Patrons of Physics Fellows Society

The personal stories of graduate fellowship recipients are shared in person and in writing at the Society's 19th anniversary dinner.

by Danielle Forde

Yadira Gaibor is a graduate student and recipient of a Whiteman Fellowship.

My family is from Ecuador, and I grew up there, too. Up until high school, there had been little to no opportunity to be involved in science. The first time I encountered physics, I was completely fascinated by it. I could see myself doing it as a career.

Yadira Gaibor

However, there were limited options in my country. Most people who studied physics were high school teachers and academia did not have a lot of support. So, I decided to move to the United States for my undergraduate degree.

As an undergraduate, I decided to do research and absolutely loved it. I worked on various projects with people from all over the country. I presented at conferences, wrote a paper, and got more involved with the academic community. I was president of our physics club, and I encouraged my peers to do research and helped with advancing their careers. We also did a significant amount of science outreach to K–12 students. Graduate school seemed like the natural next step for me, and that is how I got to MIT.

Graduate school has been a challenging experience so far. After going through the uncertainty of moving to a new city, I had to adapt to a new learning environment. However, the people I have found in the physics program have made this much better. The program has also been a great opportunity to expand my research frontiers. I am now working with George Ricker (Senior Research Scientist, MIT

Kavli Institute for Astrophysics and Space Research) on binary evolution and compact objects, like black holes and white dwarfs.

The Whiteman Fellowship has allowed me to focus on my studies and research without having to worry about finances or the time constraints of being a teaching assistant. This flexibility has allowed me to present at prestigious conferences and to have time to work on an upcoming publication.

I am also involved with the physics mentoring program to help undergraduates at MIT and to give back to our academic community. I hope to continue following my passion for research and science education.

I am sincerely grateful for your generous contributions and honored to have received this fellowship. I truly appreciate the support you have provided to our program and to the advancement of scientific efforts. I want to thank you for being part of my positive experience at MIT.

Gregorio de la Fuenta Simarro
is a graduate student and recipient of a Whiteman Fellowship.

I am a first-year graduate student in the MIT Department of Physics. Thank you so much for funding my graduate studies here at MIT. Your generosity has given me an incredible opportunity to pursue cutting-edge research in the field of two-dimensional quantum materials. To show you who you are supporting, I would like to tell you a bit about myself and my current research.

I was born in Boston, but I moved to Spain with my family at an early age. As a little child, I loved to "design" computers using pencil and paper, determined to come up with a new model of my own. I remained amazed by the inner workings of modern technology from then on. Years later, while in high school, I became passionate about physics and problem solving, and I gained an early exposure to physics research.

Knowing that US universities offer unique research opportunities to undergraduates in physics, I decided that I wanted to return to the US for college. I was fortunate to be accepted into Cornell University, where I learned about materials that have unusual, fascinating properties due to quantum mechanics, also known as quantum materials. After graduating in 2023, I came to MIT to be on the cutting edge of known experimental probes of quantum materials.


Gregorio de la Fuenta Simarro

For my PhD research, I am working in the lab of Pablo Jarillo-Herrero (Cecil and Ida Green Professor of Physics) in experimental condensed matter physics. Throughout my first year, I have learned advanced techniques to fabricate and characterize two-dimensional devices based on a quantum material known as graphene. Currently, I am searching for an exotic state known as superconductivity in a structure of four layers of graphene that are twisted with respect to one another. Also, I am interested in developing new ways to change the electronic properties of graphene devices *in situ*.

Outside of the lab, I have been involved in mentorship programs and student associations on campus. Last semester, I signed up for PhysGAAP, a program run by physics graduate students to reduce the barrier for application to the MIT Physics PhD program. During several weeks, I mentored two prospective applicants who lacked institutional resources to apply, and provided feedback on their statement of objectives, their resumes, and their personal statements. Also, I became the treasurer of Spain@MIT, a student association that aims to disseminate Spanish culture and the work of Spanish scientists on campus.

After completing my PhD, I plan to pursue a postdoctoral position to continue research in experimental condensed matter physics with the goal of starting my own group as a faculty member. But, for now, I am very excited to see what will come next in my doctoral research, and I would like to thank you again for supporting my work here at MIT.


Sofia Alvarez Lopez

Sofia Alvarez Lopez is a graduate student and a recipient of the Frank Fellowship.

