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Georgia Tech Astronomy Club members traveled to the Deerlick Astronomy Village in Crawfordville, Georgia to observe millions of stars — and be reminded of their place in the cosmos. (Georgia Tech Astronomy Club)

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The Sciences

at Georgia Institute of Technology

2025 Research and Community Review

Georgia Tech
College of Sciences

A.I.CHADHA

YEAR IN REVIEW

September 2024 - August 2025

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From the Dean

This fall marks six years since I first stepped onto campus as College of Sciences Dean. I am filled with gratitude for the remarkable progress we have made together — and for the community that makes our Institute such a vibrant place to learn, discover, and serve.

We continue to grow in size and impact, welcoming new students and faculty, launching innovative degree programs, and expanding our research footprint. Our commitment to collaboration and interdisciplinary excellence is stronger than ever, as seen in the partnerships that span our six schools and connect us with colleagues across campus, our state, and our world.

We are also celebrating a significant milestone this season, serving as the first college at Georgia Tech to surpass our campaign target. This $75 million philanthropic achievement is a testament to the generosity and dedication of our alumni, friends, and supporters — thank you. Your belief in our mission fuels our progress.

While we celebrate these accomplishments, our work continues. Looking ahead, I am excited to share several new initiatives that are shaping the future of the College and our impact.

- **Georgia Tech for Georgia's Tomorrow** — GT^2 for short — is focused on research that will improve human and environmental health across our state through resilient coastal communities, robust agricultural practices, and conservation corridors. Importantly, GT^2 will serve as a hub for interdisciplinary collaboration and public engagement.
- As artificial intelligence (AI) transforms industries and fields, our newest center, **AI4Science**, is fostering a community of interdisciplinary researchers and students who are poised to harness AI for scientific discoveries and solutions.
- Our new centers focused on **critical minerals** and on **spatial processing, design, and navigation** are advancing research in areas central to technological innovation, Georgia's economy, and the nation's competitiveness.
- Meanwhile, **Rising Tide**, our new mentorship initiative supporting early-career scientists, is strengthening our culture of coaching and providing more pathways for promotion and leadership.
- Next year, we'll welcome the first class of students into our just launched **major in mathematics and computing** as we continue to expand other new degree programs in **astrophysics** and **neuroscience**, as well as new minors in **astrobiology, computation and cognition, quantum sciences and technology**, and more.
- In April 2026, our annual **Frontiers in Science** research symposium and conference will explore the intersection of **space, science, and society**, building on the success of 2025's focus on **neuroscience and intelligence**.
- Finally, please save the date! Our new alumni travel program, **Travel Science**, heads to Iceland in September 2026 for a science-learning adventure. All College of Sciences alumni are invited to join this expedition in shared knowledge and friendship.

At the heart of these new ideas and initiatives are our people. As we strive to expand access, foster inclusion, and empower every member of our community to reach their full potential, our mission is not only to advance knowledge — but to ensure that our progress continues to serve the greater good.

I am deeply grateful for the dedication of our students, faculty, staff, alumni, and friends. Your support, enthusiasm, and encouragement make our work possible. As we look to the year ahead, I invite you to stay engaged, share your ideas, and keep investing in the future of math and science at Georgia Tech.

Go Jackets!

M. Susan Lozier

Dean and Betsy Middleton and John Clark Sutherland Chair Professor in the School of Earth and Atmospheric Sciences
College of Sciences at Georgia Tech

By the Numbers

Georgia Tech College of Sciences

6 SCHOOLS

- Biological Sciences
- Chemistry and Biochemistry
- Earth and Atmospheric Sciences
- Mathematics
- Physics
- Psychology

12+ interdisciplinary programs

HOME TO **40+** student organizations

Neuroscience, one of Georgia Tech's fastest growing undergrad programs

EXPLORE LLC
Pre-health- and research-focused Living and Learning Community

$77M+ in state funding (FY26) and **$64M+** in new research funding (FY25)

4 new strategic research centers

500+ faculty (FY26)

3,500+ students (FY26)

116% majors growth from AY15

Largest number of credit hours taught of all Georgia Tech colleges

60% of GT first-year students are from **Georgia**

Our Newest Programs

- B.S. in Astrophysics
- B.S. in Mathematics and Computing
- Ph.D. in Neuroscience and Neurotechnology
- Minors in Astrophysics, Neuroscience, Computation and Cognition, and Quantum Sciences and Technology

The Princeton Review
Ranks Georgia Tech

- #1 Best Value Overall
- #1 Best Career Placement
- #2 Best School for Internships
- #4 Best Alumni Network
- #7 Best School for Making an Impact

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Our Brains and AI

New Era in Neuroscience and Neurotechnology at Georgia Tech

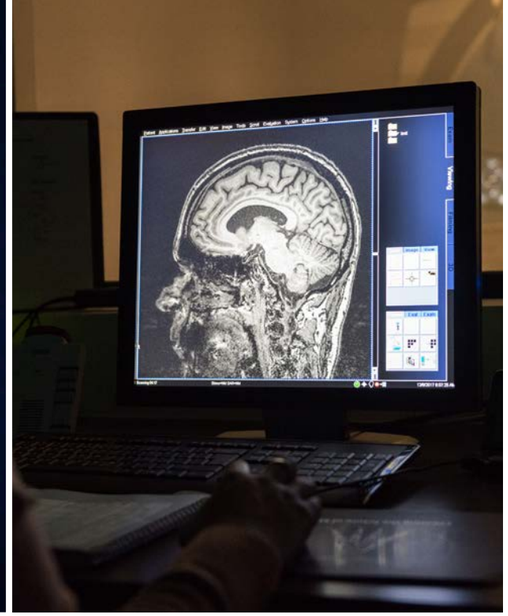
The past year has been pivotal for neuroscience and neurotechnology at Georgia Tech. After more than a decade of effort, the Institute's research and teaching ecosystem in these fields has taken shape. Key developments include a Frontiers in Science forum on biological and artificial intelligence (AI), the launch of an interdisciplinary research institute, and expanded undergraduate and graduate offerings.

Exploring the frontiers of intelligence

In April 2025, the College of Sciences hosted the Frontiers in Science Conference and Symposium, exploring the intersection of neuroscience, cognition, and AI.

During the full day of talks, faculty from the Colleges of Sciences, Computing, and Engineering as well as external keynote speakers highlighted how AI is transforming our understanding of the brain and how insights from neuroscience and psychology are, in turn, advancing AI.

"This is an exciting time at the College of Sciences and Georgia Tech. We are working at the forefront of so many questions about intelligence — human, artificial, and where the two converge," says Susan Lozier, dean of the College of Sciences, Betsy Middleton and John Clark Sutherland Chair, and professor in the School of Earth and Atmospheric Sciences.



Launching a new hub for inquiry

Building on the momentum generated by faculty-led initiatives like Neuro Next, the newly launched Institute for Neuroscience, Neurotechnology, and Society (INNS) will serve as a hub of interdisciplinary collaboration that encompasses the full spectrum of brain-related research. Its focus will include the foundations of human intelligence and movement, bio-inspired design, and the ethical dimensions of a neuro-connected future.

“The brain is one of the great remaining frontiers where discovery and innovation can unlock the future of human health and flourishing,” explains Christopher Rozell, inaugural executive director of INNS and Julian T. Hightower Chaired Professor in the School of Electrical and Computer Engineering. “INNS is uniquely positioned to lead in the modern interdisciplinary research necessary to address this grand challenge.”

> **THE BRAIN IS ONE OF THE GREAT REMAINING FRONTIERS** WHERE DISCOVERY AND INNOVATION CAN UNLOCK THE FUTURE OF HUMAN HEALTH AND FLOURISHING.

Training the next generation

Georgia Tech welcomed the first cohort of its Ph.D. in Neuroscience and Neurotechnology program in Fall 2025. A joint effort across the Colleges of Sciences, Computing, and Engineering, this new program integrates neuroscience research and technological development to examine all levels of nervous system function.

“This student-centered program, built on the strength of our exceptional researchers and educators, will bring about a major shift,” says Tim Cope, inaugural program director and a professor in the School of Biological Sciences and the Wallace H. Coulter Department of Biomedical Engineering.

“With the addition of this graduate program, we’re completing the three foundational pillars that will elevate Georgia Tech among top neuroscience institutions,” he adds, referencing INNS and the B.S. in Neuroscience program.

The undergraduate program is one of the Institute’s fastest-growing majors with 591 students enrolled in Fall 2025. Led by School of Psychology Professor Eric Schumacher, the B.S. in Neuroscience program provides interdisciplinary training in behavioral, cellular, cognitive, computational, molecular, and systems neuroscience.

Complementing these offerings is the new Minor in Computation and Cognition, created by the College of Sciences in collaboration with the College of Computing.

Story by Lindsay Vidal. Photos by Rob Felt, Benjamin Zhao, and Jess Hunt-Ralston.

Frontiers in Science speakers and the planning committee (previous page) explore the frontiers of human intelligence. INNS researchers study neuroscience and neurotechnology (left). Professor Eric Schumacher (below) leads the B.S. in Neuroscience program.

> WITH THE ADDITION OF THIS GRADUATE PROGRAM, WE’RE COMPLETING THE THREE FOUNDATIONAL PILLARS THAT WILL **ELEVATE GEORGIA TECH AMONG TOP NEUROSCIENCE INSTITUTIONS.**

The Neuroscience of Music and Memory

Music's ability to evoke emotions and trigger memories is well known, but can listening to music in the moment actually alter the content of memories?

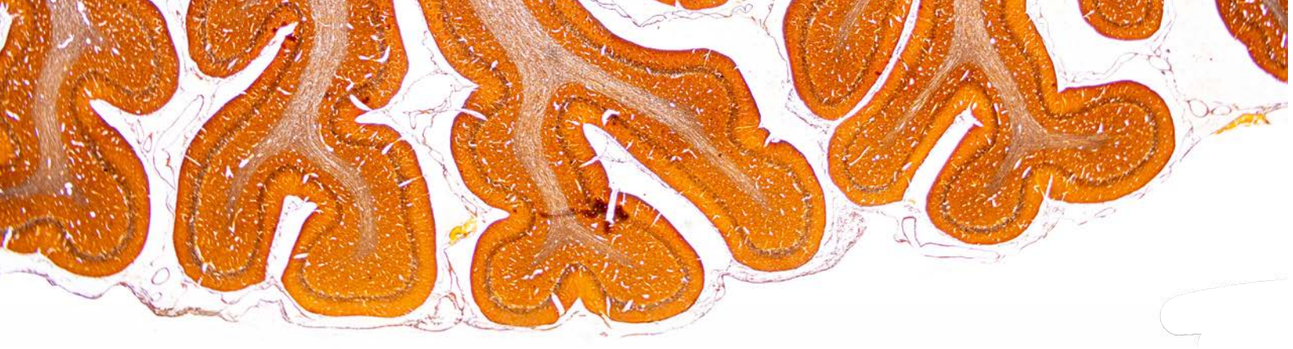
Georgia Tech's Thackery Brown, an associate professor in the School of Psychology, and Yiren Ren, a postdoctoral researcher, along with University of Colorado Boulder music experts Grace Leslie and Sophia Mehdizadeh, conducted a study to explore this question — uncovering intriguing connections between music, emotion, and memory.

Their research is rooted in the concept of memory reactivation — the idea that recalling a memory temporarily makes it malleable and allows new information to be incorporated. The study finds that listening to music while recalling certain memories can shift how you feel about them. The results suggest that music acts as an emotional lure, becoming intertwined with memories and subtly altering their emotional tone.

These findings have implications for the development of potential new strategies to help people cope with difficult memories. More specifically, this research may pave the way for music-based therapeutic interventions to support people dealing with depression, PTSD, and other mental health challenges.

Story by Jerry Grillo. Photo by Chris McKenney. When she isn't conducting her research, you can often find Yiren Ren playing the piano (right).

> DEPENDING ON ITS FAMILIARITY AND STRUCTURE, **MUSIC CAN HELP OR HINDER OUR MEMORY.**



A Brain-Inspired AI Breakthrough

Researchers at Georgia Tech have taken a critical step forward in creating efficient, useful, and brain-like artificial intelligence (AI). Led by graduate student Mayukh Deb alongside School of Psychology Assistant Professor Apurva Ratan Murty, the study was awarded a spotlight at this year's International Conference on Learning Representations, a distinction given to only 2% of papers.

"Historically, rules constraining how AI could structure itself often resulted in lower-performing models," Murty says. "We realized that for this type of biophysical constraint, you simply can't map everything — you need an algorithmic solution."

"Our models with internal structure showed more than a 20% boost in efficiency with almost no performance losses in GPTs," Deb says. "And this is out-of-the-box and broadly applicable to other models with no extra fine-tuning needed."

Murty and Deb plan to continue refining and designing brain-inspired AI systems. "All parts of the brain have some organization — we want to expand into other domains," Deb says. "On the neuroscience side of things, we want to discover new kinds of organization in brains using these topographic systems."

Deb also cites possibilities in robotics, especially in situations like space exploration where resources are limited.

"This success highlights the potential of a new approach, designing systems that benefit both neuroscience and AI — and beyond," Murty adds. "We can learn so much from the human brain, and this project shows that brain-inspired systems can help current AI be better. We hope our work stimulates this conversation."

Story by Selena Langner.

