magazine will encourage you to learn more and get involved.

First and foremost, our students continue to excel in their academic pursuits. Our faculty are committed to providing a rigorous, innovative education, and our students are rising to the challenge. From groundbreaking research projects to award-winning scholarship, our students and faculty are distinguishing themselves both on and off campus. Their work demonstrates that scientific progress at any level is a team endeavor. Interdisciplinary research is now a major part of the portfolio of the Kennedy College of Sciences.

Of course, none of this would be possible without the generous support of alumni and friends like you. Your donations help fund scholarships, new facilities and innovative programs that enhance the educational experience for all our students. We are deeply grateful for your ongoing support.

As we look to the future, we are committed to continuing our tradition of excellence and innovation. We have ambitious plans to expand our facilities, create new programs, enhance our diversity and equity and attract talented students. With your help, we are confident that we can achieve these goals and continue to provide a top-notch education to our students.

Thank you again for your support of the Kennedy College of Sciences. We are proud of our past, and excited about our future. Please stay in touch and let us know how we can continue to serve you.

I invite you to explore this new edition of Elements of Science. I believe that you will sense our passion for scientific discovery, appreciate our dedication to student success and learn more about our commitment to service.

Warm regards,

NOUREDDINE MELIKECHI, D.PHIL.
Fellow, American Association for the Advancement of Science
Fellow, Optical Society of America
Fellow, American Physical Society
Professor of Physics and Dean, Kennedy College of Sciences
University of Massachusetts Lowell

In This Issue

ELEMENTS OF SCIENCE

VOLUME 5

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SPRING 2023

THE ANTS GO MARCHING …

Biological Sciences Asst. Prof. Christina Kwapich read the book “The Ants” by Bert Hölldobler and E. O. Wilson when she was a child and was hooked.

The Pulitzer Prize-winning book set Kwapich on a path of studying insects—and eventually co-writing her own book with Hölldobler, “The Guests of Ants: How Myrmecophiles Interact with Their Hosts.”

Published in July 2022, the book examines myrmecophiles—organisms ranging from reptiles to bacteria that live within ant colonies by exploiting their communication systems. These parasitic invaders trick ants using a variety of tactics, such as tickling them or mimicking the way they smell.

The Association of American Publishers named the book a 2023 PROSE Award finalist in the biological sciences category.

Chemistry Group Makes Noble Discovery

A research group led by Chemistry Asst. Prof. Michael Ross made a recent discovery that could lead to advances in medicine, energy and other fields while reducing the use of expensive noble metals.

The researchers found that nanoparticles made of gold and tin absorbed light in a spectrum that could not be reached before. The finding is significant because gold and other noble metal nanoparticles cannot absorb higher energies of light on their own; they are limited to lower-energy light like visible and infrared. By mixing in varying amounts of a post-transition metal, the team could widen the absorption spectrum to blue and ultraviolet light.

In February, the journal "Matter" published the team’s research findings.

Partnership Gets Students Revved Up for Math

STEM-related industries are growing in Massachusetts, but racial minority representation in those fields remains low.

To provide a successful path toward STEM careers for students of color as well as those from low-income families, the Kennedy College of Sciences teamed up with The Calculus Project, a grassroots initiative to boost the number of students from underrepresented backgrounds who complete AP Calculus in high school.

For three weeks last summer, about 50 rising seventh, eighth and ninth graders from Lowell came to campus, where they learned math skills in preparation for the school year.

“It’s essential that students feel comfortable with mathematics at a young age,” says Dean Noureddine Melikechi.

PROJECT AIMS FOR EQUITABLE ENERGY EFFICIENCY

A research team led by Environmental, Earth and Atmospheric Sciences Prof. Juliette Rooney-Varga is studying how energy efficiency programs can be delivered equitably so that all residents can benefit.

“Low-to-moderate-income households with limited English proficiency, high energy burdens and who rent are less likely to benefit,” she says.

Rooney-Varga, Criminology and Justice Studies Prof. Arie Perliger and Ruairi O’Mahony, executive director of UML’s Rist Institute for Sustainability and Energy, are looking at whether word-of-mouth, or social diffusion, can accelerate the adoption of energy efficiency programs among underserved communities.

The first phase of their work is funded by a $50,000 National Science Foundation CIVIC Planning Grant.

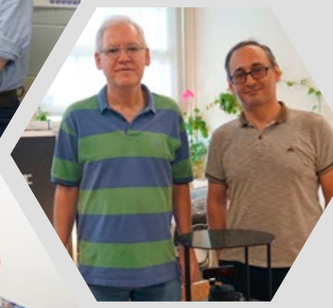
KCS Hosts Fulbright Scholars

The Kennedy College of Sciences has welcomed three Fulbright Scholars during the current academic year.

João Luís Garcia Rosa, an associate professor in computer science at the University of São Paulo in São Carlos, Brazil, joined the Richard A. Miner School of Computer and Information Sciences as a Fulbright Scholar-in-Residence. He is conducting research and teaching.

Salima Saidi-Besbes, a chemistry professor at the University of Oran in Oran, Algeria, is spending six months at UMass Lowell as a Fulbright Visiting Scholar researching new nanomaterials.

Punit Sharma, a Ph.D. student at the Indian Institute of Technology in Delhi, India, and a Fulbright Visiting Scholar, joined Physics Prof. Jayant Kumar’s lab, where he is researching the fabrication of solar cells.



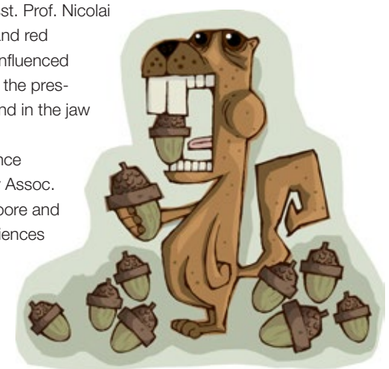
Clockwise from top, left to right: Salima Saidi-Besbes with Chemistry Prof. Olof Ramstrom; left to right, João Luís Garcia Rosa with Asst. Prof. Reza Ahmadzadeh of the Miner School of Computer and Information Sciences; left to right, Punit Sharma with Physics Prof. Jayant Kumar.

Cracking the Muscle Function Mystery

The way a squirrel cracks a nut may lead to a better understanding of how muscles function.

A research team, led by Biological Sciences Asst. Prof. Nicolai Konow, is studying the bite performance of gray and red squirrels. The researchers will test if bite performance is influenced primarily by muscle size and shape, skeletal geometry or the presence of masticatory myosin—a fibrous motor protein found in the jaw muscles of some animals.

The project is funded by a $2.14 million National Science Foundation grant. The research team includes Chemistry Assoc. Prof. Matthew Gage, Biological Sciences Prof. Jeffrey Moore and Sam Walcott, an associate professor of mathematical sciences at Worcester Polytechnic Institute.



Capturing Campus Wildlife with Cameras

UMass Lowell may be an urban campus, but it's also home to a wealth of wildlife, including ducks, rabbits, cormorants, squirrels, beavers, monarch butterflies and a variety of songbirds. Computer science major Zach D'Orto has teamed up with Noah Pietrowski, an electrical engineering student, to capture with their cameras the abundance of animals, birds and insects in their natural habitats around campus.

The two friends, who bonded over their interest in photography, bring their cameras on walks around campus and post their snaps to the Instagram account #uml_wildlife, which they launched last fall.

"I like sharing the photos with other people," says D'Orto.

PHYSICS PROFESSOR GETS NSF GRANT FOR CANCER RESEARCH

Physics Asst. Prof. Marian Jandel is researching a cancer treatment that could destroy inoperable tumors without damaging other tissue.

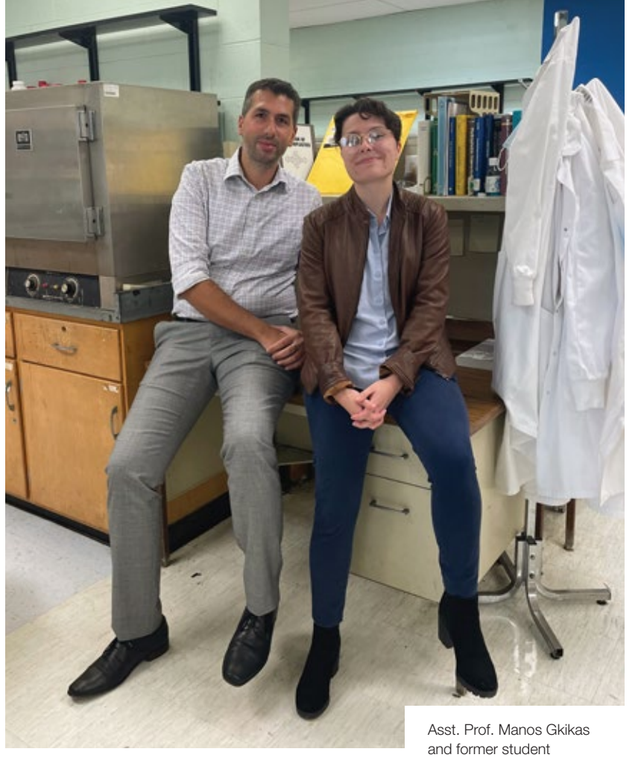
The research is funded by a five-year, $437,984 faculty early-career development (CAREER) grant from the National Science Foundation and will focus on neutron capture therapy, which works by injecting an initially non-radioactive compound containing a chemical element into the tumor tissue and then beaming neutrons into the area of the tumor. The neutrons react with the chemical element, producing radiation that can destroy cancer cells.

Deeper Dive in Health Records May Help Prevent Suicide

A recent study by researchers at UML's Center of Biomedical and Health Research in Data Sciences looked at the link between social determinants of health, such as housing instability, financial problems or violence, and suicide risk among veterans.

For the first time in a large-scale study, the team, led by Computer Science Prof. Hong Yu, examined both structured data (such as disease classification codes) and unstructured data (such as clinical notes) that was extracted from electronic health records using natural language processing. The conclusion? Social determinants of health are associated with higher suicide risk, and analyzing all available information about those determinants, including information from clinical notes, can lead to better risk assessment and suicide prevention.

The research was published in "JAMA Network Open."



Asst. Prof. Manos Gkikas and former student Frances Skinner '19

NEW TREATMENTS DEVELOPED TO FIGHT MULTIDRUG-RESISTANT GERM

Chemistry Asst. Prof. Manos Gkikas, in collaboration with Laurence Rahme, a Harvard Medical School professor and Massachusetts General Hospital (MGH) researcher, has taken aim at the multidrug-resistant bacteria Pseudomonas aeruginosa.

The researchers have been developing treatments for the common bacteria, which can cause infections in the blood, lungs and other parts of the body. Gkikas and a former student, Frances Skinner '19, created about 10 different anti-microbial drugs in Gkikas' lab that were then tested at MGH. Most showed efficacy against the bacteria. Two of the drugs were featured in a research paper, published in "Nature Communications," that was co-authored by Gkikas and Skinner, who is a Ph.D. student at the University of New Hampshire.

