# Bernard M. Gordon–MIT Engineering Leadership Program / Undergraduate Practice Opportunities Program / MIT School of Engineering Communication Lab

Launched in July 2007 through a $20 million pledge (with a matching component) from the Bernard M. Gordon Foundation (the largest gift made to MIT's School of Engineering for curriculum development), the Bernard M. Gordon–MIT Engineering Leadership Program (GEL) was established to educate and develop the character and skills of outstanding MIT students as potential future leaders in the world of engineering practice and development, and to endeavor to transform engineering leadership in the nation, thereby significantly increasing product development capability.

The program provides a challenging and supportive environment to a select group of MIT engineering undergraduates in which they develop the skills and attitudes that will prepare them to be highly effective leaders of engineering teams in industry. This year we had over 200 rising juniors and seniors apply to the GEL program. Students who applied to the program were primarily motivated by the excellent recommendations they received from former participants. Admission into the program is based primarily on students' commitment to participate and engage fully. The first year of the program (GEL 1) introduces approximately 130 students to the fundamentals of engineering leadership theory and practice as they engage in carefully crafted, team-based activities to develop and hone their leadership skills in an engineering context. For a select group of 30 to 35 students, the second year of GEL (GEL 2) is an intensely personalized leadership development program that includes opportunities for leadership practice, and significant interactions with industry leaders, staff, and peers. Selection into the GEL 2 cohort is highly competitive and requires successful completion of the GEL 1 program, as well as a personal interview with GEL staff.

Over the last five years, the GEL program has worked to meet an increasing demand from the MIT graduate community to create a similar program where students have the opportunity to learn and practice important leadership skills that will amplify their future career success. In spring 2020, the nascent Graduate Engineering Leadership Program (GradEL) officially launched its new Graduate Certificate in Technical Leadership. The GradEL program worked closely with the Office of the Vice Chancellor, and the Dean of Engineering in collaboration with the Dean's Graduate Student Advisory Group (GradSAGE). Our shared vision is that every MIT graduate student should have the opportunity, and encouragement, to build upon their technical leadership skills, and through this, further develop themselves as effective and impactful leaders who will be charged with solving the world's most challenging and complex problems. The certificate is recommended to all MIT graduate students interested in developing the leadership skills needed to maximize their impact in industry, public service, or academia. We awarded 11 certificates to the initial group of GradEL students who completed the interim requirements in May 2020.

The Undergraduate Practice Opportunities Program (UPOP) predates the GEL program. It was launched in 2001 as an initiative of Thomas Magnanti, the dean of the School of Engineering at the time. UPOP is a yearlong program that prepares MIT sophomores

to enter and thrive in the professional world, through experiential learning, individual coaching, access to internships, and mentoring relationships with MIT alumni/ae and engineering industry partners. It includes an intense, weeklong workshop during January, referred to as the Team Training Workshop, and it helps the sophomores get a summer internship and gain practicum experience in their field. In 2008, when the GEL program was formed, UPOP became affiliated with the GEL program, forming a natural progression from UPOP in the sophomore year to GEL 1 and GEL 2 in the junior and senior years. It is also worth noting that while UPOP is a recommended entryway into GEL, it is not a prerequisite. Conversely, UPOP can be taken as a stand-alone program.

A UPOP organizational restructuring late in AY2013 streamlined the alignment of UPOP and the GEL program, generating improved synergy and use of resources.

In June 2016 the Bio Engineering Communications Lab moved under the Gordon Engineering Leadership Program and became the School of Engineering Communication Lab (Comm Lab). It uses a very effective franchise model to provide structured and need-driven peer coaching for papers, presentations, faculty applications, lab reports, and so forth—primarily to graduate students. Participating departments and organizations at present are Biological Engineering, Nuclear Science and Engineering, the Broad Institute, Electrical Engineering and Computer Science, Civil and Environmental Engineering, Mechanical Engineering, and Chemical Engineering.

We would also like to acknowledge that this year's spring semester was a time of unprecedented upheaval at MIT as all three of our teams (GEL/GradEL, UPOP, and the Comm Lab) quickly reacted to the COVID-19 pandemic. We remained focused on our individual missions while also helping to best support students to further develop and grow as leaders and effective team members. Delivering a high-quality education in a virtual world is a challenge for any educational institution, but even more so for our three groups, with our unique missions and goals, and the inherently interactive and experiential nature of these programs. That said, the need for us to embody the leadership that we seek to develop in our students was both clear and obvious. Our three teams demonstrated a fierce determination to deliver in the face of adversity, and quickly redesign the rest of the semester to maximize virtual learning. We regularly communicated with students, helping many of them get resituated and prepare for a virtual semester, and in some ways this engagement with our students was even stronger than when we were physically together.