> WE CAN LEARN SO MUCH FROM THE HUMAN BRAIN, AND THIS PROJECT SHOWS THAT **BRAIN-INSPIRED SYSTEMS CAN HELP CURRENT AI BE BETTER.**

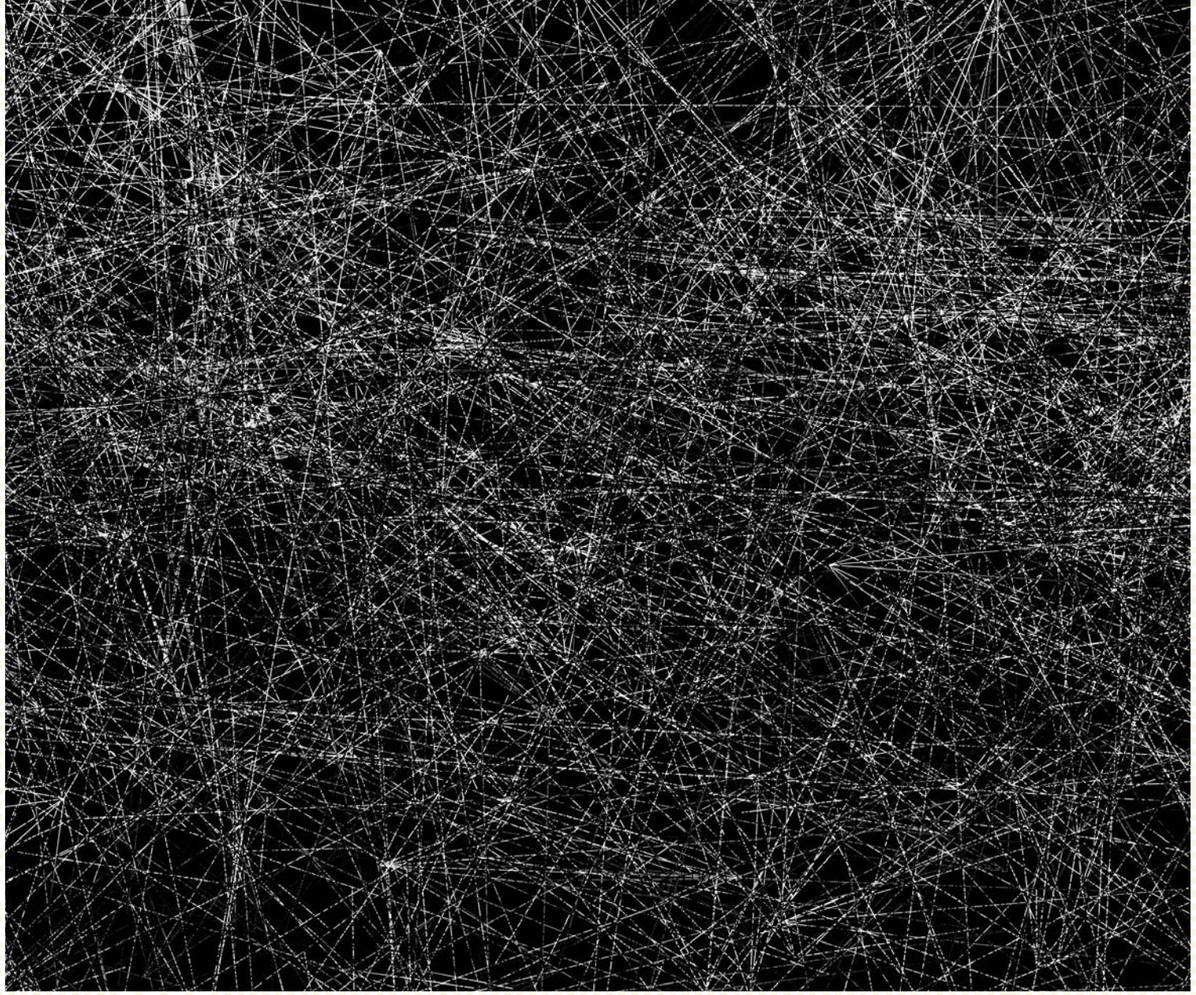
Understanding 'Brain Rot'

The term "brain rot" originates in Henry David Thoreau's 1854 classic, *Walden*. However, it has never been more relevant than in today's digital age. The term's usage increased by 230% between 2023 and 2024 — becoming the Oxford Word of the Year in 2024.

With people averaging nearly seven hours of screen time per day, *Oxford University Press* defines brain rot as the result of overconsumption of material considered to be trivial or unchallenging, particularly online content and social media.

In a recent episode of Georgia Tech's podcast, *Generating Buzz*, Eric Schumacher, a professor in the School of Psychology who specializes in the study of cognitive control, shares why brain rot is spreading and how to stem the tide.

LISTEN TO THE FULL PODCAST



Sharper Images:

How the Brain Filters Out Noise

> COLLABORATING WITH MATHEMATICIANS TO UNDERSTAND THE COMPUTATIONAL PRINCIPLES [OF THE BRAIN] IS **A GREAT EXAMPLE OF HOW NEUROSCIENCE CAN INFORM FIELDS LIKE AI.**

A multidisciplinary team including School of Mathematics Assistant Professor Hannah Choi has discovered how a neural mechanism helps our brains process visual information. The discovery could expand our knowledge of sensory perception, leading to applications in neuromedicine and artificial intelligence (AI).

Called "lateral inhibition," the mechanism occurs when neurons suppress the activity of their neighboring neurons, helping the more active ones stand out. Imagine a drawing where the artist darkens lines around contours, highlighting the boundaries between objects and their surroundings. Similarly, lateral inhibition sharpens the contrast between different visual stimuli.

To test the biological findings, Choi and her research team built computational models. As principal investigator of the Research Group in Mathematical Neuroscience, she regularly collaborates with experimental groups to build models that combine theories with biological data — bridging the gap among mathematics, neuroscience, and AI from small circuits to large brain systems.

"Neurons communicate diverse information of sensory stimuli, decision signals, and motor commands, and their operating modes are characterized by different spiking patterns that are determined by biological factors," says Choi. "Our research investigated how changes in local and global variables transition across different phases of single-neuron spiking dynamics."

"Collaborating with mathematicians to understand the computational principles underlying these inhibitory processes is a great example of how neuroscience can inform fields like AI," says lead researcher Bilal Haider, an associate professor in the Wallace H. Coulter Department of Biomedical Engineering, who worked alongside Joseph Del Rosario, a former graduate student in Haider's lab.

Their discoveries around lateral inhibition could provide insights into why some people have trouble filtering out distractions or focusing on what's important in conditions like autism or ADHD, and they could also be leveraged in AI and neural network design.

Supported by NIH and the Simons Foundation. Story by Jerry Grillo.

Anna Ivanova Among Top Innovators in *MIT Technology Review*

Anna Ivanova, an assistant professor in the School of Psychology, was named to *MIT Technology Review*'s 35 Innovators Under 35 in 2024. Her work focuses on language processing in the human brain and artificial intelligence (AI) applications, such as the language models commonly used in tools like ChatGPT.

"I am happy that, these days, language and human cognition are topics that the world cares deeply about, thanks to recent developments in AI," says Ivanova, who is also a member of Georgia Tech's Neuro Next Initiative, a burgeoning interdisciplinary research hub for neuroscience, neurotechnology, and society. "Not only are these topics important, but they are also fun to study."

By approaching the study of large language models with cognitive science techniques, Ivanova hopes to bring us closer to more functional AI — and a better understanding of the brain.

Supported by the Quest Initiative for Intelligence. Story by Audra Davidson. Photo by Allison Carter.
Anna Ivanova studies the relationship between language, intelligence, and human thought.

Georgia Tech Hosts Inaugural Computational Cognition Conference

The Center of Excellence in Computational Cognition (CoCo) recently hosted its inaugural Computational Cognition Conference — gathering more than 100 Atlanta-area, multidisciplinary researchers to explore cutting-edge work in computation, perception, decision-making, and more.

"CoCo aims to bring together researchers from Georgia Tech, Atlanta, the Southeast, and beyond to advance this field," says Blanchard Early Career Professor Doby Rahnev, the Center's founding director.

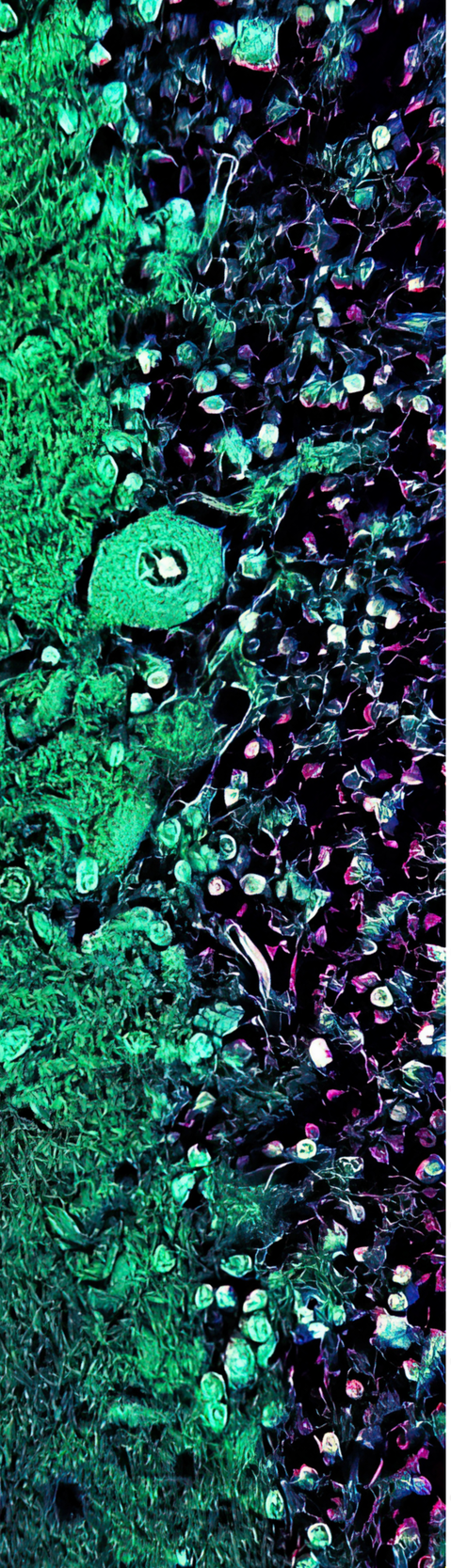
Established in 2023, CoCo seeks to better understand the human brain as a "biological computer" using the principles of computation and mathematics.

Story and photo by Audra Davidson. *Doby Rahnev delivers a talk during the inaugural CoCo Conference.*

Lewis Wheaton Elected President of the American Society of Neurorehabilitation

The School of Biological Sciences professor has served as vice president for three years, and looks foward to "engaging more people in neurorehabilitation-based research and training the next generation of neurorehabilitation researchers."

Photo by Jess Hunt-Ralston. *Lewis Wheaton also serves as director of the College's Center for Programs to Increase Engagement in the Sciences.*



Farzaneh Najafi's Award-Winning Cognitive Research

"If we want to understand cognition, we have to start small — at the level of molecules, genes, and the genome — then work our way up to systems, behavior, and cognition," says Farzaneh Najafi, an assistant professor in the School of Biological Sciences who is also affiliated with the Petit Institute for Bioengineering and Bioscience and the Institute for Neuroscience, Neurotechnology, and Society.

Throughout her career, Najafi has focused on how the brain makes and uses predictions to influence learning and behavior. She has received multiple awards enabling deeper exploration into the molecular origins of cognitive processes.

Two of her recent awards stem from the Scialog: Molecular Basis of Cognition Initiative. With additional funding from the Whitehall Foundation and Chan Zuckerberg Initiative, Najafi will lead interdisciplinary projects to uncover the role of the cerebellum and neocortex across cognitive processes.

Working with researchers from Case Western Reserve University and Stanford University, Najafi's first Scialog project focuses on how sleep deprivation alters the 3D structure of genetic material in different species' cerebellums — and investigates potential mechanisms to reverse those changes.

Her second project, in collaboration with researchers from Duke University and University of California, San Francisco explores the cerebellum's role in behavioral flexibility and adaptation, revealing how chemical signals influence various brain functions.

Both teams are highly interdisciplinary with researchers bringing expertise in different techniques and species. "Impactful discoveries happen when people from different disciplines come together and collaborate," she says. "That's how we make real breakthroughs."

Supported by the Research Corporation for Science Advancement, the Frederick Gardner Cottrell Foundation, and the Walder Foundation. Additional funding from the Whitehall Foundation and Chan Zuckerberg Initiative. Story by Audra Davidson. *Farzaneh Najafi (right) studies the role that neurons in the cerebellum (left) play in cognition and behavior.*

> **IMPACTFUL DISCOVERIES** HAPPEN WHEN PEOPLE FROM DIFFERENT DISCIPLINES COME TOGETHER AND COLLABORATE.

Our Bodies

Smart Molecules, Smarter Medicine

Engineered biosensors could revolutionize cancer detection.

Georgia Tech researchers have developed biosensors that have advanced sleuthing skills. The technology may revolutionize cancer detection and monitoring. Biosensors are devices that use an organic, living component, like enzymes or antibodies, to detect chemicals. But unlike traditional biosensors, like cells or DNA, these new sensors are made of manufactured molecules: iron oxide nanoparticles and cyclic peptides.

The new biosensors are more precise — reducing the number of false positives and making them more practical for clinical use. And because the sensors are cell-free, there is a reduced risk for immunogenic side effects. The research has been published in *Nature Nanotechnology*.

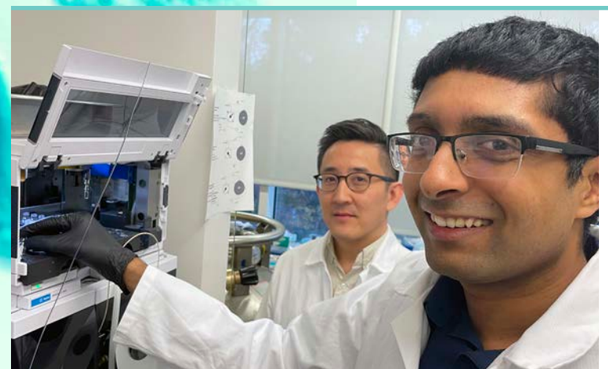
"The accuracy and simplicity of our biosensors will lead to accessible, personalized, and effective treatments, ultimately saving lives," says lead author Gabe Kwong, a professor and Robert A. Milton Endowed Chair in the Wallace H. Coulter Department of Biomedical Engineering (BME).

In animal studies, the biosensors successfully distinguished between tumors that resisted treatment and those that responded to a cancer treatment called immune checkpoint blockade therapy. Away from the tumors, the sensors also demonstrated their ability to avoid false signals from unrelated health issues.

"This level of specificity can be game changing," Kwong adds. "Imagine being able to identify which patients are responding to the therapy early in their treatment. That would save time and improve patient outcomes."