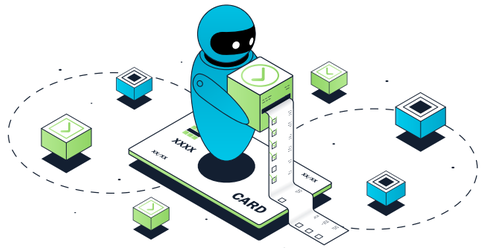
NEW EARTH SYSTEM SCIENCE DOCTORAL PROGRAM LAUNCHED

The Kennedy College of Sciences has welcomed its first group of students for the new Earth System Science Ph.D. program.

Housed within the Department of Environmental, Earth and Atmospheric Sciences (EEAS), the program gives students a deeper understanding of all major Earth system components, including the geosphere, hydrosphere, cryosphere, atmosphere and biosphere.

"We're finding that this interdisciplinary model is one of the appeals of the program," says Mathew Barlow, EEAS professor and interim department chair.

Assoc. Prof. Richard Gaschnig and Earth System Science Ph.D. student Ericka Boudreau traveled to Oregon to collect rock samples for a research project.



Computer Science Professor Wants to Teach Robots New Tricks

Asst. Prof. Reza Ahmadzadeh of the Miner School of Computer and Information Sciences envisions a world where robots can help people live more comfortably and safely, and he's developing the tools to bring that vision to life.

Ahmadzadeh's work recently got a boost from the National Science Foundation, which awarded him a faculty early-career development CAREER grant of nearly $500,000 to support his efforts to develop new algorithms for robots to learn complex tasks.

The prospective breakthroughs resulting from the work could help automate difficult and dangerous duties in the workplace and help older adults remain in their homes longer by assisting them with daily chores, Ahmadzadeh says.

HERE'S TO YOUR (DIGITAL) HEALTH

From AI and Big Data to Machine Learning and Natural Language Processing, Researchers from the Kennedy College of Sciences are Helping to Drive Innovations in Digital Health Care

BY ED BRENNEN

Many of Hong Yu's family members are medical doctors, including her husband and her sister. But Yu, a computer science professor in the Miner School of Computer and Information Sciences, was never interested in becoming a physician.

"To be honest, I can't be a doctor because I can't remember all those drug names—they're alien to me!" she says with a laugh before striking a more serious tone. "And I cannot see blood and people dying. It's too much for me."

Instead, Yu has pursued a career in biomedical data science with an expertise in artificial intelligence (AI). In doing so, she has found a way to make important contributions to the medical profession that help people lead healthier lives.

"I have recognized the power of artificial intelligence throughout my career, and I see the impact that AI can make on people's health," says Yu, who founded the Center of Biomedical and Health Research in Data Sciences (CHORDS) shortly after joining UMass Lowell in 2018. "My goal is to make the health care system better and help make a change in people's lives."

THE AVERAGE PERSON IS LIKELY TO GENERATE MORE THAN

1 MILLION GIGABYTES

OF HEALTH-RELATED DATA IN THEIR LIFETIME, ENOUGH TO FILL 300 MILLION BOOKS.

Yu is among a growing number of researchers from the Kennedy College of Sciences who are driving innovations in digital health care, a rapidly expanding field that spans everything from mobile health, telehealth and health data to robotics, wearable devices and personalized medicine. Faculty members are, among other things, creating new diagnostic tools, harnessing Big Data to improve patient outcomes and advancing the next generation of personalized AI systems.

And they're doing so at a time of explosive growth in digital health care. Consider these statistics:

- Approximately 30% of the world's data volume is being generated by the health care industry, according to a recent report by one of the world's largest banks, RBC Capital Markets, with an exponential amount of new data being created daily that's mined for valuable insights.
- The average person is likely to generate more than 1 million gigabytes of health-related data in their lifetime, enough to fill 300 million books, according to IBM Research.
- The U.S. Food and Drug Administration has added 178 artificial intelligence- and machine learning-enabled medical devices to its approved list in the past year, bringing the total number of approved devices to 521.
- In the U.S., revenue in the digital health market is projected to top $32 billion this year and grow to more than $42 billion by 2027, according to one industry estimate. Another market researcher expects the global digital health market to reach $1.5 trillion by 2030.

IN THE U.S., REVENUE IN THE DIGITAL HEALTH MARKET IS PROJECTED TO TOP

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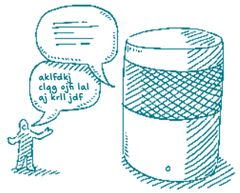
THIS YEAR AND GROW TO MORE THAN $42 BILLION BY 2027.

Digital health care has been gaining momentum for years, and innovations such as electronic medical records and wearable gadgets like Fitbits that track vital signs are now commonplace. The COVID-19 pandemic only accelerated this growth by demonstrating technology's potential to improve access, reduce inefficiencies and speed innovation. In the early days of the pandemic, for instance, contact tracing apps were developed to monitor outbreaks at the local level. Doctor's appointments, meanwhile, moved from the exam room to the video screen—a shift that appears to have some staying power. According to Deloitte's "2022 Connectivity and Mobile Trends Survey," 49% of consumers said they had attended at least one virtual medical appointment in the past year, including 59% of millennials.

"The field of digital health is still really evolving, with new problems, new techniques and new opportunities," says Computer Science Prof. Benyuan Liu, co-director of the UMass Center for Digital Health. "We are working in a very exciting area with people from different fields, developing technical solutions for real-world problems. And we are educating the next generation of technical people."

Here's a closer look at some of the work being done by Kennedy College of Sciences researchers to advance digital health care.

Computer Science Prof. Hong Yu is founding director of the Center of Biomedical and Health Research in Data Sciences (CHORDS).



CONNECTING CARE FOR OLDER ADULTS

For older adults living on their own, voice-activated smart home devices like Amazon Alexa and Google Home can be useful tools for turning on lights and setting reminders to take medication. But what if these devices could also alert someone if they left something cooking on their stove? Or detect a gradual change in the user's speech pattern that indicates a medical concern?

Several faculty members are working on advances like these as part of AI-CARING, or the AI Institute for Collaborative Assistance and Responsive Interaction for Networked Groups. Funded in 2021 by a five-year, $20 million National Science Foundation grant (with industry sponsorship from Amazon and Google), AI-CARING brings together more than 40 faculty members from UMass Lowell, Georgia Tech, Carnegie Mellon University, Oregon State University and Oregon Health & Science University. They are developing the next generation of personalized, collaborative AI systems, including sensors and smart home technologies, that improve the quality of life and independence of "aging in place" adults, particularly those diagnosed with mild cognitive impairment (MCI).

According to the U.S. Census Bureau, 17% of the U.S. population, or 56.1 million people, was 65 years or older in 2020. By 2060, that number is projected to climb to 94.7 million people, or 23% of the country. Approximately 20% of people over 65, meanwhile, have been diagnosed with age-related cognitive decline associated with MCI. The burden for their care often falls on family members, since MCI patients are not eligible for subsidized care facilities.

"We're an aging population, and there will not be as many people to provide care for every older person," says Distinguished University Prof. of Computer Science Holly Yanco, co-principal investigator on AI-CARING and chair of the Miner School of Computer and Information Sciences. "Finding ways to offload some of the burden for care that doesn't really require a personal touch, like scheduling an appointment, is something that AI can do."

UMass Center for Digital Health Co-Directors Yu Cao, left, and Benyuan Liu developed a tool to help diagnose tuberculosis.

UMass Lowell, which received a $2.4 million share of the funding, is contributing to the work in several ways.

Computer Science Asst. Prof. Reza Ahmadzadeh, an expert in technologies that allow AI systems to "learn" and interact with people, is researching how to improve the performance and cooperation of an aging adult's support team, which includes both humans (doctors, family members and neighbors) and technology (voice assistants, sensors and robots).

Plotting each team member, or "agent," on a graph, Ahmadzadeh rates their connections to one another based on how much information is shared between them (0 for nothing to 1 for everything). Using this data, he is developing algorithms to answer two questions: How will the team perform given its structure, and "more importantly," he says, what structure is required to achieve a desired performance?

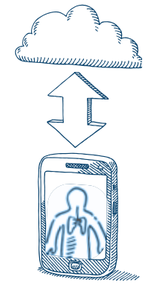
"It's interesting to me to build a team that not only helps you with one task immediately today, but that also adapts to your changes to help you later," says Ahmadzadeh, who is working with two computer science students, Ph.D. candidate Saniya Vahedian Movahed and undergraduate Monish Reddy Kotturu. "The main goal, to me, is for people to be able to sustain independence and improve their quality of life. Anything we can do in that direction, I will be happy."

Yanco, director of the New England Robotics Validation and Experimentation (NERVE) Center at UML, is working with Adam Norton, the NERVE Center's associate director, on metrics and benchmarking for the interactive AI systems being developed. She is also working with Computer Science Prof. Fred Martin, associate dean for teaching, learning and undergraduate studies, on creating educational programs in AI and robotics for K-12 students to ensure that there's a skilled and diverse future workforce in the field.

Outside of the Kennedy College, meanwhile, Electrical and Computer Engineering Asst. Prof. Paul Robinette is identifying ethics and trust issues related to the use of voice assistants.

"We don't want AI to take the place of somebody having hands-on care from a doctor or nurse. That personal interaction is important," Yanco says. "AI can assist us with health care, but it doesn't replace it. It's a tool, like an X-ray machine or any other diagnostic machine."

BUILDING DIAGNOSTIC PLATFORMS FOR COMMUNITY HEALTH



Benyuan Liu was in a remote region of Peru in 2013 when he realized just what kind of an impact he could have on people's health. The computer science professor was laying the groundwork for a digital health tool that aims to accelerate and improve the diagnosis of tuberculosis (TB), a curable bacterial infection that kills 1.6 million people globally each year, according to the World Health Organization.

"It was an eye-opening experience for me to see how technology can be used to improve the quality of health care," says Liu, whose parents were both medical doctors. "It opened the door for me to develop technical solutions to address important health problems in our society."

It also helped spawn UML's Center for Digital Health, which Liu co-directs with Computer Science Assoc. Prof. Yu Cao. Started in 2016 with a $125,000 grant from the UMass President's Science & Technology Initiatives Fund, the center brings together computer scientists, biostatisticians, epidemiologists, clinical practitioners, biomedical researchers and information security specialists from UML, UMass Chan Medical School and UMass Boston. Their goal is to use digital technology such as cloud computing, Big Data analytics, sensor monitoring and mobile devices to improve the quality, efficiency and effectivness of public health care.

Their recently completed TB diagnostic tool, called "eRx," was developed with input from U.S. and Peruvian physicians, clinicians and other public health professionals. The web-based system enables nurses and health care workers at remote TB clinics to send a patient's digitized chest X-rays to a cloud-computing server via a smartphone app. A pulmonary specialist can log in to view the images remotely on a computer or tablet and make an immediate diagnosis.