## Gordon-MIT Engineering Leadership Program

This year we continued to focus on our mission to educate and develop tomorrow's engineering leaders with an approach that incorporates students' professional, personal, and leadership progression. GEL creates a supportive environment that fosters the development of core values and which builds upon the strong technical fundamentals of the rigorous MIT education.

Students participate in the program to further enhance their departmental education and develop the essential leadership and teamwork skills that will enable them to be effective and have a future positive impact in their chosen field and industry. In addition, the GEL program provides augmented opportunities in leadership and innovation, character

development, invention, and implementation. The program is delivered through a dedicated instructional staff supplemented by other relevant subjects, collaborations with industry sponsors, and volunteer mentors and engineering industry "engineers in the room." We also offer professional education program courses for early and midcareer engineering professionals on engineering leadership and for developing innovative design skills.

During AY2020, GEL experienced sustained program growth in both student engagement and philanthropic efforts and therefore increased relevance both within the Institute and beyond. A major goal of GEL is to educate and prepare future leaders in engineering innovation, invention, and implementation efforts.

Rising juniors and seniors from engineering and other select departments are encouraged to apply to the first-year program. UPOP serves as a highly endorsed gateway into the GEL program (in AY2020, 39% of incoming GELs came from UPOP), but students can also apply having demonstrated equivalent experience in an engineering project in an academic or industrial setting. In the GEL 1 program, students actively participate in a series of augmented elective subjects and interactive and experiential learning experiences that, taken together, approximate the level of an MIT concentration.

Students who display exceptional leadership potential, strive to work in engineering industry, and remain on track to successfully complete the first-year program requirements can elect to apply for advancement to the highly selective GEL 2 program. GEL 2 is a comprehensive, and highly personalized leadership developmental experience where students continue to develop as leaders and practice their skills in peer-to-peer leadership, mentoring, giving and receiving feedback, and executing small team projects. Throughout the experience, students receive a high degree of interaction with industry leaders, faculty, and fellow peers. The aggregate two-year program requirements approximate the level of an MIT minor. We have begun exploring the process of offering GEL 2 as a minor at MIT.

We anticipate that a record high of 199 students will join and participate in the GEL 1 program for fall 2020. (This signifies substantial growth for our program enrollment, which is up from our initial cohort of 16 back in fall 2008.) Incoming GEL 1 students will represent 14 departments across the Institute, including all of the engineering departments. Additionally, 33 students will advance to GEL 2.

The majority of incoming GEL 1 students will represent MIT's School of Engineering (in proportion to department size), but also include students from the Departments of Architecture, Physics, Brain and Cognitive Sciences, Urban Studies and Planning, Management, and Mathematics (Courses 4, 8, 9, 11, 15, and 18). It's also worth mentioning that we had nine students apply and accept admission from Wellesley College. Since it is an objective of the program to prepare GEL students to work with professionals from other disciplines in industry, it is important that they learn how to collaborate effectively early on in the program.

In addition to the GEL program's ongoing efforts to support MIT students, the program's faculty and staff worked closely with MIT Professional Education to create and deliver

courses on engineering leadership and innovation for early and midcareer engineering professionals. In late January 2020 as part of MIT's Independent Activities Period (IAP), we offered our Mastering Innovation and Design Thinking course and had a total of 14 participants. For summer 2020, we offered two live virtual courses, and experienced great success with enrollment despite the global impact of COVID-19. We had a total of 23 participants take part in our Mastering Innovation and Design Thinking course from July 6–9, and 29 participants joined our Engineering Leadership for Emerging Leaders course that was held from July 24–28. These courses were both highly regarded and recognized as among the highest rated Professional Education (PE) courses at MIT. Moving forward, we plan to explore expanding our future offerings and continue to work with participants from local companies. Our intent in doing so is to later invite participants to take a more active role in the undergrad program as mentors and engineers in the room. Additionally, a share of the proceeds from offering these PE classes helps support the GEL/GradEL budget for the benefit of our MIT students.

## Program Expansion and Development

GEL continues to be widely acknowledged by the Institute as a valuable asset to students' educational experience and for developing potential future leaders in the world of engineering practice.