This multi-institutional project included Georgia Tech researchers M.G. Finn, a professor and James A. Carlos Family Chair in the School of Chemistry and Biochemistry, and Peng Qiu, a professor in BME, as well as researchers from the University of California, Riverside.

Supported by NIH and NSF. Story by Jerry Grillo. *Gabe Kwong and Anirudh Sivakumar (below) led development of new gene-free biosensors to detect cancer with collaborators. Cancer cells (left).*



> THIS LEVEL OF SPECIFICITY CAN BE *GAME CHANGING.*

RNA's Surprising Role in DNA Repair

New insights could lead to improved treatments for cancer and other diseases.

A multi-institutional team of researchers, led by School of Biological Sciences Professor Francesca Storici, has discovered a previously unknown role for RNA. As published in *Nature Communications*, their insights could lead to improved treatments for diseases like cancer and neurodegenerative disorders while changing our understanding of genetic health and evolution.

RNA molecules are best known as protein production messengers — carrying genetic instructions from DNA to ribosomes — but Storici's team found that RNA can also help cells repair a severe form of DNA damage called a double-strand break, or DSB. Cells have the tools to make some repairs, but a DSB creates significant damage — leading to mutations, cell death, or cancer if not properly fixed.

"We've learned that RNA can directly promote DSB repair mechanisms," says Storici, whose lab teamed up with mathematics experts in the lab of Natasha Jonoska from the University of South Florida. "These findings open up a new understanding of RNA's potential role in maintaining genome integrity and driving evolutionary changes."

A deeper understanding of RNA's role in DNA repair could lead to new strategies for strengthening repair mechanisms in healthy cells, potentially reducing the harmful effects of treatments like chemotherapy and radiation.

"These findings underscore the critical role of mathematical visualization in understanding complex biological mechanisms and could pave the way for targeted interventions in genome stability and therapeutic research," says Jonoska.

Supported by HHMI, NIH, NSF, and the Simons Foundation. Story by Jerry Grillo. Photo by Chris McKenney. *Researchers work inside the lab of Francesca Storici at Georgia Tech's main campus in Atlanta.*

AI for Better Antibody Therapies

From sending cancer into remission to alleviating Covid-19 symptoms, immunotherapy can provide revolutionary disease treatments. Immunotherapies use antibodies to target and eliminate the antigen, but despite its effectiveness, immunotherapy isn't used widely because finding the right antibodies to develop treatments is challenging, time-consuming work.

Georgia Tech researchers developed a tool, AF2Complex, leveraging deep learning to predict which antibodies could bind to Covid-19's spike protein. The researchers created input data for the model using sequences of known antigen binders. In a test of 1,000 antibodies, this method correctly predicted 90% of the best antibodies. The research was published in *Proceedings of the National Academy of Sciences.*

"AF2Complex improves therapeutic development," says co-corresponding author Mu Gao, a senior research scientist in the School of Biological Sciences. "If you have a high-quality model, then you can tinker with the protein sequence and optimize the antibody, making it more suitable for drug development."

The researchers believe deep learning technologies could revolutionize how we treat future diseases.

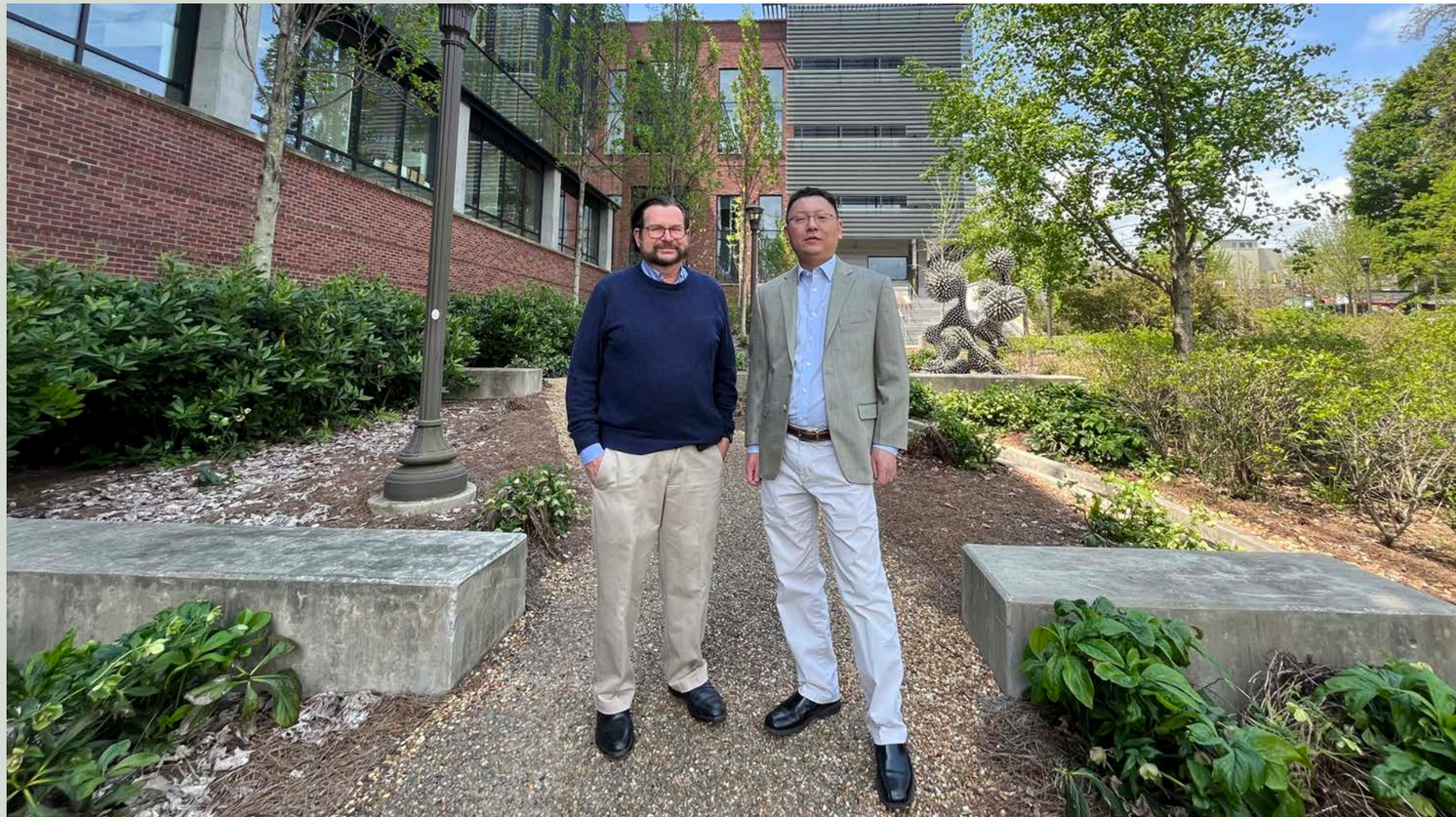
Treating the virus of the future

"Imagine the virus from hell arises. You could design a series of antibodies using this algorithm, so it cuts down the time for vaccine development," says co-corresponding author Jeffrey Skolnick, Regents' Professor, Mary and Maisie Gibson Chair, and Georgia Research Alliance Eminent Scholar in Computational Systems Biology. "There are no substitutes for a real experiment, but AF2Complex can prioritize which experiments you should do, so you have more shots at the goal."

To help prepare for future pandemics, the researchers are collaborating with Emory University to conduct experiments that validate AF2Complex's findings, as well as pursuing a path to commercialize the model.

Supported by DOE, NIH, and NSF. Story by Tess Malone. Photo by Jess Hunt-Ralston. *Jeffrey Skolnick and Mu Gao (right) outside the Krone Engineered Biosystems Building.*

> **IMAGINE THE VIRUS FROM HELL ARISES.** THIS ALGORITHM COULD HELP DESIGN ANTIBODIES, DRAMATICALLY CUTTING DOWN THE TIME UNTIL VACCINE DEVELOPMENT.



Tech Promise Helps Biology Scholars Pursue Academic Dreams — Debt-Free

Biology students Giuli Capparelli Sanabria and J'Avani Stinson are pursuing bachelor's degrees with fewer financial worries, thanks to the G. Wayne Clough Georgia Tech Promise Scholarship. Established in 2007, this need-based scholarship is the first of its kind offered by a public university in Georgia. It allows qualifying Georgia students to pursue a degree debt-free by filling the gap where other scholarships and financial aid options leave off.

Johns Creek to Georgia Tech

Capparelli Sanabria grew up in a high cost-of-living area as a financially underprivileged member of the community. Because of that, she says, it is important to her to help other students who struggle financially.

She is studying to become a veterinarian and serves on the executive board of the Tech Promise Student Ambassadors. As a board member, Capparelli Sanabria is working to increase awareness of the Tech Promise Scholarship, destigmatize financial need, and give back to the Atlanta community, particularly to local Title 1 schools.

Stone Mountain to Georgia Tech

Fueled by a lifelong love of science and devotion to helping others, Stinson shares that he hopes to use the generosity afforded to him as a Tech Promise Scholar, Gates Scholar, and NASA Pathways Intern to continue improving society.

He hopes to pursue an M.D. and Ph.D. to study chronic pediatric diseases, a goal first discovered when his sister was diagnosed with diabetes at nine years old. "My sister was pushed aside by the healthcare system," shares Stinson, "and this inspired me to help get to the root of these problems and find better ways to alleviate them."

Story by Amanda Budd.

A New Carbon Negative Method to Produce Essential Amino Acids

Amino acids are essential for nearly every process in the human body. Often referred to as "the building blocks of life," they are also critical for commercial use in products from pharmaceuticals to animal feeds. While our bodies naturally make amino acids, manufacturing them for commercial use can be costly — and that process often emits greenhouse gases like carbon dioxide.

In a landmark study, a team of researchers has created a first-of-its-kind methodology for synthesizing amino acids that uses more carbon than it emits. The research also makes strides toward making the system cost effective and scalable for commercial use.

"To our knowledge, it's the first time anyone has synthesized amino acids in a carbon negative way using this type of biocatalyst," says Pamela Peralta-Yahya, a professor with joint appointments in the School of Chemistry and Biochemistry and School of Chemical and Biomolecular Engineering (ChBE). "Carbon dioxide is readily available, so it is a low-cost feedstock — and the system has the added bonus of removing a greenhouse gas from the atmosphere, making the synthesis of amino acids environmentally friendly."

Published in *ACS Synthetic Biology*, the study, "Carbon Negative Synthesis of Amino Acids Using a Cell-Free-Based Biocatalyst," was led by Georgia Tech in collaboration with the Pacific Northwest National Laboratory, University of Minnesota, and University of Washington.

The Georgia Tech research contingent from ChBE included Peralta-Yahya, Ph.D. students Shaafique Chowdhury and Ray Westenberg, and alumna Kimberly Wennerholm (ChBE 2023).

"This system might one day be used to make chemicals ranging from aromatics and terpenes, to alcohols and polymers, and all in a way that not only reduces our carbon footprint but improves it," adds Peralta-Yahya.

Supported by ARPA-E, DOE, and DOE Office of Science's BER Program. Story by Selena Langner. Background photo by ISS National Laboratory. Pamela Peralta-Yahya (right) and glycine crystals (top), one of the critical amino acids that the system converts carbon dioxide into.

Unlocking Immunity: The Lipid Frontier

Imagine unlocking universal immunotherapies and cancer treatments, powerful vaccines, and a deeper understanding of our own immune systems. Andrew McShan is laying the groundwork for these innovations by investigating the previously understudied field of lipids and how they interact with proteins in the body.

McShan, an assistant professor in the School of Chemistry and Biochemistry, was awarded a $1.4 million CAREER grant from the National Science Foundation (NSF) to support this research. The grants are NSF's most prestigious funding for early-career faculty.

"Protein-lipid assemblies carry out all sorts of biological functions, but historically, they've been difficult to study," McShan says. "This CAREER grant will enable me to expand the current knowledge base while also allowing me to develop a class that will train the next generation of researchers, which is hugely important to me."

The new class will focus on hands-on laboratory research and peer mentorship. Students will have the opportunity to pick a protein-lipid assembly, study it using computational and experimental biophysical methods, develop testable hypotheses, and, if successful, publish their results in peer-reviewed journals.

The class will also pair undergraduate and graduate students into research teams. "This type of class, to my knowledge, hasn't been offered before," McShan adds. "Hopefully, it can not only introduce students to lipid-based research, which is typically lacking in many biochemistry curricula, but also to the type of collaborative mentorship we want to foster in research."

An undergraduate-led malaria breakthrough

When Marielle Frooman joined the McShan Lab, she brought a strong passion for chemistry but no lab experience. Today, the fourth-year biochemistry student is the first author of a groundbreaking malaria study published in *Scientific Reports*, a *Nature Portfolio* journal.

Through extensive experimentation coupled with computer modeling, Frooman led a team of undergraduate and graduate researchers to uncover eight peptides that can help the immune system recognize and fight the malaria parasite. She contributed to every stage of the research, including designing experiments, performing computational and wet lab work, analyzing data, and writing and presenting the paper.

"Marielle is one of the most passionate and talented undergraduate researchers I have ever worked with," says McShan. "Her malaria research has the potential to provide real therapeutic outcomes, including better designs for vaccines and immunotherapy."

Frooman is quick to credit Georgia Tech and McShan for providing her with such a valuable learning experience.

"At many universities, undergraduates rarely do meaningful research, but at Tech, it's a priority," she explains. "I'm extremely grateful for the opportunity to grow in such a supportive environment and to learn from mentors like Professor McShan who lead by example and make time for every student."

Her career goals include earning a Ph.D. in Chemistry with an emphasis on natural product synthesis and leading her own lab — advancing impactful research and mentoring the next generation of scientists.

Supported by NSF. Story by Selena Langner and Laura Smith. Lab photo by Benjamin Zhao. Biochemistry student Marielle Frooman (above) explored how peptides in the human immune system fight malaria through her research in the lab of Andrew McShan (left).

> AT MANY UNIVERSITIES, UNDERGRADUATES RARELY DO MEANINGFUL RESEARCH, **BUT AT TECH, IT'S A PRIORITY.**

Two College of Sciences Initiatives Aim to Foster Georgia-Focused Research

In December 2024, the College of Sciences launched two new initiatives designed to expand the local impact of its research: Georgia Tech for Georgia's Tomorrow and the Rising Tide Program.