The team also created a database of over 10,000 X-ray images—"one of the largest and best-annotated" of its kind, Cao says—which it used to develop a machine-learning algorithm that can automatically analyze new X-rays and assist physicians in identifying possible signs of TB.

"It can be a game-changer for TB diagnosis," Cao says of the project, which was funded by a four-year, $1.3 million grant from the National Institutes of Health and the National Science Foundation through the interagency program Smart and Connected Health.

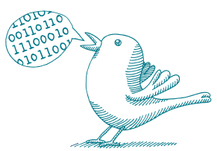
The hope, Liu and Cao say, is that the eRx system can be adapted to better diagnose other infectious diseases such as COVID-19.

The technology is already being applied to another community-based project closer to home. Last fall, a multidisciplinary UML team, led by Civil and Environmental Engineering Prof. Pradeep Kurup, received a four-year, $2.5 million NSF research grant to test and monitor the quality and safety of drinking water for thousands of Merrimack Valley residents.

"The idea is to develop a social technology platform for 'citizen scientists' in the community to monitor the drinking water safety," explains Liu, who is working on the project with Cao and Computer Science Asst. Prof. Mohammad Arif Ul Alam. "Using a smartphone app, they can upload the results to the cloud. We will develop a machine-learning algorithm to help identify where the source of contaminants is coming from in the water pipe systems."

For Cao, projects such as these are an exciting opportunity to apply his theoretical research.

"When you're contributing to lifesaving tools and infrastructures for health care, you feel you're making a real impact," he says. "It's not just your paper contribution, but also really impacting human life."



TURNING TWEETS INTO PUBLIC HEALTH TOOLS

Following his controversial $44 billion acquisition of Twitter, Elon Musk tweeted that he bought the social media platform to "help humanity."

Researchers from the Kennedy College are a step ahead of him. Second-year computer science Ph.D. student Vijeta Deshpande has been working with Prof. Hong Yu on a project that uses natural language processing and machine learning to analyze Twitter data and create an algorithm that can predict adverse health outcomes at the community level. Their tool could eventually be used by public health officials to direct resources and plan interventions in advance of a crisis.

Computer Science Ph.D. student Vijeta Deshpande has analyzed 30 million tweets.

"I love this project," says Yu, who hopes that it receives NIH funding to match the support it has already garnered from Chancellor Julie Chen and U.S. Rep. Lori Trahan.

The work stems from a project that Yu and her students took on during the early days of the COVID-19 pandemic, when they noticed more people experiencing mental health issues and food insecurity.

"We wanted to use AI to help," says Yu, whose team began by mapping the geolocations of the nearly 40,000 food pantries across the U.S. Using data from the 2010 U.S. Census, they then analyzed the socioeconomic status of more than 200,000 "block groups" across the country, a subdivision of census data that zooms into population clusters as small as 600 people and provides a more "homogenous" view than city or county data provides.

"In New York City, for instance, two different blocks can have a huge income disparity," Yu says.

Their soon-to-be-published findings show that in some rural and urban communities, "it's the rich neighborhoods that have access to food pantries, while the poor neighborhoods have much less access," Yu says. "There is a great deal of disparity."

Knowing that census figures can be quickly outdated, however, Yu's team then turned to Twitter (and its millions of active U.S. users) for better real-time data on mental health and food insecurity.

"There is a lot of diversity in the population that uses Twitter, so we have a good representation. And the data accessibility is great," says Deshpande, who notes that Twitter allows academic bodies to download 10 million tweets per month for research purposes.

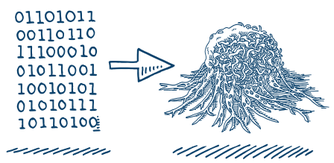
So far, Deshpande has analyzed 30 million tweets from 1,000 block groups across the country. He began by targeting tweets with the keywords "mental health" and "food insecurity," then showed a positive correlation to the existing survey data on those topics in the corresponding block groups. He took the model a step further by augmenting it for tweets that mention social determinant factors of health, such as housing insecurity, which only improved the results.

"We were quite excited to see that we are able to get better results with the social determinant data," says Deshpande, who went on to examine the full text content of the tweets using neural networks and natural language processing, an approach that Yu says reproduces survey data at nearly 80% accuracy.

"If we can train the neural network for future years, we can detach ourselves from conducting surveys and make quick predictions about health outcomes," Deshpande says.

As co-director of CHORDS, Yu has worked on AI projects that help detect physician errors and identify people at risk of suicide. While she could never be a medical doctor, she is proud of the impact she is making on people's lives.

"This field is full of golden opportunities," she says. "We can save lots of lives because of AI. It is possible we could have a way to cure cancer and other diseases. All these major advances in medicine, to a large extent, are because of AI."



HARNESSING BIG DATA TO FIGHT CANCER

In her Computational Cancer Biology Lab, Asst. Prof. of Biology Rachel Melamed connects health data to molecular data to try to understand what causes not only cancer, but also other diseases such as Alzheimer's and diabetes.

"All we do is look at data," says Melamed, who mines datasets from health records, biobanks, cancer genomics projects and experimental drug studies to investigate how a disease's development might be influenced by other health conditions and drug combinations.

"Once you have all that information on people, you can try to figure out all these complex causes of disease, like how genetics might interact with something that happens during your life to impact your risk of having cancer," she says. "Now, we don't have to look at one factor at a time; we can try to look at the combinations of factors."

In a recent study of drug combinations, for instance, Melamed and her team found that a combination of fish oil and fenofibrate, a medication used to treat abnormal blood lipid levels, could affect a person's odds of getting cancer.

"They're not the most common drugs, and they would have never been tested together before," she says. "So, the only way to discover something like that is by looking at huge datasets and seeing the association between people who take these drugs and whether or not they get cancer down the line."

Melamed's path to becoming a computational biologist—someone who uses data analysis, mathematical modeling and computational simulations to understand biological systems and relationships—started with a bachelor's degree in computer science from Brown University. A brief stint as a software engineer proved unfulfilling, however, so she joined an immunology lab as a data analyst.

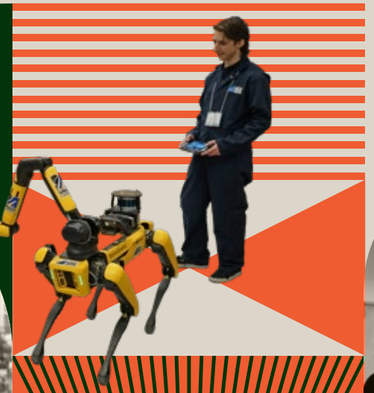
"A lot of people who get a computer science degree go on to do software engineering and work at companies like Facebook or Google, and I was just never really interested in that," says Melamed, who wanted to make a more "positive societal impact with my work" through public health.

She began to notice "more and more biology data being generated" and realized there was a demand for people who had the computational background to work with that data. So, she got a Ph.D. in biomedical informatics from Columbia University, where she worked on data from the Cancer Genome Atlas, a landmark program that analyzed thousands of samples from 33 types of cancer.

"It used to be that one person, maybe an M.D. at a big medical center, would gather data from their patients, and only they could use it. But now there's a big effort to make as much data as possible and let everyone use it, which creates so much more possibility," she says.

After a postdoc in biomedical data science at the University of Chicago, Melamed joined the Kennedy College in 2020. She teaches courses in cancer genomics and data science.

"When a lot of people think of biology, they're like, 'OK, what can I do with that? I could be a biology teacher or a doctor.' And they don't know about all this other stuff," she says. "But there are so many companies in the Boston area doing this work and looking for computational biologists. It's a good field for an undergraduate to pursue."



COMPUTER SCIENCE LEVELS UP

Clockwise from top left: Richard Miner '86, '89, '97 poses for a selfie with senior Jaelyn Dones; NERVE Center technician Peter Gavriel controls the robot Spot; Prof. Holly Yanco with Miner; sophomore Ariana Brown serves as a SoarCS peer leader; UML gathers for the dedication of the Richard M. Miner School of Computer & Information Sciences; first-year computer science students Samson Adeoya and Jon Louis.

BY BROOKE COUPAL

DO YOU HAVE A QUESTION THAT NEEDS AN IMMEDIATE ANSWER?
TURN TO GOOGLE.

ARE YOU LOOKING TO CLEAN YOUR FLOORS WITH MINIMAL EFFORT?
INVEST IN A ROBOTIC VACUUM.

ARE YOU CONCERNED CYBERCRIMINALS MAY HACK INTO YOUR COMPUTER?
DOWNLOAD ANTIVIRUS SOFTWARE.

In a world that runs on technology, the need for highly skilled computer science professionals remains strong, despite the recent tech sector layoffs. The U.S. Bureau of Labor Statistics projects there will be nearly 683,000 new computer and information technology jobs between 2021 and 2031.

"There's a huge demand for talent in STEM, and we all see the impact of computer science on our lives," Chancellor Julie Chen says. "It's important to us that our students are part of this revolution."

From the fall of 2016 to the fall of 2021, UMass Lowell's undergraduate enrollment in computer science increased by more than 50%. Currently, about 1,600 undergraduates and 300 graduate students major in computer science, making it the largest academic program at UML.

With computer science becoming more in demand both on and off campus, Kennedy College of Sciences (KCS) Dean Noureddine Melikechi recognized an opportunity.

"The computer science program has been growing tremendously, and we want to keep growing it," he says.

Thanks to a $5 million donation from triple River Hawk and Android co-founder Rich Miner '86, '89, '97 as well as a $2 million matching grant from the state, the Department of Computer Science was elevated to become the Richard A. Miner School of Computer and Information Sciences in the fall of 2022.

"I have a lot that I owe to this university, especially the computer science department," Miner said during a dedication ceremony for the new school. "I'm very happy and thrilled that my family and I could step up in this way."

The Miner School, housed within KCS, is spearheaded by Holly Yanco, a computer science professor at UML for the past 22 years and director of the university's New England Robotics Validation and Experimentation (NERVE) Center.

"She's a natural leader who can take this school to the next level," Melikechi says.

"BECOMING A SCHOOL GIVES US THE OPPORTUNITY TO START STAGING MORE GROWTH."

–HOLLY YANCO

First-year student Samuel DaSilva works on a computer science project.

A VISION FOR THE MINER SCHOOL

As the head of the Miner School, Yanco has big plans for the future of computer science at UMass Lowell.

"Becoming a school gives us the opportunity to start staging more growth," she says.

The Miner School offers bachelor's, master's, doctoral and graduate certificate programs that blend applied and theoretical studies. Concentrations in cybersecurity, data science and bio-cheminformatics are available, along with a minor in robotics. Yanco intends to build those into their own departments within the school, giving students the option to strengthen their expertise in those areas.

She also wants to make computer science more accessible to students majoring in other disciplines.

"No matter what major you are, having some knowledge of computer science is beneficial," she says.

Yanco plans to explore partnering with other UML departments to look at different ways of offering computer science to non-science students. The interdisciplinary work could result in computer science minors for specific majors such as business administration and studio art.