This year the GEL program continued to strengthen its partnership with the MIT School of Engineering's New Engineering Education Transformation (NEET) Program. GEL in collaboration with the MIT Department of Linguistics and Philosophy, developed and will facilitate interactive, ethical engineering seminars for all NEET students. The series of seminars, piloted with sophomores and some juniors last year, will reach sophomores, juniors, and seniors this year. Also, in collaboration with Philosophy and in partnership with the MIT Office of Experiential Learning, GEL supported the development of a new experiential ethics course that launched virtually in summer 2020, with 90 students enrolled. The new course, 24.133 Experiential Ethics (3 units), focuses on helping undergraduate students recognize the intersection between ethics and technology related work and research.

While we are grateful for valuable Institute partnerships like these that allow us to extend our impact outside of GEL, our dedication to supporting our current students remains unwavering. A recent change made to the GEL 1 curriculum was intended to create more scheduling flexibility and choice for our students. We worked closely with our faculty co-director Olivier de Weck to resurrect his course 16.810 Engineering Design and Rapid Prototyping. The course is now one of the three approved alternate courses that can be taken in place of 6.902 Design Thinking and Innovation Leadership for Engineers. The course provides students with an opportunity to conceive, design, and implement a product, using rapid prototyping methods and computer aided tools. However, due to the in-person nature of this course and the impact of COVID-19, we have delayed the introduction of the revised course to IAP 2022.

With respect to GEL's larger mission, we remain committed to developing students into engineering leaders who will graduate MIT and pursue a leadership role in engineering industry. Recent engineering educational research suggests that there are widespread misconceptions surrounding engineering careers; particularly, that students must

choose between engineering and managerial careers, or leave engineering to step into an executive track. We therefore felt compelled to respond and create new opportunities that showcase how engineering is a viable pathway toward either earning a leadership position or being recognized for excellence in technical contributions. Specifically, we worked to deepen the impact of the program's undergraduate experience through enhancing the GEL internship experience. Our objective was to challenge both students and employers to transform what could be a summer job into a lasting and fulfilling personal development experience that builds engineering identity in participants.

In fall 2019, we partnered with Gingko Bioworks, Northrop Grumman, and Procter & Gamble to build a pilot internship program that keeps students on the path of engineering through challenging and impactful engineering assignments where it is clear how their work will contribute to the success of a larger project at a company. The concept of so-called engineering Impactships aims to provide students with opportunities for immensely engaging engineering summer internships—as distinguished by their high-impact assignments; substantial level of responsibility; and connection to an internal sponsor who is personally vested in helping students make the most out of their participation. In addition to the employer-facilitated component of the Impactship at an engineering firm, the Impactship experience also includes reflection and personal development components facilitated by GEL.

This summer we officially launched the GEL Impactship pilot program with four of our students who were hired and accepted summer 2020 offers (two at Procter & Gamble, and two at Northrop Grumman). At the end of the summer, we hope to use the lessons learned from both our students and employers to further improve this initiative, and expand the list of companies involved to better reflect our diverse student population of engineering majors.

As for GEL's larger corporate engagement and sponsorship program, we have been fortunate to have experienced sustained growth. The GEL student engagement and sponsorship program was originally conceived in order to increase engineering industry participation in GEL's educational pursuits and further support students' internship and job search activities. In exchange, companies have a more direct university recruitment pipeline for juniors and seniors majoring in engineering and who are focused on their leadership and professional development. In AY2020, the GEL program raised $40,800 (an increase of $1,300 from last year) from engineering industry sponsorships. This year's list of corporate sponsors includes Apple, General Motors, Lockheed Martin, Naval Nuclear Lab, Northrop Grumman, Pioneer Natural Resources, Procter & Gamble, Salesforce, and Shell. In the coming year we plan to continue to work on increasing our corporate sponsorship activities and expand our list of targeted companies to create more engagement opportunities for our students.

Another achievement we want to highlight is the impact of our newly developed diversity and inclusion initiatives. Our primary goal is to support our diverse student population, which is now 60% women and people of color. This year we expanded GEL's corporate engagement and sponsorship program to attract a wider and more diverse set of engineering companies; encourage them to send guests who can support our diversity and inclusion initiatives to celebrate engineers of different ages, genders, and races. In

addition, we created two new GEL 2 student leadership positions focused on supporting staff with related educational activities. More specifically, with the active guidance, coaching and support of program staff, our student diversity and inclusion officers were tasked with strengthening the GEL community and engaging with student leaders of MIT Minority Organizations. We expanded our student engagement activities with the Office of Minority Education (OME) to further increase the program's visibility outside of GEL, and to support our spring recruitment activities in hopes of growing a more diverse student population. One of the ways we effectively promoted GEL to OME and other students from underrepresented minority groups was by inviting them to participate in our annual Senior Engineering Leaders roundtable event, which is a meaningful GEL experience related to professional development and leadership. This year's roundtable discussion included a panel of senior engineering leaders representing Energizer Holdings, Northrop Grumman, and Procter & Gamble. Two of the senior engineering leader participants are also heavily involved in their company's diversity and inclusion efforts and were able to link how these initiatives become integral to their success in supporting and leading diverse and multifaceted teams. Of the three senior leaders, two are women, two are people of color, and one identifies as a member of an LGBTQ+ community.