"The reach of Georgia Tech is global," says Susan Lozier, dean of the College of Sciences, Betsy Middleton and John Clark Sutherland Chair, and professor in the School of Earth and Atmospheric Sciences. "Our fingerprints are on discoveries and innovations that benefit people and their communities around the world. As researchers at a leading public university in the state of Georgia, we are also cognizant of the responsibility and opportunity to focus our efforts more intently here at home."

Serving Georgia through science

Georgia Tech for Georgia's Tomorrow was created to foster research related to the health and resilience of Georgia's people, ecosystems, and communities. Specifically, the center serves to boost research collaboration across the Institute, pave the way for public-private partnerships, and expand opportunities for Georgia students and communities to engage with Georgia Tech research.

The center is led by Joel Kostka, Tom and Marie Patton Distinguished Professor and associate chair for Research in the School of Biological Sciences with a joint appointment in the School of Earth and Atmospheric Sciences. He has conducted research on the vulnerability of Georgia's communities to climate change and partners with a variety of stakeholders to conduct research on the restoration and adaptive management of coastal ecosystems across the state.

Supporting early-career scientists

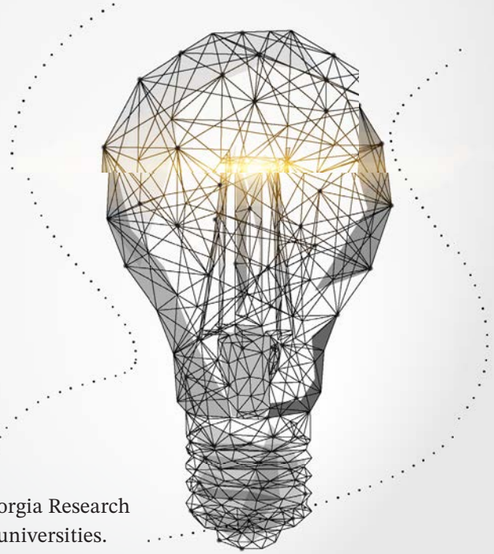
An adjacent effort, the Rising Tide Program equips early-career scientists with one-year fellowships focused on faculty mentoring and skills development for applying to competitive faculty positions.

"Rising Tide aims to help the College recruit scientists with professional or lived experiences in the Southeast — or who are focused on research with particular relevance to the Southeast," explains Program Director Alex Robel, Jean "Chris" Purvis Associate Professor in the School of Earth and Atmospheric Sciences. "One of our key goals is to bring more faculty to Georgia Tech who can contribute to research and teaching that are particularly relevant to communities in the state."

The inaugural Rising Tide cohort included seven fellows from several institutions — with research interests spanning nuclear physics, urban climate, resource recovery, machine learning, bioinformatics, and ecology.

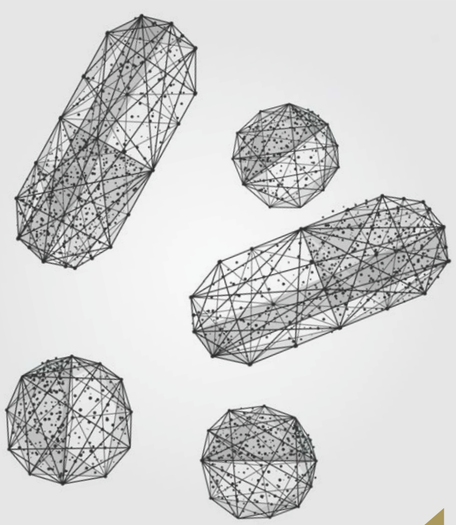
Supported by the College of Sciences Betsy Middleton and John Clark Sutherland Dean's Chair fund, a generous gift from Nathan Meehan (PHYS 1975), and the Office of the Provost. Stories by Selena Langner and Lindsay Vidal. Photo by Nick Hubbard. *The EcoCommons in the heart of Georgia Tech's campus.*

Georgia Research Alliance Funding Fuels Innovation



To accelerate scientific discovery and economic growth, the Georgia Research Alliance (GRA) strategically invests in Georgia's top research universities.

In the College of Sciences, GRA-funded initiatives are advancing discovery across a wide variety of disciplines — from foundational research to technologies with real-world impact. These efforts illustrate not only the far-reaching value of scientific investment but also the importance of supporting visionary researchers whose work is shaping a better future for Georgia and the world. The following examples highlight a few of the research projects made possible through GRA support.



Rapidly detecting antibiotic resistance

With funding from GRA's Innovation and Entrepreneurship program, TopoDX, a startup co-founded by School of Physics Associate Professor Peter Yunker, is developing a rapid diagnostic platform to transform how clinicians detect antibiotic resistance.

The technology — originating from fundamental biophysics research in Yunker's lab — uses an optical-based system to deliver accurate results in just four hours, which is significantly faster than traditional methods, and it can identify false positives that other tests often miss.

"We will keep pushing the envelope further while we try to commercialize the accomplishments that we have already made," he says.

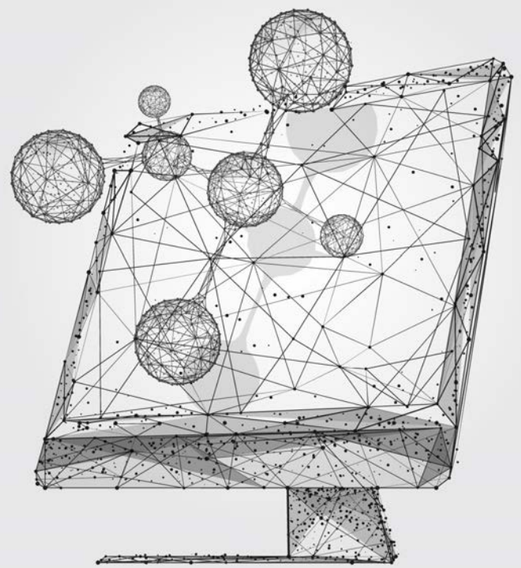
> IF YOU HAVE JUST ONE ANTIBIOTIC-RESISTANT CELL IN A HUNDRED CELLS, IT CAN CAUSE TREATMENTS TO FAIL.

Pioneering molecular electronics for smaller, more efficient computers

As silicon-based electronics approach their physical limits, Jason Azoulay, GRA Vasser-Woolley Distinguished Investigator in Optoelectronics and an associate professor in the Schools of Chemistry and Biochemistry and Materials Science and Engineering, is helping pioneer a new class of molecules that could offer groundbreaking material for computer chip creation. In collaboration with researchers from the University of Miami and the University of Rochester, Azoulay co-developed what may be the world's most electrically conductive organic molecule.

This breakthrough, published in the *Journal of the American Chemical Society*, could revolutionize molecular electronics by enabling faster, smaller, and more energy-efficient computing devices. Composed of stable, naturally abundant elements, the molecule conducts electricity with unprecedented efficiency — offering a glimpse into a future where organic materials power next-generation technologies like quantum computing.

Supported by GRA. Story by Laura Smith.



College of Sciences' GRA-Endowed Faculty

GRA initiatives, including eminent scholars, distinguished investigators, and senior fellows, bring renowned scientific talent to Georgia. These scholars are leaders in their fields — advancing discovery, mentoring the next generation of scientists, and contributing to Georgia's growing research ecosystem.

Vasser-Woolley Distinguished Investigator in Optoelectronics

Jason Azoulay, associate professor in the Schools of Chemistry and Biochemistry and Materials Science and Engineering

Eminent Scholar in Energy

Felix Herrmann, professor in the Schools of Earth and Atmospheric Sciences, Computational Science and Engineering, and Electrical and Computer Engineering

Vasser-Woolley Chair in Molecular Design

Lynn Kamerlin, professor in the School of Chemistry and Biochemistry

Eminent Scholar in Computational Systems Biology

Jeffrey Skolnick, Regents' Professor and Mary and Maisie Gibson Chair in the School of Biological Sciences

Eminent Scholar in Molecular and Cellular Biology

Marvin Whiteley, professor and Bennie H. and Nelson D. Abell Chair in Molecular and Cellular Biology in the School of Biological Sciences

Studying Wetlands — From Georgia Tech to Germany

This summer, Joel Kostka was awarded the prestigious Humboldt Research Award by the Alexander von Humboldt Foundation to assess the role of plant microbiomes in coastal marine ecosystem health and climate resilience. Kostka serves as Tom and Marie Patton Distinguished Professor and associate chair for Research in the School of Biological Sciences with a joint appointment in the School of Earth and Atmospheric Sciences.

The award's funding is supporting a research trip to Germany for up to a year — during which Kostka is collaborating with Professor Marcel Kuypers, director of the Max Planck Institute for Marine Microbiology (MPIMM) in Bremen, Germany — to investigate how microbiomes help coastal marine plants adapt to stress and keep them healthy. From there, he will investigate how plant microbiomes contribute to the carbon and nutrient cycles of coastal ecosystems — and how they contribute to ecosystem resilience.

One goal of the collaboration is to exchange information on two types of marine plants that dominate coastal ecosystems worldwide: those associated with seagrass meadows, which have been studied in Germany, and salt marshes, which have been Kostka's focus in Georgia.

Beyond supporting excellence in research, another key goal of the Humboldt Research Award is to support international collaboration — Kostka completed his postdoctoral research at MPIMM. His hope is that this project will deepen that collaboration. "I look forward to seeing what we can uncover about these critical systems while working together."

Supported by the Alexander von Humboldt Foundation. Story by Selena Langner. *Kostka's (left) research aims to increase the resilience of marsh ecosystems like this one (above) in southeast Georgia.*

Restoring and Protecting Georgia's Coast — With Oysters

Sarah Roney, a recent graduate of the Ocean Science and Engineering Ph.D. program and Brook Byers Institute for Sustainable Systems Graduate Fellow, has spent four years studying how strategically placing oyster reefs along Georgia's coast can benefit coastal living systems and the statewide economy.

Roney's doctoral thesis examined how much oyster reefs reduce the erosion caused by wave energy (ship wake) from water traffic. In addition, she sought to demonstrate a method for making young oysters resistant to predation, increasing their survival rates and that of the reef colonies they call home.

Her research focused on two major waterways in the Savannah area — the Intracoastal Waterway and the South Channel of the Savannah River — that are subject to erosive wave energy due to heavy ship and boat traffic. Roney chose one site in each waterway to place her reef structures, which were mesh bags of oyster shells seeded with young oysters. She found that constructed reefs dissipated 40% of the wave energy before it reached the marsh edge.

To improve adolescent oysters' chances of surviving to adulthood, Roney and her collaborators identified two compounds found in blue crab urine — trigonelline and homarine — that induce young oysters to devote more energy toward growing and strengthening their shells. After four to eight weeks of exposure to these compounds in hatchery conditions, the oysters' overall survival rate improved by 30% once placed in a reef.

Roney explains that this method may not only help constructed reefs become established — but may also help existing oyster reefs become more resilient by slowing, or reversing, their decline.

While coastal restoration projects are not new in Georgia, the techniques Roney developed are relatively novel. "Living shoreline strategies are less intensive and expensive to establish than traditional seawalls and are effective in reducing wave energy in waterways vulnerable to erosion," she adds.

Perhaps most significantly, these techniques restore the foundational functions of the ecosystems in which they are placed; the oyster reefs become nurseries, incubating fish, bird, plant, and crustacean species.

Over the course of the project, Roney worked with partners in the communities along Georgia's coast, including residents, business owners, citizen scientists, and students.

"The most rewarding part of the project has been seeing how many people are truly invested in our coastal resources and want oyster reefs to thrive," she says.

Supported by National Parks Service, and the University of Georgia Marine Extension and Georgia Sea Grant program. Story by Brent Verrill. *Advised by School of Biological Sciences Professor Marc Weissburg, Sarah Roney is restoring Georgia's coast with the help of oysters.*

Decades of Discovery

The long-term studies unlocking evolution's secrets.

From laboratory petri dishes to tropical islands, decades-long research programs are transforming our understanding of evolution, uncovering secrets that would remain hidden in shorter studies.

"Evolution is happening all around us — right now," says James Stroud, Elizabeth Smithgall-Watts Early Career Assistant Professor in the School of Biological Sciences. "To understand evolution, we need to watch it unfold in real time, often over many generations. Long-term studies give us a front-row seat to evolution in action."

Stroud is lead author of the first comprehensive analysis of these types of long-term evolutionary studies, published in *Nature*.

"While we can accelerate many aspects of scientific research today, evolution still moves at its own pace," says co-author Will Ratcliff, John C. and Leslie C. Sutherland Professor in the School of Biological Sciences and co-director of the Interdisciplinary Ph.D. in Quantitative Biosciences at Georgia Tech. "There is no technological shortcut for watching species adapt across generations."

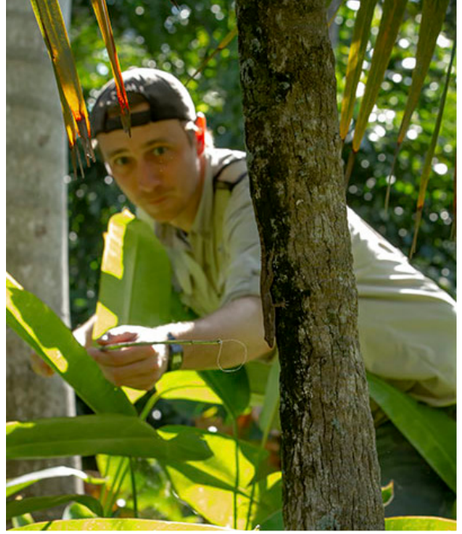
Stroud and Ratcliff are also among several teams at Georgia Tech operating their own evolutionary research programs. Together, they are leading the way in understanding life's past and predicting its future — leveraging not only advanced technology and new methods but also the simple power of time.

Florida's 'Lizard Island'

In South Florida, Stroud is documenting evolution in action on "Lizard Island," a football field-sized island with 1,000 lizards. By studying a five-species community, his research provides unique insights into how evolution maintains species' differences, and how species evolve when new competitors arrive. Now operating for a decade, it is one of the world's longest-running active evolutionary studies of its kind.