DIVERSIFYING THE CANDIDATE POOL

Computer science jobs are widely diverse, from artificial intelligence and machine learning to information security and website development. However, diversity among computer science professionals remains slim.

Women make up less than 30% of those in computer and mathematical occupations, according to the Bureau of Labor Statistics. Roughly 9% of computer and mathematical professionals are Black or African American, and about 8.5% are Hispanic or Latino.

Yanco is passionate about increasing diversity in the field.

As a female undergraduate studying computer science at Wellesley College in the late 1980s, she became empowered by the school's then-president, Nannerl Overholser Keohane.

"The president at the time would say it's not equal opportunity, but every opportunity," says Yanco, who went on to get her master's and doctoral degrees in computer science at the Massachusetts Institute of Technology. "It got me in the mindset that my question is just as good as everybody else's question."

Yanco hopes to instill that mindset in every student in the Miner School, making it a welcoming environment for all.

She plans on developing cohorts within the school upon which diverse student populations can rely for support.

"If you are the only woman in a class and you are having problems, it can make you start to think, 'Do I belong here? There's nobody else that looks like me,'" Yanco says. "That's why we need to ensure that we have strong cohorts, so that there are people like you."

Along with gender and racial diversity, incoming students are also diverse in their background knowledge of computer science. Yanco encourages all interested students to apply to the Miner School, even if they've never programmed before.

"Some people have this preconceived notion that you're either good enough when you start a computer science program or you're not, but people can learn," she says. "Through the courses that the Miner School offers, students learn how to break down problems, write code, debug programming and much more."

Tutors and advisors are on hand to provide additional academic support to students. Incoming first-year students can also participate in the summer program, SoarCS, in which they learn coding skills and meet faculty and other students in preparation for their first semester of classes.

AN ABUNDANCE OF RESEARCH OPPORTUNITIES

Computer science faculty are engaged in research in more than a dozen labs and facilities housed within the Miner School.

Prof. Xinwen Fu runs UML's cybersecurity research facility, the Cyber Range. The facility doubled its workstations from 20 to 40 in the summer of 2022, thanks to a $150,000 grant from the National Security Agency, providing more space for research teams to conduct studies.

Fred Martin, professor and associate dean for teaching, learning and undergraduate studies, is the lab director of the Engaging Computing Group, which develops novel technologies for K-12 computer science education.

Yanco, an expert in robotics, launched the Human-Robot Interaction (HRI) Lab when she joined UMass Lowell in 2001. Under grants from organizations including the National Science Foundation (NSF) and National Institute of Standards and Technology (NIST), Yanco has led the development and testing of different robot systems used for assistive and urban search and rescue tasks.

"Part of being a human-robot interaction researcher is thinking about how you evaluate the systems that you design," she says. "If you're designing something to work with a person, you have to actually test it with a person, so we did a lot of our initial testing in the hallways of Olsen Hall."

As the HRI Lab grew, eventually moving to a bigger space in Dandeneau Hall, Yanco started to think of ways she could provide robot evaluation services to others looking to test their own robot system designs. With the support of UML, the NERVE Center was born.

The core research facility, which celebrated its 10-year anniversary in February, develops test methods and metrics for measuring robot capabilities, human performance and human-robot interaction.

The U.S. Army and Navy and NIST are just some of the institutions that have turned to the NERVE Center at 110 Canal St. in downtown Lowell for testing of robot systems. A mobile NERVE Center is also available for off-site testing.

The center is home to several robots, including Spot, a doglike robot developed by Boston Dynamics; Fetch, a robot featuring a gripper developed by Fetch Robotics; and Digit, a humanoid robot developed by Agility Robotics. An interdisciplinary group of faculty members from computer science, mechanical engineering, physical therapy and biomedical engineering uses the robots in its research.

Labs and facilities throughout the Miner School invite students to assist with research projects, giving them hands-on experience that they can eventually take to the workforce.

"Each summer, between the HRI Lab and NERVE, we probably hire at least 20 undergraduates," Yanco says. "Many of them stay on for the school year."

She plans to increase those opportunities for students as the school hires more faculty.

"Every time we hire, it gives us the chance to either strengthen one of our core research areas or add a new one," she says. "This gives students the opportunity to work on a variety of groundbreaking research projects."

YANCO'S ROBOTIC ADVANCEMENTS

Yanco is continuing to pave the way for the future of robotics.

She received a $300,000, one-year NSF grant in September 2022 to establish an open-source ecosystem that would make it easier for experts to add manipulation functions, like grasping, to robots.

"Thirty years ago, if you wanted to do robotics, you had to build everything from scratch. Now, there are open-source software packages that allow you to start from a higher level," says Yanco, the grant's principal investigator. "The proposal looks at how we can pull together the robotics manipulation community to provide their resources to allow research to move more quickly."

Yanco is collaborating with Worcester Polytechnic Institute and Yale University on the project.

She is also the principal investigator of two more NSF-funded projects that look at the use of robotic exoskeletons to provide people with movement assistance when they become fatigued. Researchers are using exoskeletons created by Dephy, a Maynard, Massachusetts-based company, and Myomo, a Cambridge, Massachusetts-based company, to conduct their studies.

"We live in such a fantastic area to be doing robotics," Yanco says. "There are all these companies that we can work with."

Among other research ventures, Yanco is the co-principal investigator in the AI Institute for Collaborative Assistance and Responsive Intervention for Networked Groups (AI-CARING), which launched in October 2021 thanks to a $20 million NSF grant (see page 9). Yanco and more than 40 other researchers are developing artificial intelligence systems that work with caretakers and people with minor cognitive impairments to manage medication schedules, prepare meals and perform other daily tasks.

"This huge project across several institutions looks at how you can improve people's lives with artificial intelligence," she says.

SEARCHING FOR HABITABLE WORLDS BEYOND OUR SOLAR SYSTEM

BY EDWIN L. AGUIRRE

UML exoplanet hunter Asst. Research Prof. Christopher Mendillo with an artist's rendering of the star system Epsilon Eridani

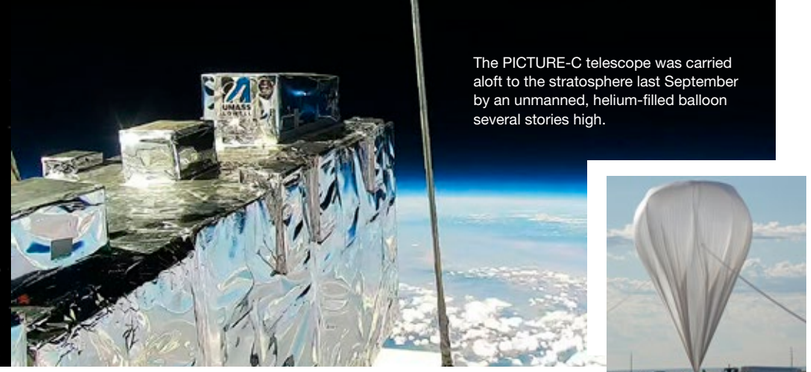
NASA-JPL-CALTECH-T. PYLE (SSC)

ON VALENTINE'S DAY 1990, as NASA's Voyager 1 spacecraft was leaving our solar system, mission controllers commanded the unmanned probe to turn its camera toward Earth and take one last shot before embarking on its long interstellar journey.

Voyager captured a portrait of Earth from four billion miles away, appearing like a tiny, dim point of light floating amid the vast emptiness of space. That view inspired the late astronomer Carl Sagan to publish his 1994 book, entitled "Pale Blue Dot," which detailed his vision of humanity's future in space.

Since then, astronomers worldwide have used advanced ground-based telescopes and orbiting observatories like Kepler, TESS, Hubble and the James Webb Space Telescope to examine the sky for other potential "pale blue dots"—Earth-like planets, orbiting nearby sun-like stars, that are capable of harboring life. To date, more than 5,000 confirmed exoplanets have been found in nearly 4,000 stellar systems scattered across our cosmic neighborhood. Of these, more than 50 are considered to be Earth-like.

Among the scientists involved in this field of exoplanet research is Asst. Research Prof. Christopher Mendillo of the university's Lowell Center for Space Science and Technology (LoCSST). Last fall, Mendillo, along with Physics Prof. and LoCSST Director Supriya Chakrabarti and the project's research team, successfully launched a planet-seeking telescope to the edge of the atmosphere from a NASA facility in Fort Sumner, New Mexico.



The PICTURE-C telescope was carried aloft to the stratosphere last September by an unmanned, helium-filled balloon several stories high.

Called PICTURE-C, which stands for Planetary Imaging Concept Testbed Using a Recoverable Experiment—Coronagraph, the 14-foot-long, 1,500-pound telescope was carried to the stratosphere by an unmanned, helium-filled balloon 400 feet wide and several stories high that was released from the Columbia Scientific Balloon Facility in Texas on Sept. 28.

Mendillo says balloons are well-suited to search for planets outside our solar system.

"We've used sounding rockets before, but balloons are an amazing platform to use for exoplanet research because of their relatively low cost, ability to lift heavy payloads and long observing duration," he says.

PICTURE-C was designed, built and tested by a team of student and faculty researchers and engineers at the LoCSST lab facility with support from a $5.6 million grant from NASA. The project's goal is to detect debris disks, interplanetary dust and, possibly, exoplanets around nearby stars.

NASA recently awarded Mendillo a five-year, $7 million grant to develop the next generation of UML's high-flying telescope, which will be dubbed PICTURE-D (Planetary Imaging Coronagraph Testbed Using a Recoverable Experiment for Debris Disks).

NASA has also named Mendillo a Nancy Grace Roman Technology Fellow, an award that gives early career researchers the opportunity to develop innovative technologies while honing the skills needed to lead wastrophysics flight instrumentation development projects. He will receive $500,000 in funding as part of the fellowship program.

"The grant will help bring our research group to a new level," Mendillo says, adding that it gives LoCSST the opportunity to add facilities or equipment to its lab and possibly to hire personnel.

TO THE THRESHOLD OF SPACE

The data gleaned from the PICTURE-C mission will not only help find new planets, but it will also shed light on the evolution of our solar system, says Chakrabarti, who is PICTURE-C's principal investigator.

"Our balloon missions will enable us to gain a better understanding of the processes and dynamics that formed our own solar system," he says.

PICTURE-C spent 14 hours observing nearby stars at an altitude of 127,000 feet—roughly 3½ times higher than the typical cruising altitude of a passenger jetliner—to get above 99% of the Earth's atmosphere.

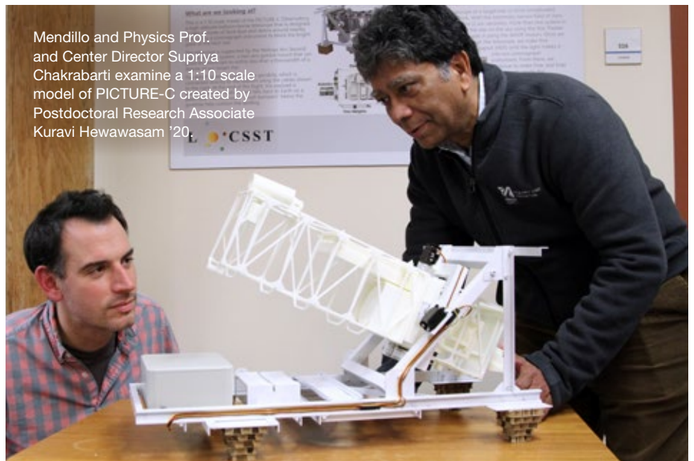
"Atmospheric turbulence distorts and blurs our image of the stars," notes Chakrabarti.