I am a first-year graduate student in the MIT Department of Physics supported by your fellowship. I would like to express my deepest gratitude for your generosity and for funding my graduate studies here at MIT! I am extremely grateful to know that I can pursue my passion for astrophysics without concerns about funding.

I grew up in Bogotá, Colombia, in a loving and caring family that always prioritized my education and my siblings' education. I completed my undergraduate degree in physics and computer science, *summa cum laude*, at Universidad de los Andes in 2023. When I took my first physics class in university, I was immediately captivated by the subject, and my excitement drove me to pursue research opportunities beyond the classroom. I had the opportunity to explore many different research projects, ranging from biophysics to high energy physics. Eventually, I discovered a fascinating topic that combines my love for physics with my training in computer science: gravitational-wave astrophysics! Gravitational waves are ripples in space and time that originate from violent astrophysical events, and they can be measured by LIGO, the Laser Interferometer Gravitational-wave Observatory.

During the summer of 2022, I was awarded an internship to do a summer research project in the group of Jess McIver, assistant professor at the University of British Columbia, Canada, as part of the LIGO Scientific Collaboration. Under her supervision, I devised a state-of-the-art machine learning model–GSpyNetTree–to distinguish true, astrophysical signals measured by LIGO from noise originating from Earth.

Right after this project, I was convinced I wanted to pursue graduate studies in the US. I was very fortunate to be accepted into MIT, one of the best places in the world to study gravitational-waves, and to be supported by your fellowship. I cannot express how grateful I was when I was told

I was being awarded your fellowship! I was very excited that I would be able to pursue my passions at MIT without any financial concerns.

I came to MIT eager to discover more about the physics of gravitational waves. As a first-year student in Prof. Salvatore Vitale's group, I am using gravitational-wave signals to study the populations of binary black holes and neutron stars in our Universe. Population studies have the potential to unveil the formation and evolution pathways of these astrophysical systems. Currently, we are working on developing novel parameter-agnostic population models to mitigate the biases that arise from the fact that all known gravitational wave detections represent only a small subset of the total gravitational-wave-emitting events in the Universe. There is no other place like MIT Physics to answer these questions. During my PhD, I want to continue refining and applying these models to discover fascinating new astrophysical phenomena.

Beyond the lab, outreach and community engagement are an important part of my life at MIT. As a Latina, I aspire to shed light on the scientific contributions of women, particularly Latinas, and foster the interest in science among Hispanic/Latino communities in the US and in Latin America through mentorship and outreach programs. Last semester, I joined GWIP (Graduate Women in Physics), and was a mentor for PhysGAAP (Physics Graduate Application Assistance Program). For PhysGAAP, I mentored two prospective applicants to MIT Physics (both from Colombia) and provided feedback on their application materials over the course of several weeks. I also joined LGSA, the Latinx Graduate Student Association, and I'm planning to run for a board position for the next academic year.


Swati Ravi

Everything I've done here at MIT has been possible thanks to your kindness and generosity. It is an honor to have received this prestigious fellowship, and I am infinitely thankful since it has given me the flexibility to pursue my passion for GWs while making my transition from Colombia to MIT all the easier. I am very grateful to be doing the research I love, in one of the best places in the world. Your generosity in funding my studies has contributed to making my first year a wonderful experience. Thank you again, Dr. Frank!

Swati Ravi is a graduate student and a recipient of the Barish Weiss Fellowship.

I am a first-year PhD student in the MIT Physics Department supported by the Weiss Fellowship. I am writing to extend my utmost gratitude for the support of your fellowship in my graduate education.

I grew up in the suburbs of Dallas, Texas, where my love of outer space was born from family trips to the Johnson Space Center in Houston and seeing the stunning images taken by the Hubble Space Telescope. I spent my school days building rockets out of two-liter soda bottles for my Science Olympiad team and taking physics classes, where I marveled at the fact that the natural laws that dictated the motion of entire galaxies were the same laws that described

a tossed baseball. Growing up as the daughter of Indian immigrants to the US, I didn't see very many people like me in the field of astrophysics and space technology, but it was through the financial support of fellowships that I was able to accomplish my ambitions of studying astrophysics and aerospace engineering through a diverse range of research experiences.