The Mountain Bird Network — and 'Tech Mountain'

A new Packard Fellowship is supporting Elizabeth Smithgall-Watts Early Career Assistant Professor Benjamin Freeman's most ambitious project to date: developing "Tech Mountain" in the tropics, a long-term project focused on surveying thousands of individual birds. From mountain slope to summit, he is tracking their motions, their nests and predators, where they live, eat, move, and die — and how this changes as temperatures warm. Freeman, who was named a 2025 Ecological Society of America Fellow, also leads the Mountain Bird Network, which supports community scientists conducting bird surveys on their local mountains.



Fiji fieldwork

For over 17 years, Julia Kubanek, a Regents' Professor in the School of Biological Sciences and vice president for Interdisciplinary Research at Georgia Tech, has conducted field expeditions to the South Pacific — with the goal of exploration, conservation, and development of marine biodiversity in Fiji and the Solomon Islands.

These decades of study have given an unprecedented window into how marine systems shift over time, and Kubanek's work characterizing the unique antimicrobial defenses of algae already shows promise for treating human disease.

9,000 generations of research

In his lab at Georgia Tech, Ratcliff studies the origin of complex life — specifically how single-celled organisms become multicellular. The work has shown how key steps in the evolutionary transition from single-celled organisms to multi-celled organisms occur far more easily than previously understood. His Multicellularity Long-Term Evolution Experiment (MuLTEE) on snowflake yeast has run for more than 9,000 generations with aims to continue for the next 25 years. It has become one of the longest-running evolution experiments.

Tech's fossil hunters

At "Fossil Fridays" in Associate Professor Jenny McGuire's lab, community members are finding fossils up to 30,000 years old. Gathered by McGuire's team in Wyoming's Natural Trap Cave, the bones provide a historic view into how populations and animals have changed over time. McGuire, who holds joint appointments in the Schools of Biological Sciences and Earth and Atmospheric Sciences and also serves as Harry and Anna Teasley Professor in Ecology, is using these paleontological specimens in conjunction with modern ones to identify strategies that conserve as much biodiversity as possible given rapidly shifting climates.

Stories by Selena Langner. *Clockwise from top left: Stroud, Freeman, Kubanek, McGuire, and Ratcliff are leading long-term evolutionary studies.*

Mapping the Mission

Research that helps Georgians thrive

Atlanta Science Festival

Loren Williams, a professor in the School of Chemistry and Biochemistry, demonstrated how temperature affects pressure using balloons during Georgia Tech's Celebrate STEAM event. More than 5,000 people attended the celebration, which kicked off the 2025 Atlanta Science Festival. *Photo by Audra Davidson.*

Researching BioLab's chemical plume

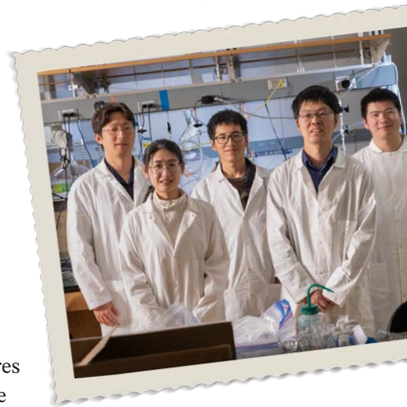
Greg Huey, a professor in the School of Earth and Atmospheric Sciences, collected real-time air chemistry data following the fire at the BioLab chemical manufacturing facility on September 29, 2024. Huey received a National Science Foundation Rapid Response Research grant to analyze the data — aiming to inform communities potentially impacted by the fire's chemical plume and improve responses to future chemical incidents. *Photo by Greg Huey.*

Developing regional critical mineral resources

During a spring workshop, Yuanzhi Tang, Georgia Power Professor in the School of Earth and Atmospheric Sciences and School of Civil and Environmental Engineering, shared an update on the Growing Resilience for America's Critical Mineral Economy initiative that seeks to facilitate the development of regional critical mineral resources. She also serves as the director of the Center for Critical Mineral Solutions that was launched with the support of a seed grant from the College of Sciences and focuses on sustainable solutions for critical energy minerals.

Studying aerosols' chemical composition

Rodney Weber, a professor in the School of Earth and Atmospheric Sciences, developed an instrument that collects water-soluble aerosol particles, grows them in water droplets, and analyzes their composition. He uses this tool to study the chemical composition of aerosols, how chemical alterations can affect their toxicity and visibility, and their potential impact on human health and the environment. *Photo by Chris McKenney and courtesy of Georgia Tech researchers.*



Ice-core drilling to analyze past air quality

School of Earth and Atmospheric Sciences Assistant Professor Pengfei Liu and his research team are collaborating with the Desert Research Institute to analyze historic aerosol data from ice cores and simulate how aerosols move from an emission source into the polar region. The work aims to improve climate models and predictions. *Photo by Chris McKenney and courtesy of Georgia Tech researchers.*

Unearthing sustainable agriculture solutions

Chris Reinhard, an associate professor and Georgia Power Chair in the School of Earth and Atmospheric Sciences, is testing methods like enhanced weathering on farms across the planet. The technique involves spreading fine-grained rocks, like basalt, over land to accelerate the natural carbon dioxide removal process.

Story by Lindsay Vidal.

Sequencing Georgia Tech's Most Recognizable Insect

What makes a yellow jacket tick — or sting? A research team led by Mike Goodisman, a professor and associate chair in the School of Biological Sciences, is finding out by sequencing the genomes of two local species: *Vespula squamosa* (southern yellow jacket) and *Vespula maculifrons* (eastern yellow jacket). "The genome is fundamental for a lot of questions that we ask," Goodisman says.

The study explores how genetic differences shape colony behavior, caste roles, and even parasitic takeovers — like when southern queens hijack eastern nests. The team hopes the data will unlock secrets behind supercolonies, seasonal survival, and the evolutionary quirks of these charismatic, if occasionally aggressive, insects.

Supported by NSF. Story by Steven Gagliano. Photo by Alejandro Santillana. *The southern yellow jacket can often be found on Georgia Tech's campus.*

> THE GENOME IS FUNDAMENTAL FOR A LOT OF QUESTIONS THAT WE ASK.

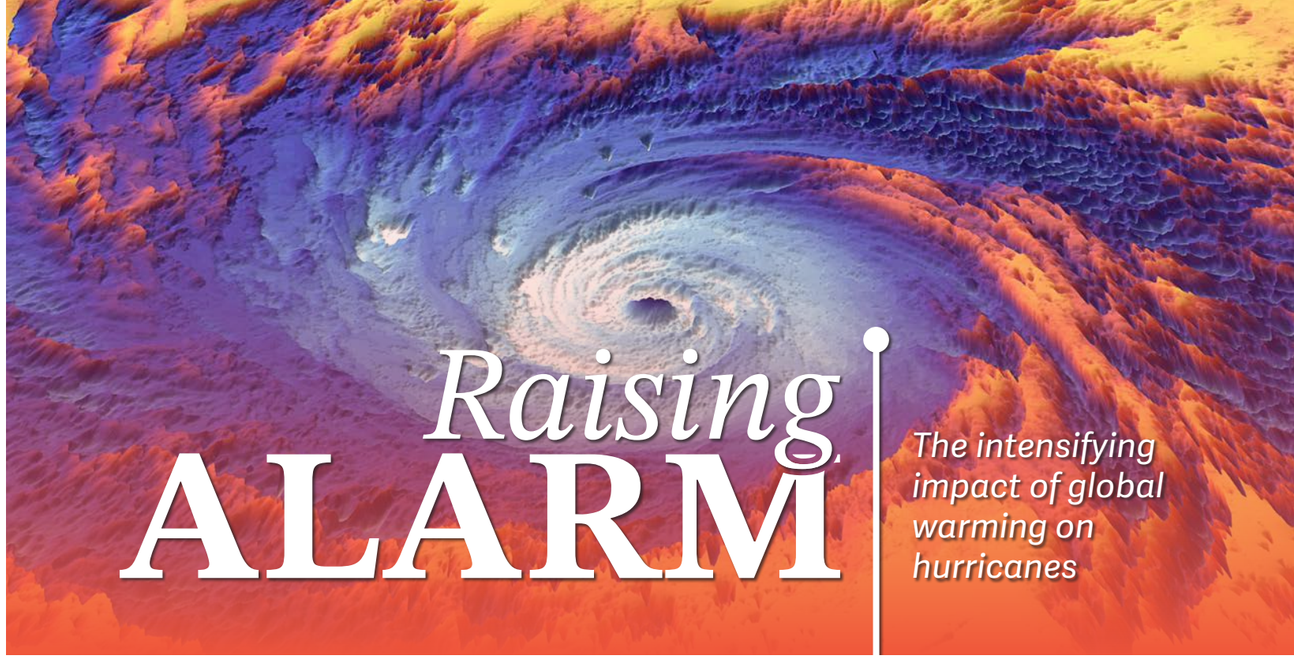
Students Develop Coral-Cooling Design

> THIS CHALLENGE SHOWED US THE POWER OF COLLABORATION AND THE POTENTIAL FOR INNOVATION IN CONSERVATION.

Ocean Science and Engineering Ph.D. students David Clark, Skylar Lama, Luisa Lopera, and Kelly Lumpkin developed a creative way to prevent coral reef bleaching as part of the National Marine Sanctuary Foundation's Coral Reef Thermal Stress Design Thinking Challenge and Workshop. The team's ocean-cooling design focused on artificial upwelling, a process that draws cooler, nutrient-rich water from deeper ocean layers to the shallower reef.

"Our backgrounds in ocean science, engineering, and biology complemented each other on this project," says Lama. "This challenge showed us the power of collaboration and the potential for innovation in conservation."

Story by Dhanesh Amin. *Coral bleaching, which happens when ocean waters heat up, can lead to disease and death for coral, wiping out critical and complex marine ecosystems.*



Raising ALARM

The intensifying impact of global warming on hurricanes

As global temperatures and oceans continue to warm, the frequency of major hurricanes is projected to increase. Extreme hurricanes in recent years are raising alarms about the intensifying impact of global warming on tropical cyclone behavior — and how to better prepare communities.

Driving forces of rapidly intensifying storms

Less than two weeks after Hurricane Helene's devastating impact last fall, Hurricane Milton became one of the most rapidly intensifying storms on record as it went from barely hurricane strength to a dangerous Category 5 storm in less than a day.

School of Earth and Atmospheric Sciences (EAS) Assistant Professor Ali Sarhadi and Senior Academic Professional Zachary Handlos were published in *The Conversation* explaining how hurricanes like Milton can rapidly intensify and what global climate change has to do with it. Rapid intensification is difficult to forecast, but there are several driving forces: ocean heat, low wind shear, moisture, and thunderstorm activity.

Building 'landslide-ready' communities

EAS Assistant Professors Frances Rivera-Hernández and Karl Lang alongside K. Harrison Brown Family Chair and Professor Rafael Bras recently led an effort to gather data about landslides caused by hurricanes hitting Puerto Rico.

Joined by students, their goal was to create a national center for the study of geohazards "with Georgia Tech as the lead institution," says Bras, who holds a joint appointment in EAS and the School of Civil and Environmental Engineering.

"We can use this data to better prepare communities," explains Rivera-Hernández. "We also worked to develop 'Landslide Ready,' which can educate the public on what to do if a landslide does happen."

Supported by NSF and the Heising-Simons Foundation. Story by Lindsay Vidal. Images by NASA (above) and Frances Rivera-Hernández. *Graduate students (left to right) Sharissa Thompson, Tatiana Gibson, and Dru Ann Harris sampled water in Puerto Rico.*

Machine Learning Is Revolutionizing Climate Science

Exponential growth in big data and computing power is transforming climate science, and machine learning (ML) is playing a critical role.

"What is happening within the field is revolutionary," says School of Earth and Atmospheric Sciences Professor Annalisa Bracco, who currently serves as a senior scientist at The CMCC Foundation (Euro-Mediterranean Center on Climate Change). "ML is allowing us to study the physics of climate in a way that was previously impossible."

Bracco is the lead author of a review paper published in *Nature Reviews Physics*. The result of an international collaboration, it shows that ML is driving change in three key areas: accounting for missing observational data, creating more robust climate models, and enhancing predictions, especially for weather forecasting and phenomena like El Niño.

The research also underscores the limits of artificial intelligence — and how researchers can work to fill those gaps. For example, ML can help fill in missing data points, creating a more robust record for researchers to reference. However, like patching a hole in a shirt, this works best when the rest of the material is intact. This means that "to keep advancing, we need scientists who can determine what data we need, collect that data, and solve problems," Bracco says.

Supported by NSF, European Research Council, Office of Naval Research, U.S. Department of Energy, European Space Agency, and Choose France Chair in Artificial Intelligence. Story by Selena Langner. Photo by NOAA. *Researchers launch a lightweight, balloon-borne instrument to collect data.*

Our Universe

From Georgia to the Galaxy — and Beyond

This year, students helped test an instrument custom-built to explore Venus' clouds, researchers led the way in black hole imaging, and an alumni-led lander mission gathered data on the Moon — and that's just the start of it.

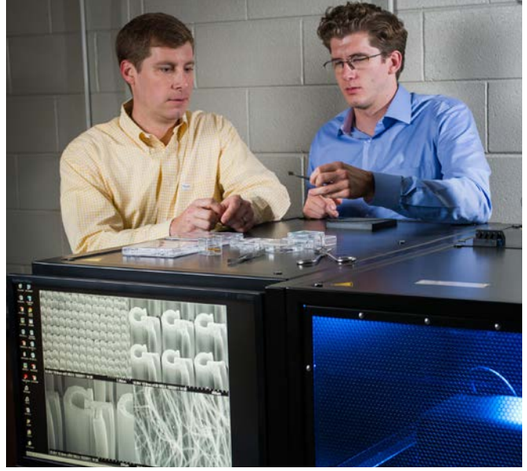
Landers weren't the only thing that launched. On campus, new astrophysics and astrobiology programs were introduced, and Georgia Tech launched a new Interdisciplinary Research Institute: The Space Research Institute (SRI).

The hub for all things space-related at Georgia Tech, SRI connects the Institute's schools, colleges, research institutes, and labs to lead statewide and worldwide conversations about space. W. Jud Ready, a principal research engineer in Georgia Tech Research Institute's Electro-Optical Systems Laboratory, will serve as the inaugural executive director.