After successfully completing its observations, ground controllers sent a command to release PICTURE-C from the balloon. They then deployed a parachute to slow down the telescope and allow it to land gently on the desert floor for reuse in a future mission.

The primary stellar targets selected for this mission were Vega (Alpha Lyrae), which is one of the brightest stars in the sky, and Epsilon Eridani.

"Dust had been detected around Vega, so it's thought to have a very big and bright debris disk close to the star. It's never been imaged directly in visible light, never been resolved," says Mendillo. "Epsilon Eridani, which is also fairly bright, is believed to have a Jupiter-sized exoplanet orbiting the star, but no one has seen the planet yet."

In the coming months, UML scientists will analyze the data that PICTURE-C captured and publish the results.



Mendillo and Physics Prof. and Center Director Supriya Chakrabarti examine a 1:10 scale model of PICTURE-C created by Postdoctoral Research Associate Kuravi Hewawasam '20.

'LIKE LOOKING FOR A MARBLE NEXT TO A LIGHTHOUSE BEACON'

Last year's mission was the second and final flight for PICTURE-C. The first, in 2019, was an engineering demonstration flight.

"That was also a big success, including the recovery," notes Chakrabarti.

The latest mission further validated many key technologies developed at LoCSST that are essential for the first direct imaging of exoplanets from a balloon.

PICTURE-C featured a specialized optical imaging system, called a "vector vortex coronagraph," which was coupled to a telescope with a primary mirror 24 inches in diameter. The coronagraph was designed to "mask," or greatly suppress, 99.99% of the direct light coming from the host star so that small, faint objects very close to the star—such as planets or interplanetary dust that otherwise would be hidden in the star's bright glare—could be studied in great detail.

"This is important, since we're trying to see planets that are more than a billion times dimmer than their host star," Chakrabarti explains. "It's like looking for a marble next to a lighthouse beacon."

To obtain the highest image quality possible, the coronagraph used an onboard active optical pointing control system and adaptive optics designed and built by Mendillo and Postdoctoral Research Associate Kuravi Hewawasam '20. It used a deformable mirror that could change its shape at high speed and in real time, according to the wavefront of the starlight that was coming in.

"This control system could optically stabilize the light beam coming from the telescope and keep the coronagraph centered on the target star to an accuracy of one milliarcsecond, or better, throughout the camera's exposure," says Mendillo.
"A milliarcsecond is equivalent to resolving an object approximately 2 meters wide on the surface of the moon, which is about 385,000 kilometers away."

Mendillo notes that the pointing stability they achieved had never been accomplished before from any platform, especially hanging from a balloon. "It performed better than the Hubble Space Telescope and the James Webb Space Telescope," he says.

At this level of sensitivity and precision, maintaining the telescope's ultrasharp focus and pointing are critical to the mission, since the telescope's performance determines how many exoplanets the researchers are able to detect.

According to Mendillo, PICTURE-C was able to use its deformable mirror to create the first-ever high-contrast coronagraph image produced by an observatory not attached to the surface of the Earth.

"This was a huge step toward our ultimate goal of directly imaging and characterizing Earth-like exoplanets from a balloon," he says.

PICTURE-D: THE NEXT GENERATION

For the PICTURE-D project, the researchers will use the same balloon platform and same telescope, but are making several major upgrades to the coronagraph to improve its performance, according to Mendillo.

Currently, Mendillo says, they can only search one side of a star at a time. Adding a second deformable mirror will allow them to look around the entire star at the same time at extremely high contrast.

"We're also collaborating with our partners at Leiden Observatory in the Netherlands and NASA's Ames Research Center in integrating a new type of coronagraph that will allow us to make polarization measurements of debris disks, as well as look for planets around binary star systems," he says.

If everything goes well, the team hopes the next mission will be the actual science flight, with the telescope fulfilling the project's science objectives.

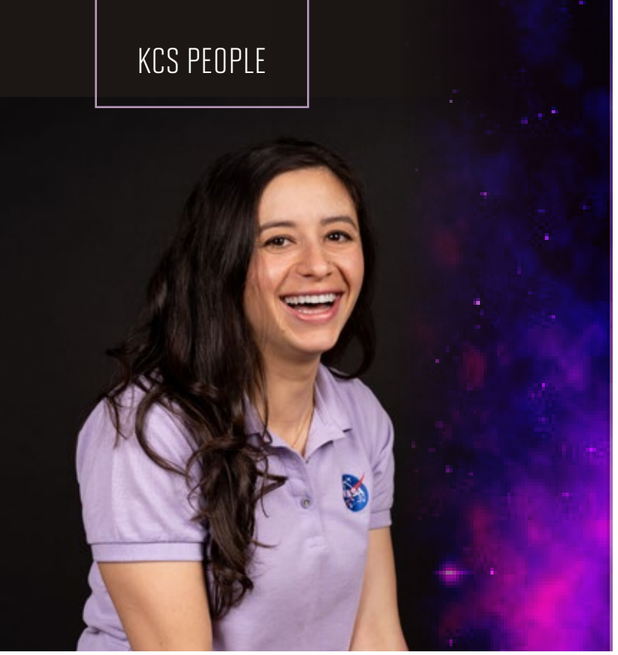
Chakrabarti says the team's approach to research is unique.

"We're a small group. Everybody does everything," he says. "This is the only group in the entire world who has been flying instruments in near-space to validate all these technologies. That's our contribution to the field."

In addition to Mendillo, Chakrabartiand Hewawasam, the team members include senior mechanical engineer Jason Martel, Ph.D. students Sunip Mukherjee and Thaddeus Potter, and Physics Assoc. Prof. Timothy Cook, who is the project's co-investigator, along with other collaborators, including scientists from NASA's Jet Propulsion Laboratory and Goddard Space Flight Center.

"PICTURE-D will be the fourth iteration of the PICTURE family of missions, which began developing spaceflight exoplanet imaging technologies back in 2005," says Mendillo.

"These missions are steppingstones along the path to an experiment that will one day take the first picture of a new pale blue dot—an Earth-like exoplanet circling a distant star."



SERGIO ALONSO '12

EVANA GIZZI '13, '14

Required Computing Course launched Math Alum on Path to NASA

BY BROOKE COUPAL

Evana Gizzi '13, '14 sees a distinct parallel between UMass Lowell and NASA.

"They're both supportive environments to thrive in," says the double River Hawk, who earned bachelor's and master's degrees in applied and computational mathematics before getting a Ph.D. in artificial intelligence at Tufts University.

Gizzi credits UMass Lowell with providing her with opportunities that led her to a career at NASA's Goddard Space Flight Center, where she serves as principal investigator of Research in Artificial Intelligence for Spacecraft Resilience (RAISR).

RAISR, a project that Gizzi created in 2020 while a NASA Pathways intern, focuses on using artificial intelligence to speed up the detection and repair of problems in spacecraft.

She also contributes to other NASA projects, including an ongoing constellation mission that aims to capture scientific events in space from several angles, using multiple satellites.

"Not only am I extremely proud of where I am today, but I can also honestly say that I love my job," Gizzi says. "I have a deep sense of purpose in what I do."

Less than 36% of the NASA workforce is female, according to the U.S. Equal Employment Opportunity Commission, but Gizzi says her co-workers have made her feel welcome.

"I have been inspired by seeing my colleagues rally to give me that extra support and go above and beyond to make me feel included and at home," she says.

As for the future of women in STEM, she hopes to see the gender gap narrow.

"I have high hopes that more women get involved," she says. "I have observed that women have an especially unique leadership capability. I have had some of the greatest successes on projects that were led by women."

NASA's Goddard Space Flight Center is based in Greenbelt, Maryland, but Gizzi received approval to work remotely from Lowell so she can build partnerships between NASA, UMass Lowell and other Boston-area universities and companies.

Last fall, Gizzi was invited to address incoming students at the university's 2022 Convocation ceremony to talk about her path from student to NASA researcher. Two months later, she staffed a NASA booth at the university's Fall Career Fair. Having interned at the space agency while a doctoral student at Tufts, she knows the importance of getting students involved in research.

"Students can bring this cutting-edge perspective to help solve problems, especially in artificial intelligence," she says.

Gizzi did not always aspire to work in the field of artificial intelligence, but a required computing course she took during her junior year at UMass Lowell changed her trajectory. Her professor, triple River Hawk Mark Sherman, who at the time was pursuing a Ph.D. in computer science, told Gizzi that she had a "knack for coding."

"That really empowered me," she says.

Sherman helped get Gizzi into the lab of Computer Science Prof. Fred Martin, where she worked on web development.

"Fred was the one who took the initial leap of faith in me by letting me work in his lab," she says.

Gizzi landed an internship in web application development with MITRE in Bedford, Massachusetts, the summer after graduating with her bachelor's degree. She received her master's degree a year later and returned to MITRE as a full-time web application developer, a position she held for about two years.

Gizzi still keeps in touch with people at UML. She got married in 2021 to Navy veteran Mitchell Conway '21, who also earned a bachelor's degree in mathematics at UML. Martin attended their wedding, and Gizzi's bridal party consisted of mostly UMass Lowell alumni.

Being surrounded by people who wanted her to succeed is what made UMass Lowell so special, says Gizzi.

"Throughout my entire time at UMass Lowell, I had become so conditioned to exist among those who believed in me that I would go on in my career to seek out people where there was mutual encouragement of one another," she says.

GRACE HANSEN '23

SPORTS AND SCIENCE COME TOGETHER FOR BIOLOGY MAJOR

BY KATHARINE WEBSTER

Honors College student Grace Hansen is a biology major and captain of the UML Division I women's lacrosse team.

She's also a budding researcher who is fascinated by chronic traumatic encephalopathy, or CTE, a degenerative brain condition sometimes found in athletes who have suffered repeated head injuries. Hansen is now applying to graduate schools to study neuroscience.

"I've always wanted to find a way to combine sports and science, and I think this might be the perfect way to do it," she says.

Hansen received a $4,000 Immersive Scholarship from the university that she used for a summer study abroad program on ecology and marine biology in the Galapagos Islands.

"It was easily the greatest experience of my life," she says.

Hansen got her first research internship during summer 2022 at Burke Neurological Institute in White Plains, New York. She reviewed studies involving an enzyme that affects neurodegeneration and regeneration—and was the first author on the resulting research paper. She began thinking about how that research might apply to CTE.

"That introduced me to the whole field of sports neurology," Hansen says.

For her honors thesis, Hansen is comparing biomarkers in the blood of student-athletes who are vegetarians and omnivores.

