GIANT LEAPS

by Sandi Miller

The MIT Leadership and Professional Strategies and Skills Training (LEAPS) program is a two-part class providing guidance to graduate students and postdocs for careers in science.

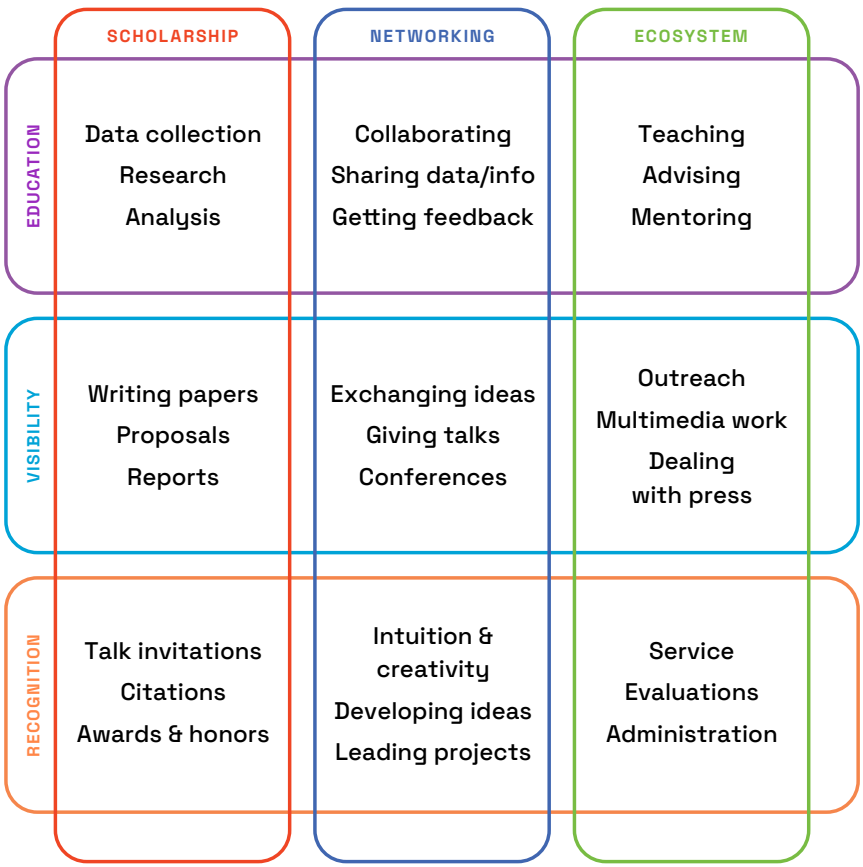
There's a reason why graduate students and postdocs sign a confidentiality agreement for the leadership and professional career development training class hosted by the Physics Department, but governed by "Las Vegas rules"—What's shared in LEAPS stays in LEAPS.

Stories are shared about misunderstandings, career flubs and "bad behavior." A grad student confesses that feedback on their work has them feeling like a child being scolded. A professor's communication style leaves one woman scientist believing that her opinions and thoughts don't matter. A student is anxious when an advisor expects him to write an abstract by himself. A physics grad student admits to hating writing; when a LEAPS mentor breaks the news that a physics career requires it, she realizes it's time to switch to computer science.

The class isn't therapy. It's LEAPS, short for LEAdership and Professional Strategies and Skills Training, a two-part class that aims to help STEM-centric graduate students and postdocs at MIT navigate their science careers and work more effectively with others.

"I think introspection is very important for every scientist," says LEAPS co-founder and Professor of Physics **Anna Frebel**. "Part of this is teaching them to learn about

Professional Strategies and Skills: Career Success Matrix



Developed by Prof. Anna Frebel, the matrix is used in the LEAPS course. Using the nine sectors of this matrix, participants learn about the unspoken landscape of academia and skills required to succeed in a STEM career. This matrix is designed to chart career goals, assist advisors with setting learning expectations for group members, and discuss career aspirations. *Courtesy of Anna Frebel.*

themselves on their own. We are not therapists, but we do talk about hard stuff. When things get too personal, we pass people on to MIT's resources." On the other hand, LEAPS was born because there wasn't such a class for any emerging MIT scientists interested in leadership development.

LEAPS ahead

LEAPS emerged from the experiences of two longtime STEM-centric mentors. **Anna Frebel**, an astrophysicist and professor of physics at MIT, and **Angeliki Diane Rigos**, program manager for MIT's Center for Enhanced Nanofluidic Transport, and associate director for Graduate Programs at MITEI, were introduced to each other in 2019. For years, Frebel and Rigos had been teaching leadership and career development training in addition to their full-time jobs when they decided to collaborate. They wished to

promote excellence in teaching and research "by teaching students and postdocs those career skills that are typically not talked about or taught but badly needed," says Frebel. The program would involve extensive implementation strategies and discussions about respect, inclusion, collaboration and mentorship in the workplace.