"With the launch of the SRI, we're uniting interdisciplinary experts to take on some of humanity's most profound questions," says Executive Vice President for Research Tim Lieuwen. "Georgia Tech's research institutes are about advancing knowledge — and using it to improve lives, inspire future generations, and help shape a better future for us all."

> WITH THE LAUNCH OF THE SPACE RESEARCH INSTITUTE, WE'RE UNITING INTERDISCIPLINARY EXPERTS TO **TAKE ON SOME OF HUMANITY'S MOST PROFOUND QUESTIONS.**

Photo by the Georgia Tech Astronomy Club. Members of the Georgia Tech Astronomy Club traveled to the Deerlick Astronomy Village in Crawfordville, Georgia to observe the galaxy.



New astrophysics major, minor

A new B.S. in Astrophysics is launching in the School of Physics. The major focuses on the future of astronomy and astrophysics, especially in the era of discoveries made by the James Webb Space Telescope and the Laser Interferometer Gravitational-Wave Observatory. A Minor in Astrophysics will be offered starting Summer 2026.

The Astrophysics Major and Minor — which will replace the existing concentration and certificate, respectively — reflect a new chapter in the history of astrophysics education and research at Georgia Tech.

While astronomy coursework and outreach have long existed at the Institute, astrophysics officially began in 2008 when the School of Physics launched the Center for Relativistic Astrophysics (CRA). Today, the CRA boasts more than a dozen faculty and research scientists with expertise spanning high-energy astrophysics, extrasolar planets, gravitational-wave astronomy, and astroparticle physics.

New astrobiology minor

The new Minor in Astrobiology welcomed its first enrolled students this fall. Open to all undergraduates at Georgia Tech, the minor will teach students about physical and chemical conditions for the development of a habitable planet. It will also explore Earth, space, and planetary science; the origin and evolution of life on Earth; and the critical evaluation of scientific issues related to astrobiology in media and popular culture.

The foundation of the new minor is the popular School of Earth and Atmospheric Sciences (EAS) course EAS 1601: Habitable Planet. Led by EAS Assistant Professor Frances Rivera-Hernández, the course enrolls up to 300 students a semester.

"Students from a lot of different majors enjoy 1601 because they get a true sense for the broadness of astrobio — stars, galaxies, biology, life beyond Earth, and how we create technology and science to explore those places," Rivera-Hernández explains.

The new minor builds on a plethora of astrobiology options: Georgia Tech's Center for Astrobiology was launched in 2010 and also includes the Astrobiology Graduate Certificate Program, Astrobiology Fellows, and ExplOrigins young researcher group.

The Center for Astrobiology is now supported by the new SRI and co-directed by Rivera-Hernández and EAS Assistant Professor Christopher E. Carr, who holds a primary appointment in the Daniel Guggenheim School of Aerospace Engineering.

The offerings are designed to help students explore astrobiology according to their interest, says EAS Jean "Chris" Purvis Professor Jennifer Glass, who co-directs the Astrobiology Graduate Certificate Program and the new Astrobiology Minor.

"Whether you're curious about Foundations of Life, want to dive deep into Earth, Space, and Other Worlds, or are exploring career ideas for Astrobiology in a Wider World, we've built a home for you in these astrobio courses at Tech," she says.

Stories written by Jess Hunt-Ralston and Lindsay Vidal. *W. Jud Ready next to alumnus Graham Sanborn (left photo) as well as Jennifer Glass (right photo) are two of many faculty at Georgia Tech leading a new frontier in space research and education.*

The Mathematics of 'Space Storage Spots'

School of Mathematics Professor Anton Leykin has been awarded a prestigious Simons Fellowship for his proposal of applying nonlinear algebra to tackle Smale's sixth problem — one of the key mathematical questions of the 21st century. Leykin is one of two mathematicians in the School awarded the fellowship, and he is joined by Associate Professor Benjamin Jaye.

The mathematical problem — known as "Smale's sixth problem" — involves understanding the number of ways celestial bodies can be arranged in space to stay at relative equilibrium, growing neither further apart nor closer to each other as they orbit.

Leykin is also collaborating on a separate but related project with aerospace departments around the country to understand the trajectories of spacecraft that could be affected by the gravitational pull of the Moon and Earth.

The mathematics developed for this type of problem could help teams place small spacecraft near a Lagrangian point — a space "storage spot" where it would remain stationary relative to the Earth. For example, the James Webb Space Telescope was placed at one of these points where it conveniently stays in Earth's shadow — avoiding the bright light and heat of the Sun, Earth, and Moon.

"Even with our current technology, there are no easy solutions," Leykin says. "Smale's sixth problem is about acquiring more theoretical knowledge. Discovering something on the theoretical front can be of practical importance for applied scientists — and for designing missions going far into the solar system."

Supported by the Simons Foundation. Story by Selena Langner.

> DISCOVERING SOMETHING ON THE THEORETICAL FRONT CAN BE OF PRACTICAL IMPORTANCE FOR APPLIED SCIENTISTS — AND FOR **DESIGNING MISSIONS GOING FAR INTO THE SOLAR SYSTEM.**

A Mars Volcano ‘Hidden in Plain Sight’ Could Help Date Mars — and Its Habitability

New research is showing that a long-overlooked mountain on the rim of Jezero Crater — where NASA’s Perseverance Rover is currently collecting samples for possible return to Earth — is likely a volcano. Called Jezero Mons, it is nearly half the size of the crater itself and could add critical clues to the habitability and volcanism of Mars, transforming how we understand Mars’ geologic history.

For first author Sara C. Cuevas-Quiñones, who completed the research as an undergraduate during a summer program at Georgia Tech, it also underscores the importance of research programs for undergraduates. “This was my first time conducting research,” she says. “It was fascinating to learn how different data sets could be used to decode the origin of a landscape. After Jezero Mons, it became clear to me that I would continue to study Mars and other planetary bodies.”

The team included corresponding author Professor James Wray and Assistant Professor Frances Rivera-Hernández (School of Earth and Atmospheric Sciences), alongside Jacob Adler, then a postdoctoral fellow at Georgia Tech and now an assistant research professor at Arizona State University.

“This makes Jezero more interesting than ever,” says Wray, who first noticed the mountain’s volcanic features in 2007. “We have the confluence of incredible sedimentary rocks — which could be from a habitable region — alongside volcanic rocks with important scientific value.” If returned to Earth, volcanic rocks can be radioisotope dated, providing an unprecedented window into the geologic history of the planet.

The take home message? “Mars is the best place we have to look in our solar system for signs of life, and thanks to the Perseverance Rover collecting samples in Jezero, the United States has samples from the best rocks in the best place on Mars,” Wray says. “If these samples are returned to Earth, we can do incredible, groundbreaking science with them.”

Story by Selena Langner. Photo by NASA. *NASA’s Perseverance Rover drives up to the rim of Jezero Crater.*

From Mars to the Stars

Studying the interstellar object 3I/ATLAS.

This July, the comet 3I/ATLAS was seen streaking past the orbit of Jupiter. The surprise? It wasn’t from the solar system.

3I/ATLAS is the third known interstellar object (ISO) to visit the solar system: In 2017, a long, oddly shaped asteroid called *‘Oumuamua* passed by Earth, and less than two years later, a second ISO was discovered.

“ISOs provide a unique opportunity to explore other solar systems without leaving our own,” says James Wray, a professor in the School of Earth and Atmospheric Sciences. “Studying these objects could give us incredible insight into extrasolar planets and how our planet fits into the universe.”

Wray, who primarily studies the geoscience of Mars, is uniquely situated to study 3I/ATLAS. This summer, he was awarded a Simons Foundation Pivot Fellowship — one of the most prestigious sources of funding for cutting-edge research — to conduct pioneering ISO research.

“This new interstellar object will pass closer to Mars than to Earth, so we can potentially make key observations of it with the very Mars cameras I have worked on for decades,” he shares.

In addition, Wray will work alongside collaborators including Karen Meech, a professor of the University of Hawai‘i who led the paper characterizing *‘Oumuamua*, to conceptualize what a mission to intercept a future ISO with spacecraft might look like.

“I want to understand how planets got to be the way they are and if they could have ever hosted life,” Wray says. “ISOs could be the key to imminent breakthroughs in understanding our place in the galaxy.”

Supported by the Simons Foundation. Story by Selena Langner. Art by NASA. *Artist’s rendition of* ‘Oumuamua *at the edge of the solar system.*

In a Very Close Galaxy

From Arizona deserts to salty Canadian lakes, Georgia Tech researchers are using Earth analogs to understand space — and life on this planet.

Gayathri Murekesan (left) and Amanda Stockton (right) sampling in Iceland.

Amanda Stockton, an associate professor in the School of Chemistry and Biochemistry, develops tools that can survive harsh space conditions — like those on Mars or Europa. To design these tools, she says, researchers need to better understand what these extreme environments are like. This is where Earth analogs come in: Stockton has studied the Orca Basin at the bottom of the Gulf of Mexico and the Western Australia Transient Lakes, and has sifted through volcanic sand in Iceland.

> THIS CAN HELP US ANSWER **HOW LIFE ON EARTH ORIGINATED.**

Water's presence on a planet is often a key indicator of life, and while planets like Mars haven't had abundant surface water in millennia, the salt remaining on their surfaces may suggest they were once habitable. School of Earth and Atmospheric Sciences (EAS) Professor James Wray, Assistant Professor Frances Rivera-Hernández, and Emmy Hughes (Ph.D. EAS 2025), a postdoctoral researcher, are studying Mars' craters in search of evidence of salty deposits. Hughes is also exploring salty lakes in British Columbia, applying the same techniques researchers use on Mars to analyze terrestrial data against Mars' findings.

"Salts on Mars' surface would have formed through the evaporation or freezing of a brine, and this brine required some amount of water to be present," she says. "This could help us answer how life on Earth originated and how extensive life is throughout our solar system."

Emmy Hughes and researchers in British Columbia.

Georgia Tech students Tatiana Gibson (left) and Alivia Eng (center) collaborate with Marion Nachon (right) from Texas A&M University. Photo by Courtney Flatt/Northwest Public Broadcasting.

Frances Rivera-Hernández, an assistant professor in the School of Earth and Atmospheric Sciences, studies sedimentary rocks on planets like Mars to extrapolate what their climates were like in the past. The rocks, collected by NASA's Curiosity Rover, can help determine how much liquid water Mars once had, how and where it was distributed, and whether those environments were suitable for life.

Rivera-Hernández uses the same instruments to study places on Earth with environments comparable to Mars' past. "Ultimately, we want to better understand Earth, and the best way to do that is to understand its differences from other planetary bodies," she says.

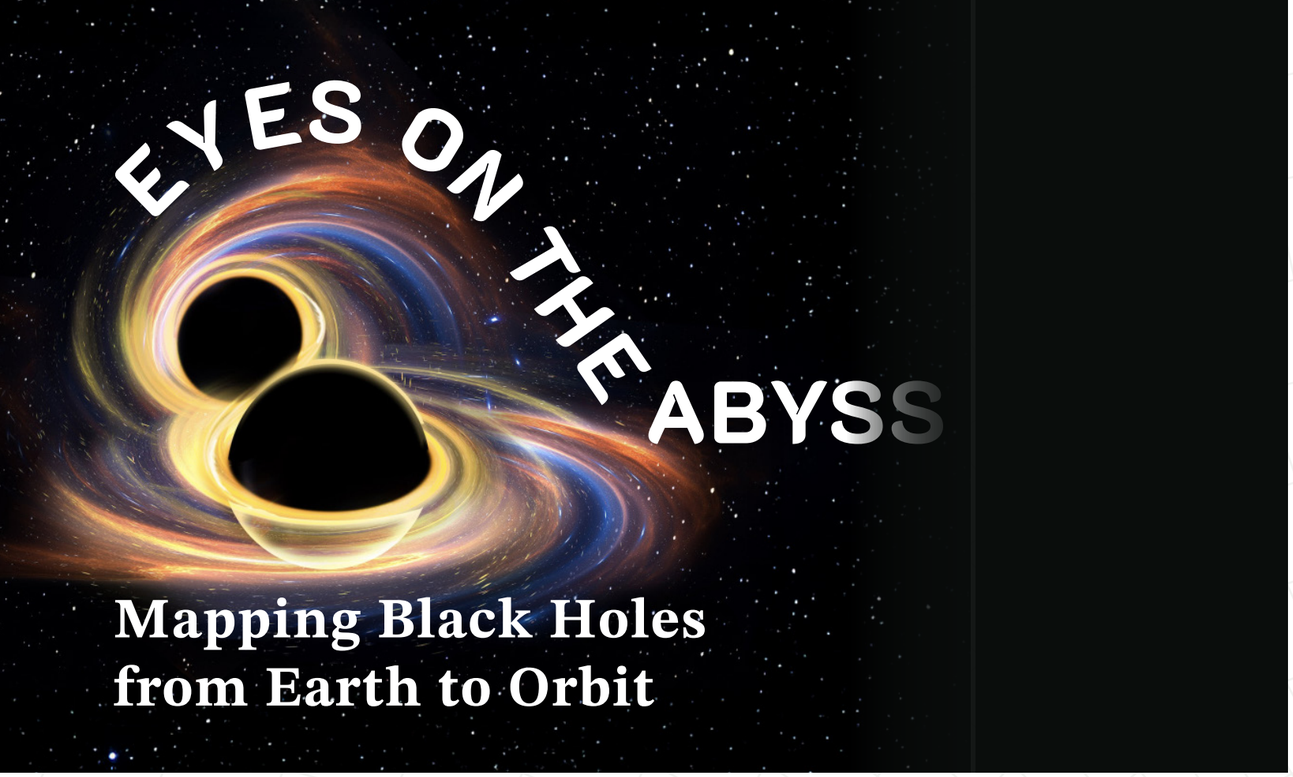
Jennifer Glass, Jean "Chris" Purvis Professor in the School of Earth and Atmospheric Sciences, studies bacteria crucial to Earth's chemical cycles and how those chemical cycles create conditions that lead to life. Her lab focuses on the greenhouse gases that microorganisms produce and consume, such as methane, which can form ice-like structures under the seafloor and possibly on distant planets. If these gas signatures could indicate life here, then they also might on other planets.