Our other diversity and inclusion related activities for this year included hosting an exclusive women and diversity panel sponsored by Procter & Gamble, and co-hosting a women and leadership seminar with the MIT Department of Aeronautics and Astronautics, featuring Deborah James, 23rd Secretary of the US Air Force. We also provided two of our women students the opportunity to attend and participate in the Women in Technology East Coast Conference in Boston in October 2019. Furthermore, the entire Gordon staff (GEL/GradEL, UPOP, and Comm Lab) demonstrated their commitment to improving our educational programming to better reflect and celebrate diversity and inclusion by actively participating in several related MIT Human Resource workshops.

In service of the MIT graduate community, we are pleased to report the expansion of the Graduate Engineering Leadership Program. In developing GradEL, the GEL program worked closely with the Office of the Vice Chancellor, and the Dean of Engineering in collaboration with the Dean's Student Advisory Group. Our shared vision is that every MIT student should have the opportunity to professionally develop themselves as effective and impactful leaders who will be charged with solving the world's most challenging and complex problems.

We utilized last year's initial seed funding granted by the Office of the Dean for the School of Engineering and a select number of donors to help increase GradEL's growth trajectory and support our graduate students' professional development. In AY2020 we developed and delivered two IAP workshops, six new spring workshops, and three new graduate courses including, 6.S976 Engineering Leadership in the Age of Artificial Intelligence, 6.S978 Negotiation and Influence for Technical Leaders, and 6.S979 Multi-Stakeholder Negotiation for Technical Experts.

In AY2020, GradEL successfully launched a graduate certificate in technical leadership, and at the end of the spring semester, reached a major milestone with the graduation of the very first student cohort—we awarded completion certificates to the 11 students who had successfully completed all of their program requirements. The certificate is

recommended to all MIT graduate students interested in developing the leadership skills needed to maximize their impact in industry, public service, or academia. About half of the GradEL graduates are at the master's level and about half are doctoral students.

Our future plans for GradEL include having our GradEL faculty and GradSAGE students, under the direction of Faculty Co-Director Olivier de Weck and Senior Program Manager David Niño, continue to develop the overall academic architecture and strategy for our program. We also will be continuing to work with the School of Engineering's Resource and Development Office to expand our fundraising efforts in order to sustain the future growth of GradEL.

## Gordon-MIT Engineering Leadership Program Years One and Two: Continued Growth

Every year the GEL program kicks off its admissions season with the ambitious recruitment goal of building an applicant pool that is talented and reflective of MIT's top engineering talent. At the beginning of the spring semester, we were fortunate to be on campus and worked closely with our excellent second year student leadership team to plan and strategize a multifaceted marketing campaign. Our promotional efforts focused on the supportive community aspect of GEL. Midway into the semester, this approach proved to be highly effective as we received over 100 applications from across the School of Engineering.

However, MIT's response to the COVID-19 crisis quickly drove the GEL program's annual recruitment season into uncharted territory. We were challenged to pivot and adjust our marketing strategies to be conducive to, and successful in, an already highly saturated virtual environment. With halfway left to go in our admissions season, we transitioned to a heavy online engagement of students, departments, and other organizations. In addition, our students were highly supportive and proved to be excellent promoters and recruiters. One of the biggest changes we made was updating the admissions process itself as a way to support students during this difficult transition and lend predictability to their lives and schedules for next year. For the first time ever, we temporarily extended the application deadline, shifted to online interviews and rolling admissions, and welcomed incoming students into the GEL community soon thereafter.

We are pleased to announce that at the end of our admissions period we recruited one of the largest applicant pools to date with a total of 201 applications (39% of students who applied were current UPOP students). While this was perhaps one of the most unusual recruitment years for GEL, we attribute our success to remaining positive and dedicated to supporting our students. We focused on building upon the momentum of our early spring recruitment efforts in order to further grow and sustain the GEL community.

It is also worth sharing that over half of the current GEL 1 cohort applied to the elite GEL 2 program. The 48 students who applied are a testament to the positive effect we are having on our students who feel they are deriving benefit and value from the program.

With the goal of preparing potential future leaders of engineering innovation, invention, and implementation efforts, 112 GELs earned certificates of completion in May 2020—30 from the GEL 2 and 82 from GEL 1.