Frebel and Rigos worked with the Dean of the School of Science, the ICEO office, and the Associate Provost to launch LEAPS as the 2020 pilot program, "Special Topics in Physics." This spring 2022, LEAPS was listed officially in MIT's course catalog.

ABOVE:
Dr. Angeliki Diane Rigos.

BELOW:
Professor of Physics Anna Frebel.

Credit (both): Rose Lincoln Photography

Students take these new concepts back to their research labs and classrooms. They reflect on their relationship with advisors and colleagues, learn about job searches and negotiation tactics and map out their careers. These lessons not only fill a void for many seeking career advice and leadership preparation, they provide students with a training ground to create boundaries and seek self-awareness.

"LEAPS grew out of a desperate need to soft skill-educate scientists," says Frebel. "I don't think there's any semester-long leadership program that is geared toward emerging STEM scientists anywhere in the U.S. that is taught by actual scientists. We have attended the weeklong leadership programs, the brief summer workshops, the weekend workshops. By having this training over the course of an entire semester gives everyone a chance for the lessons to stick."

And this is leadership training with a scientific twist. "Leadership is the "car," and we're taking it apart, every little screw. We care about how the motor functions," says Frebel.

Adds Rigos, "These students are so smart, but they have been observing leadership unconsciously. Now they are consciously analyzing what is going on."

The leadership evolution of Felix Knollmann

Second-year physics grad student **Felix Knollmann**'s research explores the potential of integrated photonic devices to scale-up readout, control and networking of trapped ions for future quantum computing and quantum sensing applications. He is building a cryogenic ion trapping testbed for photonic integration under Prof. Isaac Chuang's Quanta Group at the MIT-Harvard Center for Ultracold Atoms, and for Dr. John Chiaverini's Quantum Information and Integrated Nanosystems Group at MIT Lincoln Laboratory.

Knollmann supervises several UROPS; assists a senior photonics grad student to build and program an automated photonic device tester; is a member of the Physics Values Committee; and is an advocacy chair on the Physics Graduate Students Committee. After serving as an 8.02 mentor, he realized that as a leader and collaborator, he could benefit from LEAPS.

Knollmann took this year's 8.397, "Developing your Leadership Competencies," which he credits for helping him to communicate more clearly, work more effectively with others, create a group vision and network more. He said that a leadership lesson by LEAPS co-founder **Angeliki Diane Rigos** focused on the importance of communicating a vision. "I realized that I had not explained the broader context of our experiment to the UROP student I was mentoring. Since then, I have taken time to delve into the motivation and timeline of our experiment."

LEAPS has helped Knollmann learn the "soft skills" that are often taken for granted by many busy students and postdocs. "We can say all we want about the objectivity of our work, but to work successfully with others it is extremely helpful to empathize with and attempt to understand people," he says. "I have sometimes felt that my misjudgment of someone's emotional state led to a worse outcome for the project I wanted assistance on."

Knollmann adds, "The LEAPS class makes me reflect on the group dynamics at play in my various circles and assess the leadership styles of the people I report to. Talking to lots of other students and postdocs in the small group discussion gives me a wider perspective on the different approaches to leadership in science and the cultural differences between departments."

Physics PhD candidate Felix Knollmann. Credit: Rose Lincoln Photography

Dominika Durovcikova's leadership journey

After receiving her master's degree in physics at the University of Oxford, **Dominika Durovcikova** successfully applied to the MIT Physics doctoral program, only to find herself back home in Slovakia during the extended lockdown. She says that LEAPS not only provided an interactive classroom experience, it also "offered some academia-specific perspectives that I found intriguing."

Durovcikova says she is putting her leadership lessons into action as a second-year graduate student in astrophysics, and as an officer in the Physics Graduate Student Council. She also leads GAGA

(Grads Advising Graduate Admission), which was formed in response to the MIT graduate students' Strike for Black Lives recommendations in 2020.

"The content on effective communication is something that I'm definitely using in my everyday life, especially when it comes to communicating with people who think differently than I do. I am also more alert to other people's and my own leadership styles—both to the positives (appreciating what other people are doing well), and the negatives (realizing what is missing or could be improved)."

In the Quantum and Precision Measurements Group led Prof. Vivishek Sudhir, Durovcikova works on precision measurements to study the interface between quantum physics and general relativity. While she advances in her career, she regularly consults the LEAPS career matrix "to see if I'm getting what I want out of my current PhD experience."

"The LEAPS course helped me set more realistic expectations about what faculty jobs are like and what the different components are that go into the application and the job itself," she says. "Even if I were to go into industry or some other field, it is still useful to have been exposed to these concepts."

LEAPS back

Many LEAPS students and postdocs return to teach in the class. **Martina DalBello**, a Physics of Living Systems postdoc in Prof. Jeff Gore's Lab for Ecological Systems Biology, says last year's LEAPS class helped her in the lab, with mentoring others and learning new empathy skills.