"That's a whole other interest of mine," says Hansen, who is a vegetarian. "We want to see if it affects athletic performance."

NOAH MASON '23

CHEMISTRY STUDENT ENVISIONS A FUTURE AS A RESEARCHER

BY BROOKE COUPAL

Honors chemistry major Noah Mason caught the research bug.

The East Bridgewater, Massachusetts, resident enrolled at UMass Lowell unsure of his future, but an opportunity to work in Chemistry Asst. Prof. Michael Ross' lab led him to discover his passion for research.

"I'm fully in on conducting research," he says. "I really love it."

As a sophomore, Mason scanned professors' websites and became intrigued by Ross' research interests in materials chemistry and nanotechnology. He reached out to Ross and soon became the newest member of the Ross Research Group.

Over the next two years, Mason received funding to work in the lab from the Kennedy College of Sciences' Science Scholars program and the Northeastern Section of the American Chemical Society and was awarded an Honors College Fellowship.

"It can be really tough as an undergrad to get funding and support for research, so getting that was a real blessing," he says.

Mason worked on a project that looked at combining gold nanoparticles and post-transition metals such as tin, bismuth, indium and gallium. He and the rest of the Ross Research Group discovered that the metallic mixture absorbs high energies of light, like blue and ultraviolet, which gold nanoparticles cannot do on their own. The discovery gained the attention of the scientific journal Matter, which published a paper co-written by Mason about the group's findings.

"It's been so much fun working in Ross' lab on this discovery, and it's what inspired me to do a Ph.D. program after graduating," Mason says. "The next stage of my life, I owe to this project."

SYLVIA ISLER ’96

MENTORS OPENED DOORS FOR GOOGLE’S SYLVIA ISLER

Now She Mentors Others

BY KATHARINE WEBSTER

Two crucial mentors opened doors for Sylvia Isler ’96 while she was studying computer science at Hampton University, a historically Black university, and at UMass Lowell.

“So many people took a chance on me—and then, of course, I had to deliver,” she says. “If you crack open a door, I will take that opportunity and run with it.”

Now, Isler mentors others while working as director of engineering for Google’s first and most well-known product: its search engine. “It’s hard for me to say ‘No’ to those mentoring opportunities,” she says.

Her first professional mentor was James West, a Hampton University alumnus renowned for co-inventing the electret microphone while interning and then working at Bell Laboratories.

West, whose mother Matilda was among NASA’s “hidden figures”—Black women mathematicians who worked as “human computers” in the early days of the space race—also founded Bell Labs’ Association of Black Laboratory Employees to advocate for equity. He regularly visited Hampton University to encourage students to pursue careers in science and technology. In the mid-1980s, one of those students was Isler.

“I met him early on in my career, and I didn’t realize the importance of who he was,” Isler says. “He was just a cool dude with a ponytail, and I started doing internships at Bell Labs before I even graduated, thanks to him.”

West also encouraged Isler to apply for an AT&T Cooperative Research Fellowship, the company’s pioneering program for students from underrepresented groups. The fellowship offered Isler both financial support and mentoring to pursue a Ph.D. in computer science at the University of Pennsylvania. But as she finished up her master’s degree at Penn, she was having trouble finding a thesis advisor and dissertation topic.

That’s when UML Electrical and Computer Engineering Prof. Charles Thompson, who served as an outside adviser to students in the fellowship program, suggested that Isler transfer to UMass Lowell to complete her doctorate in computer science.

In Thompson’s lab, Isler was part of a multidisciplinary research team that included students in engineering, physics and computer science. Not only did she get academic and career guidance from Thompson and Kavitha Chandra, now associate dean of engineering, but she absorbed two implicit lessons: the value of collaboration and the importance of cultivating a lifelong learning mindset.

“There was a wide variety of expertise and levels in the lab, and everybody had something to contribute,” she says. “I learned, don’t give up on yourself and don’t give up on anyone else too quickly, either.”

After earning her doctorate, Isler got her first job in the basic science research division of MathSoft in Seattle. When the business division found itself short an engineer, she was asked to take over the lead in developing S-Plus, an enhanced commercial version of statistical analysis software created by engineers at Bell Labs.

A PATH TO LEADERSHIP

That experience changed her career path, as she discovered that she enjoyed managing people and developing practical applications: “This was my first time developing something that somebody was actually going to sell and other people were going to use. I said, ‘Hey, I like this!’”

But Isler, who grew up in Silver Spring, Maryland, was far from home and family. So after a few years at MathSoft, she joined a financial technology startup, Kiodex Inc., in New York City, where her sister was also living and working. Isler engineered the company’s software, which was aimed at “democratizing” the energy derivatives market by opening it to smaller businesses.

In 2003, she won UML’s Francis Cabot Young Alumni Award for her accomplishments—and she was just getting started. She went on to work for companies as big as J.P. Morgan Chase and EMC and then for smaller startups.

Before joining Google three years ago, Isler took a job as vice president of engineering at Cityblock Health, a spinoff of Alphabet, Google’s parent company. Cityblock partners with the Centers for Medicare and Medicaid Services and a range of health care agencies to provide integrated and preventive care for people in underserved neighborhoods in New York City, Boston and Charlotte, North Carolina.

Isler and her team built a software platform incorporating recommended treatments for chronic conditions including kidney and heart disease, asthma, high blood pressure, diabetes, mental illness and cognitive decline. Cityblock doctors and social workers used it when meeting with patients to understand their health care needs and help them with next steps, such as finding a store in their neighborhood where they could buy fresh fruits and vegetables.

“Our philosophy at Cityblock was ‘Nothing about the patient without the patient,’” Isler says. “We had doctors who would treat the members with dignity and not assume they were not compliant because they did not have the money” to follow a prescribed treatment plan.

The cause was close to Isler’s heart after both of her parents and her sister died—her father of heart failure due to undiagnosed hypertension, her mother after suffering from dementia and her sister from a combination of mental illness and diabetes.

> “There was a wide variety of expertise and levels in the lab, and everybody had something to contribute. I learned, don’t give up on yourself and don’t give up on anyone else too quickly, either.”
>
> –SYLVIA ISLER

Isler was proud of her work. But when her wife suffered a serious health crisis three years ago, she reached out to a hiring manager at Google who had been trying to recruit her. He agreed she could work remotely from her home in a New York City suburb, with occasional trips to Google’s California headquarters, and created a position for her.

“I needed more stability,” she says. “At Cityblock, engineering, security, QA and IT were all under my purview. At Google, I didn’t have to build any of that; I just had to come in and lead.”

And lead she has. At first, she managed a small group working to rearchitect the system that builds Android OS. In June 2021, Isler switched over to a group working on Google’s search engine. In late 2022, she was promoted to director of engineering for search infrastructure, and she now leads a team of 50 engineers working with people across the company to rearchitect Google Search, which is 25 years old.

Isler also uses her position to offer opportunities to others. In addition to being an angel investor, she is working on a Google initiative to prepare people from disadvantaged backgrounds for jobs in tech. She also volunteers as a mentor with SEO (Sponsors for Educational Opportunity) USA, an education nonprofit that aids students who are underrepresented in their chosen fields.

And in 2022, she joined the advisory board for the Kennedy College of Sciences. It’s a tribute not only to Thompson but to her parents, who were educators who raised her to “keep my eyes on the prize.”

“My parents were very adamant about, ‘Your background can never be a barrier,’” Isler says. “My mom would say, ‘Keep on keeping on. Yes, you’re going to encounter people who don’t want to see you succeed, but you’re going to brush them off.’ That’s the attitude that has been instilled in me.”

Sylvia Isler with a group of young software engineers she mentored.

UNDER THE LENS

BY BROOKE COUPAL

BIOLOGY PROFESSOR LOOKS TO GENE REGULATION FOR INSIGHT INTO EVOLUTION

Genetic mutations are essential for human evolution, but they can also cause harm.

Humans have about 20,000 genes in their genome (the entire set of DNA instructions found in a cell), and most of them have been created through genetic mutations that produce duplicate genes. Gene duplication allows organisms to evolve new biological functions, such as the ability to better digest starchy foods. However, having extra copies of genes can also cause imbalances associated with a wide range of health conditions, including cancer, cardiovascular disease and neurodevelopment disorders.

Biological Sciences Asst. Prof. Frédéric Chain is researching a gene-regulation mechanism that could prevent such imbalances and help new genes evolve new functions.

His work is being funded by a five-year, $1.35 million CAREER award from the National Science Foundation (NSF). The highly competitive grant is awarded to early-career faculty who, according to the NSF, “have the potential to serve as academic role models in research and education, and to lead advances in the mission of their department.”

Why is the regulation of duplicate genes important?

FC: Every so often, cells in our body make mistakes that lead to DNA mutations that can be inherited. Some of these mutations generate duplicate copies of large segments of DNA that include entire genes. While gene duplication is a vital evolutionary process, genes are usually not a good thing to have duplicated in the short term, because they can cause genetic disorders and diseases. For this reason, most new duplicate genes will be eliminated over time by natural selection, preventing them from evolving new functions.

I’m interested in how a cell regulates these extra copies to repress their potentially negative effects, allowing for the retention and evolution of duplicate genes. Understanding how the cell’s regulatory machinery handles newly duplicated genes is important in determining the initial processes by which new biological functions emerge in different organisms. The research can also provide insights into developing therapeutic targets for dealing with conditions associated with gene duplication.

What gene regulation mechanism are you studying?

FC: I’m studying a mechanism in cells called epigenetic modification, where extra proteins and molecules can attach to DNA, affecting DNA shape and the way that genes work. We do not know the evolutionary impact of epigenetic modifications on newly emerged genes. I’m looking at whether this could allow duplicate genes to survive long enough in the genome and develop new functions. We will be using recent technological advances in gene sequencing, including long-read sequencing and epigenomic profiling, to test this hypothesis.

You’re using stickleback fish to study gene regulation. Why these species?

FC: Stickleback fish have been studied for over 100 years, mainly for their behavior and ecology, so we know a lot about different populations. They have become an important model organism to study evolution, thanks to having a diversity of population “ecotypes” that have adapted to distinct environments with a broad assortment of traits. Ten thousand years ago, before the last glaciation, stickleback fish mostly survived in marine environments. As those glaciers receded, they created lakes, streams, ponds and other freshwater environments. These fish were able to rapidly adapt to these environments, and new genes might have enabled this. So, they allow us to look at genetic and epigenetic changes that have arisen in different stickleback populations within the last few decades or centuries, and to evaluate how genes of different ages are regulated.

Are there collaborators with this research project?

FC: I’m getting support from my Department of Biological Sciences colleagues. Asst. Prof. Natalie Steinel has a stickleback fish lab and helps me with the field and lab work involving those organisms. Asst. Prof. Teresa Lee is an expert in epigenetics, so she can help with the interpretation of epigenetic data. Assoc. Prof. Jessica Garb is an expert in genomics, and she can also assist with data processing. I have external collaborators as well, including Assoc. Prof. Anne Dalziel at Saint Mary’s University, Prof. Catherine Peichel at the University of Bern, Asst. Prof. Trevor Krabbenhoft at the University at Buffalo and Dr. Philine Feulner, group leader of Fish Genomics at the Swiss Federal Institute of Aquatic Science and Technology.