Another GEL goal is to increase the focus of national engineering education on the development of leaders of engineering innovation, invention, and implementation. In AY2020, the GEL program continued to play a key role in advancing the Community of Practice for Leadership Education for Twenty-First-Century Engineers (COMPLETE) by having Reza Rahaman, industry co-director, and Leo McGonagle, executive director, participate in its fall conference at Cornell University in September 2019. The ongoing COMPLETE meetings—the purpose of which is to share best practices and advance the practice of engineering leadership—gather representatives from over a dozen institutes in North America with engineering leadership programs. Creative public relations efforts augmented the program's visibility in numerous national and trade publications, reinforcing GEL's position as the thought leader in engineering leadership.

As a founding member of COMPLETE, we remain vested in supporting its future growth and expanding the number of universities represented in order to build a more diverse and inclusive organization. During the September 2019 conference we arranged special invitations to University of California at Berkley and Southern Illinois University, both of which have growing engineering leadership education programs. We had also planned to attend the spring 2020 COMPLETE meeting at Western University in Canada, but unfortunately this conference was cancelled due to the repercussions of COVID-19.

Despite the cancellation of the spring 2020 COMPLETE meeting, the GEL program remains a driving force behind advancing the agenda for this burgeoning group and for engineering leadership education more broadly. It is worth sharing that Joel Schindall, Gordon product development chair and professor of the practice emeritus, has been continuing to lead an initiative with other members to create a compendium of COMPLETE best practices.

We also are proud to share that our GEL students contributed to the national discussion involving leadership development and engineering leadership education through participation by four GEL students at the Naval Academy Leadership Conference in January 2020. The theme of this year's conference centered on the importance of investing in your people and mentorship.

Of related significance, the GEL program's impact on engineering leadership education has grown to a national level through participation in the American Society of Engineering Education (ASEE). In the last five years, GEL has played a critical role in creating the ASEE Engineering Leadership Development Division (LEAD), which, though a newer division, is the ninth largest division in the ASEE with over 700 members. David Niño currently represents GEL and serves as ASEE LEAD division chair, overseeing the division's academic papers submissions and other LEAD activities. In support of the GEL program's mission to disseminate best practices in engineering leadership education, Niño and Diana Chien, Comm Lab senior program manager, actively participated in this year's annual ASEE Conference, which was held virtually in late June 2020.

We are pleased that our program's impact has extended on broader scale through our affiliation with these different organizations and institutional partnerships. However, we would be remiss to mention the incredible success of these institutional collaborations without recognizing the many challenges faced through the residual effects of the

COVID-19 pandemic. The restrictions on travel made it difficult for us to be able to host more of our industry partners and university collaborators to participate in our educational engineering leadership activities. While there is still much uncertainty regarding the ongoing effects of the worldwide COVID-19 crisis, we are committed to using our virtual setting to our advantage and increasing the number and diversity of companies and universities involved in our educational activities for next year.

## Future Plans Summary

- Extensive summer planning for fall semester, whether it be in-person, virtual, or a hybrid of the two; take lessons learned from spring 2020 semester to improve student experience; the decision was recently made for fall 2020 to be 100% online

- Collect lessons learned from summer 2020 Impactship employers and student participants to make future improvements; recruit more companies to get involved that reflect current GEL cohort engineering majors and interests

- Expand GEL's corporate engagement and sponsorship program to attract a wider and more diverse set of engineering companies; encourage them to send guests who can support our diversity and inclusion initiative to celebrate engineers of different ages, genders, and races

- Increase MIT alumni/ae engagement with the program by expanding outreach efforts

- Make improvements to marketing and outreach campaign to broaden GEL student applicant pool to reflect MIT's top engineering talent

- Continue to diversify GEL's mentor roster to be more representative of current majors, women, and engineers from underrepresented minority groups (almost 60% of GEL student population identify as women)

- Make improvements to marketing and outreach campaign to broaden GEL student applicant pool to reflect MIT's top engineering talent

- Under the direction of Olivier de Weck, faculty co-director, continue to work with GradSAGE and members of the fledgling faculty advisory board to develop the academic architecture and strategy for GradEL

- Work closely with Resource Development to solicit potential GradEL program supporters to provide funding to expand development of the program

- Increase outreach and awareness of MIT Professional Education courses to companies vested in supporting younger engineers' leadership and professional development

- Increase MIT alumni/ae engagement with the program by expanding outreach efforts

- Explore new opportunities for collaboration with the MIT departments where GEL can lend its expertise in engineering leadership to help channel new innovations

- Continue to help lead strategic planning along with partner universities, as part of ASEE LEAD

- Continue to deepen staff understanding of inclusion and diversity issues by ongoing sensitivity and unconscious bias training

## Undergraduate Practice Opportunities Program

Established nearly 20 years ago, the Undergraduate Practice Opportunities Program (UPOP) is a yearlong, co-curricular professional development program for sophomores. Participating students develop the skills and confidence necessary to thrive in an ever-changing workforce through UPOP's unique community of industry mentors, employer partners, program alumni, and dedicated staff.