"I had always believed that being a good leader was something that you were born with," says DalBello, now a LEAPS co-facilitator. "Leading is not just about others but also ourselves. The LEAPS course sets out to

ABOVE: Physics PhD candidate Dominika Durovcikova.

BELOW: Professor Anna Frebel leading a discussion in the LEAPS classroom.

Credit (both): Rose Lincoln Photography

teach you how to become better in leading yourself and others. I am learning to 'read the audience' better. Every time I interact with a new person on the team, I try to put myself into the shoes of the other person and adapt the way I communicate. This helps demolish barriers and make the environment, such as the lab, a more welcoming space."

In one "Ah-Ha!" moment, DalBello realized a different way to grapple with authorship decisions. "The way I used to deal with this type of conflict was to think, 'I'll strive to achieve all my goals no matter what.' This time, I sought to find the optimal outcome for both, avoid escalating the discussion and put more value on maintaining the relationship with the other person."

Rigos and Frebel love seeing their understanding of a concept dawn on their students. "I've had people in class have light bulbs go off; they will say, 'Now I understand what is happening in that conversation,'" says Frebel. "We need to talk to students about the unspoken expectations. They will otherwise remain blinded by the forest and run into the trees. We teach them how to take the blindfold off and use a flashlight to find the right path forward."

Global LEAPS

The LEAPS program creates a sort of missionary zeal among many students. Durovcikova and other alums are already talking about teaching LEAPS all over the world.

Durovcikova hopes to empower others with LEAPS concepts, perhaps in Slovakia. In the past, she has worked with "Unimak," where Slovak and Czech university students encourage high schoolers to study at world-class universities such as MIT; with Encouraging Women Across All Borders, which she co-founded to teach leadership and communication skills to women undergraduates and community college students via a global mentoring program; and has taught quantum physics as well

Dr. Angeliki Diane Rigos supporting a LEAPS students' session. Credit: Rose Lincoln Photography

as LEAPS-related concepts at a weeklong summer camp for high school students in Slovakia.

An incoming postdoc was drawn to MIT in part to disseminate LEAPS lessons back in Texas. Physics postdoctoral fellow **Jamie Karthein** was a graduate student at the University of Houston when she learned about LEAPS from her husband, MIT LNS postdoc **Jonas Karthein**, who was a co-facilitator in 2021.

"His excitement about the strategies one learns from LEAPS was so tangible that I wanted to learn how I could grow and develop in this direction, too. Since these crucial aspects of professional and leadership skills development are typically not available as a proper course, I became interested in further disseminating these skills myself," says Jamie Karthein.

She worked with Frebel and Rigos to incorporate LEAPS into her NSF Ascending Postdoctoral Fellowship proposal. Karthein is currently a postdoctoral fellow at the MIT Center for Theoretical Physics with a research focus on theoretical nuclear physics, including the exploration of the phase diagram of QCD matter in collaboration with Prof. Krishna Rajagopal.

Starting this summer, she plans to teach a selection of the LEAPS leadership and professional strategies program to undergrads at minority institutions in Texas via the NuSTEAM program, hosted at the University of Houston.

Another LEAPS alum exports LEAPS to Canada. MIT Department of Materials Science and Engineering postdoc **Ahmed** (**Tia**) **Tiamiyu** was a co-facilitator last year. He's now sharing LEAPS concepts with his research group members as an assistant professor at the University of Calgary.

When Tiamiyu interviews students for his research group, he works to avoid supervisor-student conflict by providing written job expectations during the interview process. "Now, I have students who are aware of what needs to be accomplished before graduating," he says. "Some faculty members like this idea and have since requested a copy of it to be used during their own student interviews process."

As a teacher, he especially appreciated the lessons in working with different learning styles and backgrounds. "I now weave DEI in my lecture contents and approach to teaching, to ensure all the students have a sense of belonging."

Austrian students will also benefit from LEAPS thanks to 2020 postdoc participant **Esther Heid**, who is teaching chemical engineering at the Vienna University of Technology.

"Before coming to MIT, a lot of leadership styles I had encountered in academia were characterized by an elbow-mentality to at least some extent—one only gets far by putting others down," says Heid. "I encountered a few laissez-faire leadership styles, where no true leadership was exerted, and nearly no guidance, feedback or mentorship were given. The LEAPS course helped me find a leadership style that is genuine, built on my values and utilizes my strengths to empower others."

The LEAPS program has also received requests to be taught in Jordan and Germany, and Rigos founded "Epistimi," to provide 8.397 to women in STEMM (Science, Technology, Engineering, Mathematics, and Medicine) globally.

"We wish to bring this LEAPS concept to more places around the world," says Frebel.

Open to all MIT graduate students and postdocs, each semester-length LEAPS class is capped at 80 participants, and co-taught by postdoc co-facilitators. For further information, visit the program's web site at *physics.mit.edu/academic-programs/subjects/mitleaps/*.