The diverse range of expertise that my collaborators bring will ensure the success of this research project and offer research opportunities to students in our labs. I have several students, from Ph.D. candidates to a first-year student, assisting me with the research. My goal is to train the next generation to lead the charge in genomics and bioinformatics research.

Criteria for the NSF CAREER award include community service and a commitment to STEM diversity. How does your project meet these requirements?

FC: Our research team will use data generated from this study to produce bioinformatics tutorials and run workshops for high school educators to develop genomics curricula to strengthen students’ coding and analytical skills. I’m collaborating with Sheila Kirschbaum, director of the Tsongas Industrial History Center (a partnership between UMass Lowell’s School of Education and the Lowell National Historical Park), to recruit high school teachers from the area. In the summer, we will take on local high school interns who will learn about biological data analysis and participate in our research. Being in Lowell is great because we can access students from underrepresented backgrounds in STEM and hopefully attract them to the field of bioinformatics.

UNDER THE LENS

Chemistry Students Lean In to DEI Lessons

Asst. Teaching Prof. Suzanne Young Shines a Light on Achievements of Underrepresented Scientists

BY ED BRENNEN

It's a slow shift, barely perceptible to the untrained eye. But it's one that Asst. Teaching Prof. Suzanne Young has observed in her Chemistry 1 and 2 courses over the past two years.

Ever since she started weaving five-minute biographies of Black, brown and Indigenous scientists into her chemistry courses—"DEI in STEM" modules, as she calls them—Young has noticed that students sitting in the back of the classroom have gradually started taking seats closer to the front.

"Any teacher can tell you: Where students sit on Day 1, 95% of them are sitting there on the last day of class," says Young, who has taught for more than 30 years and is in her 13th year in the Kennedy College of Sciences. "It's not an accident when someone goes from the seventh row to the third row."

By getting students to lean into lessons on scientists such as Tanya Latty, a Black entomologist at the University of Sydney in Australia who works on the chemistry of slime mold, or the late Fred "Clever Fox" Begay, a nuclear physicist of Navajo and Ute descent who worked for the Los Alamos National Laboratories, Young is trying to connect students to STEM fields by showing them just how diverse those disciplines truly are.

Asst. Teaching Prof. Suzanne Young (right) has created nearly two dozen lessons on contemporary scientists from diverse backgrounds for her chemistry classes.

"In chemistry textbooks, the faces of discoverers and the names of equations and principles are all European-based. That's the history, and that's great," says Young, who has created close to 20 mini-lessons on contemporary scientists from diverse backgrounds and shared them with fellow faculty members from the Chemistry Department.

But Young adds, "When students see faces like theirs, it makes a difference. They need to see that they have a place."

Young's diversity, equity and inclusion initiative is just one step that Kennedy College faculty are taking to provide a more culturally responsive education at UML, where 40% of undergraduates are students of color.

This fall, two Biological Sciences faculty members, Asst. Prof. Natalie Steinel and Teaching Prof. Naomie Wernick, organized an Inclusive Teaching book club. The first book on their reading list was "Inclusive Teaching: Strategies for Promoting Equity in the College Classroom" by Kelly A. Hogan and Viji Sathy.

"One of the strengths of UML is the diverse backgrounds and experiences of our students, and faculty want to be sure everyone has an opportunity to learn and for their voices to be heard," says Steinel. "I think everyone who's participated has found approaches to apply in their own courses."

Young was inspired to create the DEI modules in 2020 following the murder of George Floyd and the ensuing nationwide protests. After attending campus listening sessions on social justice and inclusion, "It occurred to me that many of us as faculty had our hearts in the right place, but that it needs to come out more," says Young, who read more than a dozen books and attended over 30 conferences on Zoom to learn more about the topic.

Young's students appreciate her efforts.

"We mostly learn about people in the past who set the foundation. It's worthwhile to learn about people in the present from different backgrounds," says Diego Goodrich, a junior chemistry major who found the module on Clever Fox particularly interesting.

"It's good to know about people who aren't in the textbook, who aren't appreciated as much," adds Arshjot Kaur, a junior psychology major on the pre-med track.

The students' enthusiasm is the reaction Young was hoping for.

"This university cares as much about the teaching and development of students as it does about maintaining top-level research," she says. "The country, and the world, needs these students. We're not going to solve problems like global warming unless we train enough people to go into the sciences."

Faculty Publications

PROFS. MATHEW BARLOW AND FRANK COLBY, *Department of Environmental, Earth & Atmospheric Sciences:*

- "A Climatology of Snow Squalls in Southern New England 1994-2018," Monthly Weather Review.

PROF. MATHEW BARLOW:

- "Surface-to-Space Atmospheric Waves from Hunga Tonga-Hunga Ha'apai Eruption," Nature.
- "Evaluation of the Forecast Skill of North American Multi-Model Ensemble for Monthly and Seasonal Precipitation Forecasts over Iran," International Journal of Climatology.

ASSOC. PROF. TIBOR BEKE, *Department of Mathematics & Statistics,* "Effects of Debulking on the Fiber Microstructure and Void Distribution of Carbon Fiber Reinforced Plastics," Composites, Part A: Applied Science and Manufacturing.

ASST. PROF. FRÉDÉRIC CHAIN, *Department of Biological Sciences:*

- "Very Low Rates of Spontaneous Gene Deletions and Gene Duplications in Dictyostelium discoideum," Journal of Molecular Evolution.
- "Diversity in Expression Biases of Lineage-Specific Genes during Development and Anhydrobiosis among Tardigrade Species," Evolutionary Bioinformatics.

ASST. PROF. YIMIN CHEN, *Richard A. Miner School of Computer & Information Sciences:*

- "Applying Behavioral Finance to Influence Consumer Decision-Making and Behavior via Human-Automation Interaction," Duffy, V.G., Lehto, M., Yih, Y., Proctor, R.W. (eds), Human-Automation Interaction.
- "MANDA: On Adversarial Example Detection for Network Intrusion Detection System," IEEE Transactions on Dependable and Secure Computing.

ASSOC. PROF. JENNIFER FISH, *Department of Biological Sciences,* "Fgf8 Dosage Regulates Jaw Shape and Symmetry through Pharyngeal-Cardiac Tissue Relationships," Developmental Dynamics.

EMERITUS PROF. ROBERT GAMACHE, *Department of Environmental, Earth & Atmospheric Sciences:*

- "Partition Sums for Non-Local Thermodynamic Equilibrium Conditions for Nine Molecules of Importance in Planetary Atmospheres," Icarus.
- "Non-LTE Spectroscopy of the Tetradecad Region of Methane Recorded in a Hypersonic Flow," Icarus.

ASSOC. PROF. RICHARD GASCHNIG, *Department of Environmental, Earth & Atmospheric Sciences:*

- "History of Crustal Growth in Africa and the Americas from Detrital Zircon and Nd Isotopes in Glacial Diamictites," Precambrian Research.
- "Halogen (F, Cl, Br, and I) Concentrations of the Upper Continental Crust through Time as Recorded in Ancient Glacial Diamictite Composites," Geochimica et Cosmochimica Acta.
- "Constant Iron Isotope Composition of the Upper Continental Crust over the Past 3 Gyr," Geochemical Perspectives Letters.
- "Homogenising the Upper Continental Crust: The Si Isotope Evolution of the Crust Recorded by Ancient Glacial Diamictites," Earth and Planetary Science Letters.
- "The Jagged Western Edge of Laurentia: The Role of Inherited Rifted Lithospheric Structure in Subsequent Tectonism in the Pacific Northwest," Laurentia: Turning Points in the Evolution of a Continent, Geological Society of America.

ASST. PROF. JAMES HEISS, *Department of Environmental, Earth & Atmospheric Sciences:*

- "Effects of Future Increases in Tidal Flooding on Salinity and Groundwater Dynamics in Coastal Aquifers," Water Resources Research.
- "Seasonal and Spatial Production Patterns of Dissolved Inorganic Carbon and Total Alkalinity in a Shallow Beach Aquifer," Frontiers in Marine Science.

ASSOC. PROF. ARCHANA KAMAL, *Department of Physics & Applied Physics:*

- "Trade Off-Free Entanglement Stabilization in a Superconducting Qutrit-Qubit System," Nature Communications.
- "Perturbative Diagonalization for Time-Dependent Strong Interactions," Physical Review Applied.

ASST. PROF. NICOLAI KONOW and PROF. JEFFREY MOORE, *Department of Biological Sciences,* and **ASSOC. PROF. MATTHEW GAGE,** *Department of Chemistry,* "Bridging the Muscle Genome to Phenome Across Multiple Biological Scales," The Journal of Experimental Biology.

ASST. PROF. NICOLAI KONOW, "Validation of a Joint-Constrained Foot Model Using Biplanar Videofluoroscopy," Computer Methods in Biomechanics and Biomedical Engineering.

ASST. PROF. CHRISTINA KWAPICH, *Department of Biological Sciences:*

- "Ants Prefer Small and Unprotected Seeds: Implications for Restoration in Arid Ecosystems," Restoration Ecology.
- "Apache Cicada Nymphs Are a Dominant Food Source for Desert-Dwelling Black Bears along a Sonoran Desert River," Ecology and Evolution.
- "The Guests of Ants: How Myrmecophiles Interact with Their Hosts," published by Belknap Imprint of Harvard University Press.

ASST. PROF. TERESA LEE, *Department of Biological Sciences,* "C. elegans Gonad Dissection and Freeze Crack for Immunofluorescence and DAPI Staining," Journal of Visualized Experiments.

PROFS. BENYUAN LIU AND YU CAO, *Richard A. Miner School of Computer & Information Sciences:*

- "AFP-Mask: Anchor-Free Polyp Instance Segmentation in Colonoscopy," IEEE Journal of Biomedical and Health Informatics.
- "DMA-Net: DeepLab with Multi-Scale Attention for Pavement Crack Segmentation," IEEE Transactions on Intelligent Transportation Systems.
- "Automated Disease Detection in Gastroscopy Videos Using Convolutional Neural Networks," Frontiers in Medicine.
- "A Machine Learning-Based System for Real-Time Polyp Detection (DeFrame): A Retrospective Study," Frontiers in Medicine.
- "eRxNet: A Pipeline of Convolutional Neural Networks for Tuberculosis Screening," International Journal of Semantic Computing.
- "Deep Learning Assisted Mouth-Esophagus Passage Time Estimation During Gastroscopy," IEEE International Conference on Tools with Artificial Intelligence.

continued on next page

- "DeepPoint: A Deep Learning Model for 3D Reconstruction in Point Clouds via mmWave Radar," International Conference on Artificial Neural Networks.
- "Enhance Chest X-ray Classification with Multi-Image Fusion and Pseudo-3D Reconstruction," International Joint Conference on Neural Networks.
- "MAF-Net: Multi-Branch Anchor-Free Detector for Polyp Localization and Classification in Colonoscopy," Medical Imaging with Deep Learning.