Each year, UPOP supports several hundred MIT sophomores. Applicants come from all Institute majors and represent more than one third of the sophomore class, providing, each year, a rich cross-section of the student body.

In AY2020, of the 398 students who applied, 186 students (47%) completed UPOP's Team Training Workshop requirement, where under the guidance of UPOP's industry mentors and expert presenters, the students developed valuable skills in teamwork, communication, and problem-solving in preparation for their summer professional experience. Additionally, despite the significant disruption in summer internships and experiences across the globe this year, to date 82% of UPOP students completed all of the requirements of the yearlong program, including participation in and reflecting upon the summer internship or practicum.

UPOP requirements include: participation in either one of the two intense weeklong Team Training Workshops, delivered over IAP, or the three-day alternative workshop over Presidents' Day weekend. These workshops feature experiential modules taught by MIT faculty and other industry professionals, focusing on themes of communication, problem-solving, and teamwork, as well as topical seminars led by staff and MIT alumni/ae. UPOP students must also work toward securing a career-relevant summer practical experience; submit written reflective reports during their summer experience; and complete follow-up meetings with staff in the fall semester of their junior year.

Consistent with past assessments, student response to the Team Training Workshops was very positive. After session one of the Team Training Workshop, with 75% of students responding, UPOP students awarded the program a Net Promoter Score of 19.3, and after session two, with 58% of students responding, UPOP students awarded the program a Net Promoter Score of 15.5 Throughout each Team Training Workshop session, the UPOP staff administers surveys to gather feedback on the student experience, which includes a self-assessment as it relates to the Workshop's five overarching learning objectives:

- I feel more confident in my ability to engage with employer and mentors

- I feel more confident in my ability to work effectively, and help to create a productive environment as a leader or member of a team

- I feel more confident in my ability to communicate among group members with diverse backgrounds, and effectively present the group's results

- I feel more confident in my ability to help the group come to creative problem solutions using the processes and tools I have learned

- I feel more confident in my ability to identify and employ additional resources when unexpected issues or conflicts arise in the group

In sessions one and two of the Team Training Workshop, respondents agreed to nearly each of the above from 95% to 100%, with an outlier low of only 86% of students from session two agreeing to the final learning objective of identifying and employing additional resources when an unexpected issue arises.

With overwhelming support from the participating students, and demonstrated by their self-assessments and Net Promoter Scores for the Team Training Workshops both this year and in prior years, UPOP remains confident that although the model will need to adjust in the upcoming academic year due to COVID-19, the Team Training Workshops are and will continue to remain a central feature of the program into the future.

### Broadening the Program's Impact

This year, UPOP expanded our reach into the first-year class with two initiatives geared toward priming them for future professional development opportunities. The first was a new First-Year Discovery Course, SP.253 Challenge Your Self-Identity to Grow and Achieve Life and Career Happiness, in which a UPOP staff member guided students through exercises and reflective activities to accelerate their path toward self-authorship. The course saw students shift from a static mindset into one of growth; to feel comfortable with all available paths at MIT; and gain skills to better present themselves and their ideas. This year UPOP staff led the expansion of an all first-year event called the First Year Major Mixer to help first year's navigate major declarations later that spring. This year our goal was to expand our reach as well as solidify this as an annual affair by partnering with the Office of the First Year as well as a resident director from Residential Life. The event was virtualized to account for COVID-19, and still had a strong showing of over 60 first-years in attendance with over 100 interactions with representatives from multiple departments.

Both initiatives were done in close collaboration with other departments across the Institute.

### Response to COVID-19

Following the March 2020 announcement that MIT would shift from on-campus to virtual instruction, the UPOP staff facilitated five virtual events for current and prospective UPOP students. UPOP mentors also offered to step in and support UPOP students, offering to host popular roundtable discussions virtually that focused on adapting to a remote workspace. UPOP staff also updated the program's Summer Send Off event held in May to feature content specially focused on assisting students and teaching them how to navigate a virtual work space.

Eight UPOP companies cancelled recruitment activities and upcoming internship programs. Additionally, there were 24 students whose summer experiences were cancelled. Of the students who lost their internship or experience, 71% of them have since confirmed alternate employment.