"If we are going to find another planet that is teeming with life, it would be outside of our solar system," says Glass. "That would fundamentally change humanity's perspective on our place in the universe."

Story by Tess Malone.

School of Earth and Atmospheric Sciences Ph.D. student Lea Adepoju holds sediments that contained methane hydrates beneath the seafloor near Oregon. Ocean Science and Engineering Ph.D. student Claire Elbon (center) and Jennifer Glass look on. Photo by Rob Felt.

> **ULTIMATELY, WE WANT TO BETTER UNDERSTAND EARTH**, AND THE BEST WAY TO DO THAT IS TO UNDERSTAND ITS DIFFERENCES FROM OTHER PLANETARY BODIES.



Mapping Black Holes from Earth to Orbit

LIGO detects most massive binary black hole to date

The Laser Interferometer Gravitational-Wave Observatory (LIGO)'s LIGO-Virgo-KAGRA (LVK) collaboration recently detected GW231123, the largest binary black hole merger ever seen with gravitational waves — a phenomenon that occurs when two black holes are pulled into each other's orbit and combine.

Before merging, both black holes were spinning exceptionally fast, and their masses fell into a range that should be very rare — or impossible.

"Most models don't predict black holes this big can be made by supernovas, and our data indicates that they were spinning at a rate close to the limit of what's theoretically possible," says Margaret Millhouse, a research scientist in the School of Physics who played a key role in the research.

The findings challenge current theories on how smaller black holes form, says School of Physics Assistant Professor and LIGO collaborator Surabhi Sachdev. "Black holes from supernovae can weigh up to about 60 times the mass of our Sun," she says. "The black holes in this merger were likely the mass of *hundreds* of suns."

To find black holes, LIGO measures distortions in spacetime — ripples that are created when two black holes collide. While the signal for GW231123 lasted for just one-tenth of a second, seeing it at both LIGO Observatories — placed in Hanford, Washington and Livingston, Louisiana — was critical. "These short signals are very hard to detect, and this signal is so unlike any of the other binary black holes that we've seen before," Sachdev explains. "Without both detectors, we would have missed it."

"GW231123 is a record-breaking event," says School of Physics Professor Laura Cadonati, who has been a member of the LIGO Scientific Collaboration since 2002. "LIGO has been observing the cosmos for 10 years now, and this discovery underscores that there is still so much that this instrument can help us learn."

This August, LIGO released new data revealing 128 new possible detections — providing another window into how this exceptionally heavy black hole might fit into the universe.

A space-bound black hole imaging mission

While LIGO collects gravitational wave data from the ground, a new mission is aiming to take a different kind of black hole imaging to space. Scientists from Georgia Tech, Georgia Tech Research Institute, NASA, and 10 universities from around the world convened to plan the launch of the Space-based Precision Millimeter Interferometry Telescope (SPRITE) project.

The proposed NASA Medium-Class Explorer mission would build on the groundbreaking achievements of the Event Horizon Telescope (EHT), a network of ground-based telescopes able to synchronize observations from around the globe.

With the EHT ground system, "we've run out of Earth," says Professor and Chair of the School of Physics Feryal Özel, SPRITE's principal investigator and a well-known astrophysicist instrumental in EHT's success. "SPRITE will send two telescopes into orbit."

Unlike Earth-based telescopes, which rely on the planet's rotation to change viewing angles, SPRITE's telescopes will rotate independently across space with data continuously transmitted from the satellites to ground stations.

"I like to think of it as an MRI machine rotating around a patient," explains Özel. "In space, our telescopes can perform this orbital dance from great distances — giving us multiple perspectives of a black hole and allowing us to build a much more complete image."

The team aims to create more images of previously unseen black holes, confirm binary black holes through visual imagery, and study the hot gas dynamics around black holes.

If selected by NASA, SPRITE is expected to launch in the mid-2030s, marking the beginning of a new era in space imaging.

Supported by NSF. Stories by Selena Langner and Laura Smith. Art by Raul Perez and Davis Newell. An illustration of the binary black hole merger GW231123.

Launching the AI4Science Center

The new AI4Science Center will use state-of-the-art artificial intelligence (AI) and machine learning (ML) techniques to address complex scientific challenges — combining expertise and resources from various disciplines to foster the creation of robust, reusable AI tools and methods that can be used across scientific domains.

"AI and ML have the potential to revolutionize scientific discovery, but there is a clear need for foundational research centered on AI/ML methodologies and application to scientific problems," says Dimitrios Psaltis, a professor in the School of Physics who uses complex computer simulations to investigate black holes and to test them with the theory of general relativity.

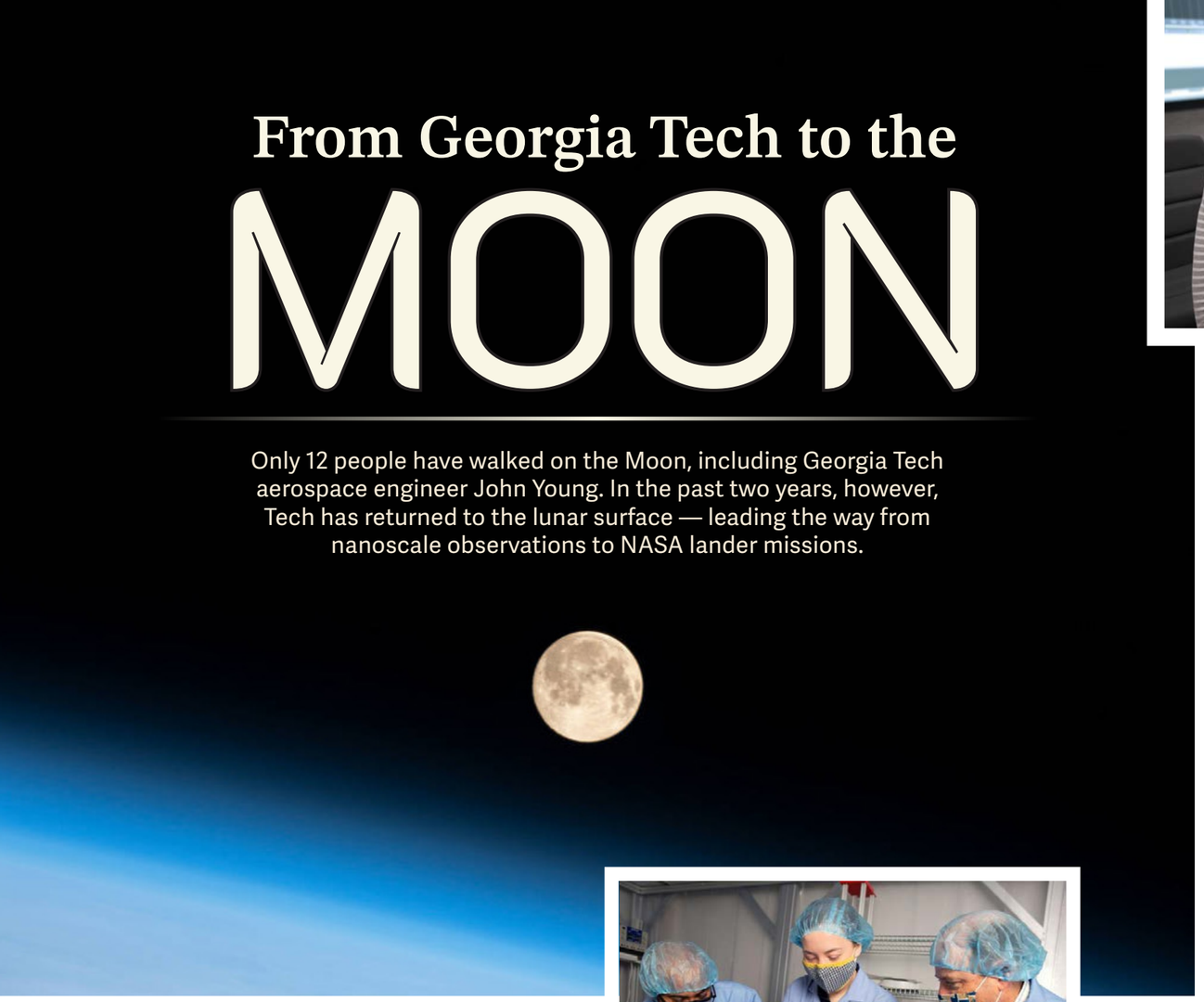
Psaltis will co-lead the center alongside Molei Tao, a professor in the School of Mathematics, and Audrey Sederberg, an assistant professor in the School of Psychology — building on the leading research in the sciences and AI/ML at Georgia Tech.

The College's seed grant program, created in 2024, will fund the center for three years, starting in fiscal year 2026. The AI4Science Center is the third initiative to be seeded by this program.

Story by Lindsay Vidal.

From Georgia Tech to the MOON

Only 12 people have walked on the Moon, including Georgia Tech aerospace engineer John Young. In the past two years, however, Tech has returned to the lunar surface — leading the way from nanoscale observations to NASA lander missions.



Shining a lunar flashlight

Right now, about 70 million miles away, a Ramblin' Wreck from Georgia Tech streaks through the cosmos. It's a briefcase-sized spacecraft called Lunar Flashlight that was assembled in a Georgia Tech Research Institute cleanroom in 2021, then launched aboard a SpaceX rocket in 2022.

The plan was to send Lunar Flashlight to the Moon in search of frozen water. Mission control for the flight was on Georgia Tech's campus with students sitting in the figurative driver's seat — working to coax the craft toward its intended orbit in coordination with NASA's Jet Propulsion Lab (JPL).

Issues with the propulsion system kept the CubeSat from reaching the Moon, but this disappointment opened new opportunities for students: when it was clear that Lunar Flashlight would settle into orbiting the Sun, JPL turned over ownership to the Institute. Georgia Tech is now the only higher education institution that has controlled an interplanetary spacecraft.

An alumni-led lunar mission

This March, NASA'S PRIME-1 (Polar Resources Ice Mining Experiment) mission landed on the Moon with the goal of analyzing lunar samples and investigating how viable living on and mining from the Moon could be.

Two Georgia Tech alumnae, Jackie Williams Quinn and Janine E. Captain, led the PRIME-1 team for NASA. Quinn, a civil engineering Ph.D. graduate, wrote the initial proposal. She also managed the development of the space-rated drill TRIDENT (The Regolith Ice Drill for Exploring New Terrain) through a contract with Honeybee Robotics and Honeybee's Jameil Bailey, a fellow Tech alumnus, to ensure it was built to operate in harsh lunar environments.

Captain, a chemistry Ph.D. graduate, led the MSOLO (Mass Spectrometer Observing Lunar Operations) team, testing the mass spectrometer in a Hawaiian volcano and ensuring it could analyze TRIDENT's soil samples for water and other critical volatiles in the vacuum of space.

At Georgia Tech, Regents' Professor Thom Orlando and Senior Research Scientist Brant Jones in the School of Chemistry and Biochemistry leveraged data from experiments in ultra-high vacuum chambers to determine how water interacts with lunar soil. From there, they created a theoretical model that simulated how much water they might find from what PRIME-1 sampled.

Although the ATHENA lander ended up on its side during the landing, the mission wasn't a loss. While PRIME-1 couldn't drill into the Moon, TRIDENT and MSOLO still functioned and gathered important data from the lunar atmosphere.

The mission is already proving pivotal to future NASA endeavors. "The fact that PRIME-1 was fully functional is pretty amazing," Captain says. "All this work we did was worth it."

Lunar research at the nanoscale

New NASA-funded research is revealing the possible role of space weathering in forming some of the water on the Moon, along with possible risks to human space missions.

Researchers spatially mapped a lunar sample at the nanoscale while analyzing optical signatures of Apollo lunar samples from different regions of the lunar surface — extracting information about the chemical composition of the lunar surface and radiation history.

"It's the first time these tools have been applied to space-weathered lunar samples, and it's the first we have been able to see good signatures of space weathering at the nanoscale," says Thom Orlando, who is also the principal investigator of Georgia Tech's Center for Lunar Environment and Volatile Exploration Research, a NASA Solar System Exploration Research Virtual Institute.

The Georgia Tech team partnered with the University of Georgia (UGA) Nano-Optics Laboratory, led by Professor Yohannes Abate, which has expertise in nano-FTIR spectroscopy and nanoscale imaging techniques that have historically been used to address condensed matter physics problems. The collaboration with the UGA team enabled high-resolution chemical and structural characterization of the lunar grains down to approximately 10 nanometers.

At this scale, "you can learn a lot about how the atom positions change and how they are disrupted due to radiation," says Orlando. Changes in the optical signatures helped the team understand how the lunar surface formed and evolved but also provided "a really good idea of the rocks' chemical composition and how they changed when irradiated," he explains.

Some of the optical signatures also showed trapped electron states, which can help determine the radiation history of the Moon. Trapped electrons can lead to an electrostatic spark, which could be a problem for astronauts, exploration vehicles, and equipment.

The next research phase will involve combining the UGA analysis tools with a new tool from Georgia Tech that will be used to analyze Apollo lunar samples, which have been in storage for over 50 years.

PRIME-1 is supported by NASA. Stories by Jason Maderer, Tess Malone, and Anne Wainscott-Sargent. Photos by NASA (main and above) and Candler Hobbs (left).

Glenn Lightsey and students work on Lunar Flashlight (left). Janine E. Captain and Jackie Williams Quinn participate in simulation training for PRIME-1 (above).

Life in Our Universe

The chemistry of life

A new study published in *Nature Chemistry* is shedding light on the prebiotic processes that may have led to life on Earth.

"Our research applies concepts from evolutionary biology to chemistry," explains study co-lead Loren Williams, a professor in the School of Chemistry and Biochemistry. "Chemical evolution is chemistry that keeps changing and doing new things," he says. "We wondered if we could set up a system that does this by oscillating between wet and dry conditions."

In nature, these systems might look like a landscape where water condenses and then dries out, over and over again — conditions that arise naturally from the day-night cycles on Earth. The study's results suggest that environmental factors like this played a key role in shaping the molecular complexity needed for life to emerge.