I completed my undergraduate education in astrophysics at Columbia University, where through the support of a four-year undergraduate fellowship—the Science Research Fellowship—I was able to conduct research in mechanical engineering to design tools to help astronaut spacewalks; in civil engineering to test hardware for spaceflight; in biological sciences to fly bacteria to the International Space Station, to study how they developed antibiotic resistance; and in astrophysics, where I modeled distant galaxies to understand the composition of stars inside of them.

After graduating, I earned the Mitchell Scholarship to complete my master's degree in Ireland at University College Dublin where I worked on characterizing detectors to fly on a small Cube Satellite and to study the highest-energy gamma-ray light coming from cosmic explosions in the distant universe.

When I finally came to MIT, this wide variety of research experiences helped me greatly narrow my research interests to studying the energetic universe through building and using space-based telescopes. But to my surprise, there was more than one lab working in this niche subsection of astrophysics here at MIT.

The support of your fellowship has allowed me the financial freedom and flexibility to coordinate a lab rotation between two different research groups. Performing a rotation has allowed me to learn from multiple research projects before finding the best-fit single project to focus my doctoral research on. My rotation in the fall semester with Dr. George Ricker involved my testing the capabilities of new telescope imaging technology to help build the optics for a future satellite studying Gamma Ray Bursts—highly energetic cosmic explosions. My rotation this semester with Dr. Herman Marshall uses a technique called polarimetry to study how the X-ray light coming from highly energetic objects like neutron stars and black holes oscillates to help us understand levels of detailed structure and geometry of these objects never studied before.

This year I have already co-authored two papers as a Tier-1 contributor, submitted to the *Astronomy and Astrophysics* journal. In the first of these papers, I looked at polarized light from a neutron star in a binary system with a "normal" (main sequence) star to understand the structure and geometry of the neutron star's winds and gas. My analysis revealed that the polarization direction of the light changed dramatically over the course of two days, indicating that the axis that the neutron star is spinning might be offset from the axis that the neutron star is orbiting the other star in the binary. In the second of these papers, I performed the first observation of polarized X-ray light from the Squid Galaxy, specifically the galaxy's central black hole. The observation demonstrated that light was oscillating in a direction perpendicular to the jet of material spit out by the black hole, allowing us to calculate the angular width of the donut-shaped torus of gas and dust surrounding the black hole to within a five-degree uncertainty—unprecedented precision in our understanding of the structure of these objects.

I recently had the honor of hearing you speak in our first-year seminar class. Your story of Prof. Jerrold Zacharias giving you the chance to work in his atomic beam laboratory and kickstarting your career mirrors much of my own experience at MIT. Before arriving here at MIT, I had never worked in the field of X-ray polarimetry,

which I now study, but the fellowship support allowed me a foot in the door to begin learning from world-class mentors. I am inspired and humbled by your career in pushing the boundaries of astrophysical detectors, and I hope to spend my own doctoral studies at MIT building an X-ray polarimetry detector that can observe polarized X-ray light from black holes and neutron stars in a wider energy range previously unstudied.

I am grateful for the opportunity to study questions about the universe, such as black-hole and neutron-star structure, that humble and awe me each and every day, and this opportunity would not have been possible without the generosity of your fellowship support. Thank you for continuing the legacy of Prof. Zacharias in supporting my graduate education and countless others in this generation of young astrophysicists.

SUPPORT THE MIT DEPARTMENT OF PHYSICS

The MIT Department of Physics strives to be at the forefront in every field where new physics can be found. By constantly pushing the limits, we have a chance to observe new general principles and to test theories of the structure and behavior of matter and energy.

We invite you to join us on this journey with your financial support. Please consider a gift on behalf of the MIT Department of Physics. As important as outright gifts are to the Department, deferred gifts and other tax planning approaches can often make a more substantial gift possible. Gifts in any amount to the Physics Department unrestricted fund provide the discretionary funds necessary to start new experiments and new science.

Attracting the best graduate students to work with our faculty continues to be our highest priority. We have established the **Patrons of Physics Fellows Society** to recognize friends of the Department who have made it possible for us to recruit the very best graduate students. A commitment of $100,000 or higher will make you a member of this society. You will receive updates from the named graduate student you are supporting and be invited to the annual Patrons of Physics Fellows Society dinner.

With your help, we will continue to understand the deepest aspects of nature, perhaps even the origins of space, time, and matter. To make a gift, or for more information on making a gift, please contact:

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