Due in large part to the tremendous support from UPOP alumni/ae, there was a 50% increase in UPOP-exclusive internship offerings this spring as compared to the prior academic year. UPOP alumni/ae provided 60% of the active internship positions this spring.

UPOP staff have remained in close contact with both students who are employed this summer and those who are not. UPOP converted its annual site visits to a virtual format, communicating with UPOP students, their supervisors, and company recruiters at 13 separate companies.

UPOP also took a leadership role on the Institute's Summer Opportunities and Resources Team, co-leading a committee charged to build awareness of summer employment and additional summer opportunities which included standing up and maintaining a centralized web portal in late April to benefit all MIT undergraduate and graduate students.

### Summer 2020 Internships

As the practicum part of the program, UPOP students are required to participate in a summer experience within an organization to help develop and expand their professional experience. Due to the impact of COVID-19, our industry partners experienced unprecedented changes to their internship programs and recruitment processes. This mainly resulted in a higher-than-average percentage of UPOP sophomores participating in a domestic MIT UROP and alternative experiences. The majority of UPOP students participated in industry internships from large corporations to small startups, from corporate to research and government. Also, unique this year, most of our student's participated in a remote internship: 66 students were full remote, six students were on-site, and four students were in a hybrid experience where they were both on- and off-site.

- Total UPOP students: 186

- Total industry internships (domestic and international): 80, of which 54% were through a direct UPOP connection with the employer, and 28% were hosted by a UPOP alumnus/a's company

- This year a record 36% (67 UPOP students) participated in a UROP or other summer research experience, in part due to the cancellation of MIT summer experiences and limited internship opportunities

- Despite the disruption to the employment market, 82% of UPOP sophomores were employed in an approved and paid summer experience

- UPOP staff are continuing to support the remaining 34 students who did not confirm an internship or research experience

- UPOP's top summer 2020 intern employers were Keolis Commuter Services, MathWorks, and Microsoft (three interns each)

### Employer Engagement and Sponsorship

In AY2020, UPOP again attracted a large pool of actively engaged volunteers, sponsors, and intern employers. Seventy companies posted UPOP-specific job opportunities for sophomores and 68 attended the two Team Training Workshops' capstone events—the January Networking Luncheons. In addition to UPOP's traditional offerings of company field trips and educational events, UPOP also hosted nine corporate-sponsored events.

UPOP initiated an industry sponsorship campaign in AY2014. The campaign raised $48,000 that year, in AY2020 UPOP received over $90,000 in corporate sponsorship funding. This year UPOP also received generous, in-kind donations from our employer-partners Amazon and Apple.

## MIT Alumni/ae and Mentor Support and Program Involvement

UPOP continued and expanded the mentorship program within the Team Training Workshop weeks during IAP and Presidents' Day weekend, where MIT alumni/ae and other industry professionals volunteer to participate in the workshops as mentors for teams of seven to eight students. Mentors are essential for facilitating delivery of curriculum content and guiding student discussions at their tables. Of the 43 mentors who participated in AY2020, 35 were repeat participants from past years and eight were new. UPOP also engages with over 480 community members, many of whom are MIT and UPOP alumni/ae, through a quarterly newsletter that provides updates and highlights of the yearlong program.

To continue advancing the goals of UPOP through mentor and alumni/ae involvement, the program established a UPOP advisory board in 2014 that meets once a year and comprises 20 or more MIT alumni/ae and other industry professionals, who work actively with UPOP staff on committees, and curriculum review and revision.

## Financial Support

In addition to their participation as mentors, and seminar and module presenters, MIT alumni and other friends of the program have been generous financial supporters, enabling UPOP to reach its goal of a $5 million endowment fund through their outright gifts and pledges. A total of 112 individual donors contributed $134,512 to the program in AY2020. UPOP also participated in the MIT Annual Fund's 24-Hour Challenge, for a second consecutive year and earned a generous $7,500 challenge gift, which will be matched dollar for dollar by the mentor's employer. In just 24 hours, UPOP received $8,550 dollars in gifts from 58 donors.

## Alumni/ae

UPOP alumni/ae continue to be involved as industry volunteers, intern employers, and sponsors on behalf of their organizations as reflected in their advocacy for UPOP student internships in spring 2020 noted above. In AY2020, 30 graduated UPOP alums participated in the program as industry volunteers in networking and educational events, and in spearheading professional opportunities for UPOP students.