"This research offers a new perspective on how molecular evolution might have unfolded on early Earth," says co-lead author Moran Frenkel-Pinter, an assistant professor at The Hebrew University of Jerusalem. "This is experimental evidence that may help bridge the gap between prebiotic chemistry and the emergence of biological molecules."

Supported by NSF, NASA, the Azrieli Foundation, the Israel Science Foundation, the Minerva Foundation, and the FEBS Foundation. Story shared jointly with The Hebrew University of Jerusalem newsroom. Photo by USGS.

In the Painted Desert of Northern Arizona (shown here in a colorized palette of purples), wet-dry cycling has contributed to the formation of the colorful layers visible in the landscape.

Unraveling prehistoric proteins

Every organism on Earth is made up of proteins, and ancient proteins may hold important clues to how life originated.

For years, evolutionary biochemists assumed that ancient proteins emerged from a simple signature called a motif — a tiny protein giving rise to entire families. However, new research led by Georgia Tech suggests that the famous motif was not unique, but rather one of many possible signatures with similar properties.

"This work completely reshapes how we think about proteins," says Lynn Kamerlin. What was assumed to be a building block of early life is probably just a fossil fragment — and not the complete picture.

Kamerlin, a professor in the School of Chemistry and Biochemistry and Georgia Research Alliance Vasser-Woolley Chair in Molecular Design, co-led the team alongside Liam Longo, an associate professor at the Institute of Science Tokyo in Japan.

The research, which has implications ranging from biotechnology to understanding the origin of life, raises a host of new questions: when did this motif become dominant, and what else could life have looked like?

Supported by the Knut and Alice Wallenberg Foundation, the Okinawa Institute of Science and Technology Graduate University, the Cabinet Office, Government of Japan, and the National Academic Infrastructure for Supercomputing in Sweden. Story by Tess Malone.

> THIS WORK **COMPLETELY RESHAPES** HOW WE THINK ABOUT PROTEINS.

Looking for life in Venus' clouds

A Georgia Tech-led research team recently braved an erupting volcano to test an instrument that was custom-built to explore Venus' clouds. The research is part of Rocket Lab's 2026 mission that, if successful, will mark the first private spacecraft to reach Venus and the first U.S. mission to study its sulfuric acid-filled clouds in nearly 40 years.

Called VENUSIAN (Volcanic Emission iNvestigation Utilizing Single-particle In-situ Automated Nephelometry), the project is led by Christopher E. Carr, an assistant professor in the Daniel Guggenheim School of Aerospace Engineering with a joint appointment in Earth and Atmospheric Sciences. His team tested the instrument near the Kīlauea volcano, which is located in Hawai'i Volcanoes National Park on the Big Island, alongside collaborators from the Massachusetts Institute of Technology, the University of Colorado Boulder, and Droplet Measurement Technologies.

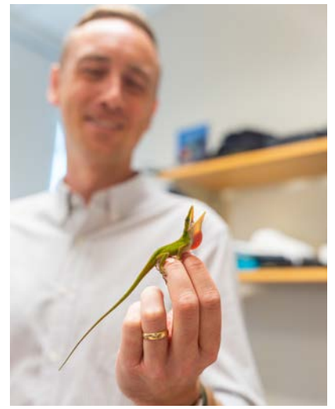
The goal is to measure the size and composition of Venus' aerosols — tiny particles that make up clouds. By looking at individual particles within the planet's atmosphere, researchers hope to learn about other compounds that could exist, including organic molecules that could influence a carbon cycle.

"The differences between Earth's and Venus' atmospheres have forced our whole team to look at how we approach astrobiology completely differently," Carr says. And with Georgia Tech overseeing all field tests, it has also given students an opportunity to test and model hardware that will fly in space. "As a first-year student, this has been a great introduction — getting my feet wet in what future space missions might look like and, more broadly, what the engineering test cycle looks like," says Violet Oliver, a student overseeing ground sampling tests.

For Carr, the more he studies Venus, the more interesting it becomes. "Is there life in the clouds of Venus? I don't think so, but if it's there, I want to find it."

Supported by NASA. Story by Anne Wainscott-Sargent.

Our Impact



College of Sciences Surpasses Campaign Goal

Sciences is the first Georgia Tech College to reach its target, exceeding a $75 million campaign goal.

The College of Sciences has exceeded its $75 million campaign target, raising $78 million and counting as part of the Institute's historic philanthropic effort, Transforming Tomorrow: The Campaign for Georgia Tech.

"Achieving this milestone reflects the generosity and deep commitment of our alumni, donors, and friends to advancing science education and research," says Susan Lozier, dean of the College of Sciences and Betsy Middleton and John Clark Sutherland Chair. "We are energized by this momentum and grateful to everyone who has supported us through investment in our success as we continue to fundraise for key priorities such as endowed faculty positions, graduate fellowships, undergraduate scholarships, and innovative teaching and experiential learning."

"This early success highlights the foundational and essential role of the sciences," adds College of Sciences Director of Development Dan Warren.

The funds raised are already making a meaningful impact across the College, supporting students, faculty, and research. New programs made possible in the College by Transforming Tomorrow include the Student Transfer Enrichment Program, which helps transfer students thrive through academic support, social engagement, and leadership development, as well as the Rising Tide Program, which helps recruit and mentor early-career scientists. Also noteworthy is the enhanced Career Education Program, which connects students with alumni and career opportunities.

Story by Laura Smith. To learn more or make a gift to the College of Sciences, contact Dan Warren, director of Development for the College of Sciences, at dan.warren@cos.gatech.edu.

STEP Eases Transfer Transition

The new Student Transfer Enrichment Program (STEP) helps transfer students adjust — and thrive — within the College of Sciences.

Lewis Wheaton, a professor in the School of Biological Sciences and director of the Center for Programs to Increase Engagement in the Sciences (C-PIES), oversees the program.

"STEP allows us to focus on the unique needs of a growing population at our College — ensuring they feel connected and understand all the opportunities afforded to them at Georgia Tech," says Wheaton. "I am thankful to the College of Sciences Advisory Board who stepped up to help fund and build this program that will positively impact many of our students."

As a pilot program, STEP provides academic support, social engagement, and leadership development to the more than 150 undergraduate students who transfer into the College of Sciences each year.

STEP student Suzanne Sewell, a chemistry major from Milton, Georgia, transferred from Auburn University to receive in-state tuition and participate in undergraduate research.

"Taking part in STEP's welcoming environment and meeting other transfer students made me feel like I wasn't on my own, trying to adjust to a new school and classes," explains Sewell.

Stepping up

Students are first introduced to STEP through GT 2000, a one-credit-hour class led by College of Sciences Programs Director Lea Marzo.

In addition to weekly discussions and special events, activities focus on how to acclimate to the Institute, including free academic tutoring in core science and math classes.

After they finish the GT 2000 class, STEP students are paired with peer mentors.

Colin Stephenson, a biochemistry major with a pre-med focus, hopes his personal experience helps others.

"Becoming a STEP mentor felt like something I could do to ensure newer transfer students wouldn't have to stumble through challenges alone," says Stephenson.

STEP is open to any student transferring into the College of Sciences. On-campus housing is not required, but students can opt to live in Explore, the College of Sciences living learning community.

Story by Laura Smith. *STEP mentors (left photo) provide valuable guidance and advice about navigating life at Georgia Tech. Above, C-PIES Director Lewis Wheaton (left) and College of Sciences Programs Director Lea Marzo (right) pose with STEP students.*

The Scientific Method of Success

Is there a perfect formula for business success? For many College of Sciences alumni, the answer lies in science fundamentals, particularly the scientific method.

Navigating the startup landscape

Thomas Kim, BCh 1992, is president and CEO of two life science startups. His company, EpiVario, aims to develop treatments for preventing relapse in drug and alcohol addiction and PTSD.

"The entire startup company process can be construed as an exercise in the scientific method," says Kim. "You start with preclinical data and a thesis on how that translates to human disease, then pressure test everything. Not everything works the first time — or even the 50th time."

He points to the scientific method as foundational in making crucial business recommendations. "Whether you're responsible for research and development or company strategy, it's a key skill to take deep analysis and translate it into quality decision-making."

For Kim, the work is personal: "I feel fortunate to work in a field where our efforts can improve human lives."

From lab to leadership

Maureen Metcalfe, M.S. BIO 2014, worked full-time at the Centers for Disease Control and Prevention while earning her master's degree in biology at Georgia Tech. Her Alzheimer's research in Professor Ingeborg Schmidt-Krey's laboratory involved over 600 failed experiments.

"I lived the scientific method, especially the test-your-hypothesis part," says Metcalfe.

Those failures taught her resilience, time management, and the ability to make informed decisions — skills vital to her consulting career at Deloitte.

"Almost every time there is a problem on a client project, I rely on certain aspects of the scientific method, such as observation, research, data analysis, or testing," says Metcalfe.

The perseverance she developed in the laboratory has helped her complete complicated client projects: "Science gives you the skill set to keep asking questions and not accept a failure or setback."

Building career success

Christa Sobon, M.S. PSY 1996, has spent more than 30 years leading programs that drive business success.

"I've been able to use elements of the scientific method in every place I've worked," says Sobon. "It equips you with critical thinking skills and promotes an effective approach to tackling challenges."

When bringing a product to market, she emphasizes the importance of data. "We gather data in terms of understanding customer pain points, then create a new product designed to solve that particular problem."

Sobon explains that they rarely stick the landing on the first try.

"We refine, test in the market again, and iterate until we launch a successful product — basically a mini-version of the scientific method," she adds.

Sobon is a strong believer in a scientific education: "Skills rooted in science enable individuals to analyze complex problems, develop innovative solutions, and make data-driven decisions, all of which are essential in business today."

Story by Laura Smith.

> **SCIENCE GIVES YOU THE SKILL SET TO KEEP ASKING QUESTIONS** AND NOT ACCEPT A FAILURE OR SETBACK.

Shriners Children's to Establish Research Institute at Science Square

The Shriners Children's Research Institute is establishing a new pediatric medical research facility in Science Square Labs — the Southeast's premier life sciences district — investing more than $153 million into the facility and creating 470 new jobs. The nonprofit healthcare system will be positioned across from Georgia Tech's North Avenue Research Area.

"Georgia Tech is excited to welcome Shriners Children's to Science Square," says Tech President Ángel Cabrera, M.S. PSY 1993, Ph.D. PSY 1995. "We developed Science Square to create a leading hub for life sciences research and innovation, and Shriners' decision to be here will accelerate our progress to drive medical innovation, create high-impact jobs, and greatly strengthen Atlanta's thriving innovation ecosystem."

Serving as a multidisciplinary innovation hub that is focused on advancing healthcare for children, the institute's areas of research will include cell and gene therapies, robotics, artificial intelligence, medical devices, biologics, and data informatics.

Georgia Tech's proximity and research strengths were key factors in the decision to locate Shriners Children's in Atlanta. Projected to be the largest tenant of Science Square, Shriners Children's would put the facility at 82% occupancy, and this addition further establishes the district as a hub for global innovation and community impact.

Welcoming more research labs to Science Square

In addition to the Shriners Children's Research Institute, seven cutting-edge medical and biomedical research labs from Georgia Tech and Emory University are relocating to Science Square. "We hope others will join us to continue Atlanta's evolution into a global hub for medical breakthroughs," adds Cabrera.

Story by Siobhan Rodriguez.

Young Alumni Board

Established in 2024, the College of Sciences launched its Young Alumni Board to deepen the relationship between recent graduates and the College. The volunteer-based leadership group partners with the College's External Advisory Board and Friends of the Sciences to engage its community and support its strategic plan.

The inaugural Young Alumni Board consists of 13 members who obtained an undergraduate degree from the College within the last 20 years or a master's or Ph.D. degree from the College within the last 10 years. The Board recently elected Riana Burney (BCh 2015) as the first chair and Sathya "Sat" Balachander (Ph.D. BIO 2018) as the first co-chair.

"I am incredibly excited to be the inaugural chair of the Young Alumni Board," says Burney. "We will serve as a bridge between current students and young alumni — fostering mentorship, engaging our community, and driving new perspectives and initiatives to create networks that extend beyond graduation."

Among the board requirements, members support the Dean's Excellence Fund and participate in regular meetings. Each member will serve a three-year term.

"Joining the Young Alumni Board was a chance to give back to a community that deeply invested in me while at Georgia Tech," says Austin Hope (PSY 2014), who serves as a people partner at Google.

Chair

Riana Burney
B.S. Biochemistry 2015
Senior Laboratory Analyst, The Coca-Cola Company

Co-Chair

Sathya "Sat" Balachander, Ph.D.
Ph.D. Biology 2018
Licensing Associate, Emory University

Members

Stephen Crooke, Ph.D.
Ph.D. Chemistry 2018
Head of Virology - Global Clinical Immunology, Sanofi

Ralph Cullen
M.S. Psychology 2011
B.S. Psychology 2008
Quantitative Research Manager, Etsy

Alison Graab
B.S. Earth and Atmospheric Sciences 2008
Senior Vice President, The Alpine Group

Austin Hope
B.S. Psychology 2014
People Partner, Google

Hannah Liu
M.S. Bioinformatics 2017
Senior Manager, Data Analysis, Natera

Anita Mohammad, Ph.D.
B.S. Psychology 2012
Founder and CEO, ZenEdge Coaching

Piper Rackley
M.S. Biology 2023
B.S. Biology 2022
Technology Analyst, Timber Technologies

Kristel Topping, Ph.D.
Ph.D. Applied Physiology 2021
Principal Researcher, Home Depot

Yusuf Uddin, Ph.D.
Ph.D. Biology 2018
B.S. Biology 2012
Head of Talent, KdT Ventures

Megen Wittling
B.S. Biology 2018
M.D./Ph.D. Candidate, Emory University

Ashley Zuniga
B.S. Biochemistry 2014
Director, Project Management, GeoVax Labs, Inc.

External Advisory Board

The College of Sciences Advisory Board provides guidance to the Dean and administrators on priorities and directions for science education and research. Board members are from the private and public sectors and academia, including alumni and other individuals interested in the success of the College and Georgia Tech.

Chair

Jeffrey S. Hurley, Ph.D.
Ph.D. Chemistry 1992
M.S. Chemistry 1990
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