ASSOC. DEAN MATTHEW NUGENT, *Biological Sciences,* "The Future of the COVID-19 Pandemic: How Good (or Bad) Can the SARS-CoV2 Spike Protein Get?" Cells.

PROF. VIKTOR PODOLSKIY, *Department of Physics & Applied Physics:*

- "Physics-Informed Machine Learning of Optical Modes in Composites," Advanced Photonics Research.
- "Controlling Light Emission with Photonic Funnels," Conference on Lasers and Electro-Optics.
- "Hypergrating for Focusing Vortex Beam below Diffraction Limit," Conference on Lasers and Electro-Optics.
- "Optimizing Funnels for Mid-IR NSOM Tips," SPIE Optics and Photonics.
- "Physics-Informed Machine Learning for Optical Modes in Composites," Advanced Photonics Research.

ASST. PROF. MICHAEL ROSS, *Department of Chemistry:*

- "Abiotic Sugar Synthesis Autocatalyzed by CO2 Electrolysis Products," Joule.
- "Plasmonics for Environmental Remediation and Pollutant Degradation," Chem Catalysis.
- "The Viability of Implementing Hydrogen in the Commonwealth of Massachusetts," Frontiers in Energy Research.

ASST. PROF. NATALIE STEINEL, *Department of Biological Sciences:*

- "Evolutionary Gain and Loss of a Pathological Immune Response to Parasitism," Science.
- "Voluntary Participation in Flipped Classroom Application Sessions Has a Negligible Effect on Assessment Outcomes in an Accelerated Pass/Fail Course," Advances in Physiology Education.
- "The Timing and Development of Infections in a Fish-Cestode Host-Parasite System over the Winter in Alaskan Lakes," Parasitology.

ASST. PROF. JUAN ARTES VIVANCOS, *Department of Chemistry:*

- "Perceptions of Changes in the Environment Produced by the COVID-19 Pandemic across the Northern Hemisphere: Implications for Environmental Protection Policies," Environmental Impact Assessment Review.
- "Single-Molecule Conductance of Double-Stranded RNA Oligonucleotides," Nanoscale.

ASST. PROF. JOY WINBOURNE, *Department of Environmental, Earth & Atmospheric Sciences*, "Herbivores Drive Scarcity of Nitrogen-Fixing Plants," Nature News & Reviews.

ASSOC. PROF. ANNA YAROSLAVSKY, *Department of Physics & Applied Physics:*

- "Fluorescence Polarization Imaging of Methylene Blue Facilitates Quantitative Detection of Thyroid Cancer in Single Cells," Cancers.
- "Investigation of Silk as a Phantom Material for Ultrasound and Photoacoustic Imaging," Photoacoustics.
- "Design and Validation of a Handheld Optical Polarization Imager for Preoperative Delineation of Basal Cell Carcinoma," Cancers.
- "Method for Designing and Characterizing Phototherapy Shields," Journal of Biomedical Photonics and Engineering.
- "Exogenous Fluorescence Polarization Imaging for Cancer Detection," Optical Tools and Techniques for Cancer Diagnostics.

New Faculty

BIOLOGICAL SCIENCES
Asst. Prof. Sarah Gignoux-Wolfsohn
Visiting Lecturer Sandhya Royan

CHEMISTRY
Assoc. Prof. Jerome Delhommelle
Asst. Teaching Prof. Bhavna Gupta

COMPUTER SCIENCE
Asst. Prof. Anitha Gollamudi
Visiting Lecturer Thuy-Ngoc Nguyen
Visiting Lecturer Johannes Weis

ENVIRONMENTAL, EARTH & ATMOSPHERIC SCIENCES
Visiting Lecturer Kimberly Howell

MATHEMATICS & STATISTICS
Asst. Prof. Bowei Wu
Asst. Prof. Shiwen Zhang

PHYSICS
Asst. Prof. Romy Guthier
Asst. Teaching Prof. Ramanpreet Kaur

Student Success

KESHANI PATTIYA ARACHCHILLAGE, *Department of Chemistry,* presented at the Materials Research Society fall meeting. She also received the following awards from the American Chemical Society:

- Analytical Chemistry Division Travel Award
- Biological Chemistry Division Travel Award
- Medicinal Chemistry Division Travel Award

ISABEL AUGUSTINE, *Department of Chemistry,* received the National Science Foundation's Sustainable Water Innovations in Materials: Mentoring, Education, and Research National Research Traineeship Fellowship.

MEAGHAN BARRY, *Department of Biological Sciences,* was awarded a Predoctoral Fellowship from the American Heart Association entitled "Molecular Mechanisms of Troponin-I Based Regulation of Cardiac Muscle Contraction."

ERICKA BOUDREAU, *Department of Environmental, Earth & Atmospheric Sciences*, "Pb Isotopes in Detrital Feldspars Reveal Unlikely Relationships Between Southern and Northern Cordilleran Terranes," Annual Meeting, Geological Society of America.

ADERLYN CASTILLO, *Department of Chemistry,* gave an undergraduate student presentation at the Materials Research Society fall meeting.

SPASEN CHAYKOV, *Department of Physics & Applied Physics,* "Loop Corrections in Minkowski Spacetime Away From Equilibrium 1: Late-Time Resummations" and "Loop Corrections in Minkowski Spacetime Away From Equilibrium 2: Finite-Time Results," Journal of High Energy Physics.

SUBRATA CHANDRA, *Department of Chemistry,* received the American Chemical Society Biological Division Travel Award and presented at the Materials Research Society fall meeting.

SAMUEL DELAP '21, *Biological Sciences,* is continuing as a Master of Science student in the Konow lab while working full time in industry.

ABANTIKA GHOSH, *Department of Physics & Applied Physics:*

- "Machine Learning for Optical Modes in Composites," Advanced Photonics Research.
- "CoPhy-PGNN: Learning Physics-Guided Neural Networks with Competing Loss Functions for Solving Eigenvalue Problems," ACM Transactions on Intelligent System and Technology.
- "Physics-Informed Machine Learning for Optical Modes in Composites," Advanced Photonics Research.
- "Physics-Informed Machine Learning of Optical Modes in Composites," Conference on Lasers and Electro-Optics.

SHELBI GILL, *Department of Biological Sciences:*

- "Very Low Rates of Spontaneous Gene Deletions and Gene Duplications in Dictyostelium discoideum," Journal of Molecular Evolution.

SYDNEY HY, *Department of Biological Sciences,* "Workerless Queens and Queenless Workers: The Behavior of the Social Parasite Tetramorium atratulum with Tetramorium immigrans in Its Introduced Range," Animal Behaviour Live: Annual Online Conference.

TYLER IORIZZO AND PETER JERMAIN, *Department of Physics & Applied Physics:*

- "Investigation of Silk as a Phantom Material for Ultrasound and Photoacoustic Imaging," Photoacoustics.
- "Design and Validation of a Handheld Optical Polarization Imager for Preoperative Delineation of Basal Cell Carcinoma," Cancers.
- "Method for Designing and Characterizing Phototherapy Shields," Journal of Biomedical Photonics and Engineering.

TYLER IORIZZO:

- "Optical Method for Monitoring Temperature Induced Changes of Biotissues," U.S. Patent application.
- Received the Physics Department Graduate Student of the Year, Medical Physics.
- Received the American Society for Laser Medicine & Surgery Abstract Presenting Author Scholarship.

PETER JERMAIN:

- "Fluorescence Polarization Imaging of Methylene Blue Facilitates Quantitative Detection of Thyroid Cancer in Single Cells," Cancers.
- "Handheld Optical Polarization Imager Delineates Surgical Margins of Basal Cell Carcinoma," Biophotonics Congress: Biomedical Optics.
- "Expanding Medical Physics Research to New Frontiers in Dermatology and Pathology," American Association of Physicists in Medicine Webinar Series.
- Best Student Paper Award in Microscopy, Histopathology, and Analytics, Optics Biophotonics Congress: Biomedical Optics.

DEVIN JENNESS '22, *Department of Biological Sciences,* gave an invited presentation on his honors thesis project, "Food Hardness, Activation Level and Fiber Architecture Influence in Vivo Operating Length Ranges of Rat Jaw Muscles," at the Society for Experimental Biology's symposium, Not Just Down the Hatch: Food Processing Mechanisms in Animals.

HOON KANG AND ROMAN MENEGHINI, *Department of Biological Sciences,* "Intrinsic and Extrinsic Sources of Variation in the Hidden Nest Architecture of the Ant, Pheidole pilifera," invited talk at the Symposium on Spatial Structure and Organization within Social Insect Colonies. International Congress of the International Union for the Study of Social Insects.

NOAH MASON, *Department of Chemistry,* received the Northeast Section of the American Chemical Society's Norris Richards Summer Fellowship.

JEAN-CHRISTOPHE METIVIER, *Department of Biological Sciences,* "Diversity in Expression Biases of Lineage-Specific Genes during Development and Anhydrobiosis among Tardigrade Species," Evolutionary Bioinformatics.

ANANYA MUKHERJEE, *Department of Physics & Applied Physics,* "Linear Growth of Structure in Massive Gravity."

TEYA NIGRO and CASSIDY SCHULTZ, *Department of Biological Sciences,* **NATILIA WOOZENCROFT,** *Department of Chemical Engineering,* and **DEEPSHIKHA ANANTHASWAMY,** *Department of Biological Sciences,* presented Lee Lab posters at the Northeast Society for Developmental Biology meeting.

OLASUNKANMI OLORUNSAYE, *Department of Environmental, Earth & Atmospheric Sciences,* "Effect of Geologic Heterogeneity on the Development of Salt Fingers in Beach Aquifers," Geological Society of America Connects.

MATEO RULL-GARZA '22, *Department of Biological Sciences,* is enrolled as a Master of Science student in the environmental science program at the University of Massachusetts Amherst. His project is on pesticide effects on pollinator-plant interactions.

CASSIDY SCHULTZ and DEEPSHIKHA ANANTHASWAMY presented Lee Lab posters presented at the C. elegans Development Meeting.

MEGHAN SPENCE '22, *Department of Biological Sciences,* is working as an associate scientist at Nova Biomedical.

DIVYA TSIROS, *Department of Biological Sciences,* "Compositions and methods for treatment of angiogenesis related diseases," U.S. Patent application.

NIDHI VAKIL, *Richard A. Miner School of Computer and Information Sciences:*, "Generic and Trend-Aware Curriculum Learning for Relation Extraction in Graph Neural Networks," Proceedings of the 2022 Conference of the North American Chapter of the Association for Computational Linguistics: Human Language Technologies.

NATE ZBASNIK and KATIE DOLAN, *Department of Biological Sciences,* "Fgf8 Dosage Regulates Jaw Shape and Symmetry through Pharyngeal-Cardiac Tissue Relationships," Developmental Dynamics.