## Staff

UPOP introduced one new position this year, Rosheen Kavanagh joined UPOP as the senior program manager in late November 2019. Kavanagh has worked at MIT for over 16 years, most recently in the MIT Annual Fund where she launched and managed the Annual Fund's student philanthropy and MIT10 annual fundraising campaigns, and most recently managed the MIT 24-Hour Challenge. Now at UPOP, Kavanagh oversees the strategic direction of the program, manages the UPOP advisory board, and works closely with campus partners to increase awareness of the value of UPOP. Kavanagh

supervises all five full-time UPOP staff members and reports to Reza Rahaman, industry co-director of UPOP, Gordon ELP, and the Communication Lab.

UPOP's full-time staff also includes two student program staff (a student program administrator and a student program coordinator); an employer relations program manager; a mentor liaison and outreach coordinator; and a communications and operations coordinator. This year, UPOP experienced three staff departures. Ariel Folkerts joined UPOP on a temporary basis as the communications and operations coordinator in August 2019, and was hired in the role full-time in early March 2020. Folkerts brings with her a background in career advising, and excellent digital marketing experience. UPOP is currently conducting two searches to fill the remaining open positions and hopes to be fully staffed by early fall 2020.

### By the Numbers

- Of the Class of 2021, 276 students graduated from UPOP in September 2019

- Of the Class of 2022, 398 MIT sophomores applied to UPOP in fall 2019; 186 are expected to graduate in September 2020

- UPOP's corporate sponsorship program raised more than $90,000 in AY2020

- UPOP's continues its efforts to increase diversity among its mentor pool to better reflect the UPOP student population; with eight new mentors this year, 33% of the program's mentors are women, up from 26% in AY2018

- This year, 43 mentors collectively provided 104 hours of support and guidance for our students over the course of the three Team Training Workshops

### Student Program Retention

Interest in UPOP has grown a great deal since the first UPOP class of 73 students in AY2002. Applications in recent years remain consistently high (40% or more of the sophomore class). Despite a good deal of efforts by the UPOP staff to increase retention, we have seen a steady decrease in recent years, and in AY2020 a significant drop in retention as seen in the figure below.



UPOP Student Retention Comparison AY15-AY20
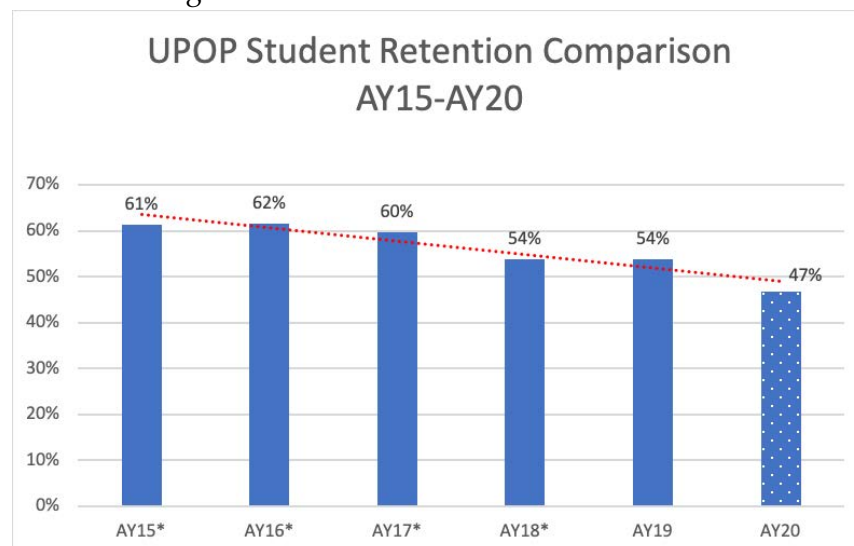
Since AY2017, staff implemented a number of measures to increase retention, including offering unique UPOP professional development resources, a support network of community members including UPOP alumnus student advisors. Our program also maintains an open door policy throughout the year for advising and coaching needs on a drop-in basis for current students and program alumni/ae who are still on campus. There has been a focus on flexibility and adjusting the program to meet the limitations of participating students' schedules.

As mentioned, a core requirement of UPOP's yearlong program is attendance at one of UPOP's two, weeklong Team Training Workshops during MIT's Independent Activities Period. As opportunities over IAP have expanded since UPOP's early years, the timing of the workshops presents a scheduling conflict for many of MIT's sophomores, who are, for example, involved with the Alumni Association's Externship Program, MISTI Global Teaching Labs, and the increasing number of other campus programs offered over IAP. UPOP introduced a three-day alternative version of the IAP Team Training Workshop over Presidents' Day weekend for those who qualify, unfortunately that has done little to resolve the conflicts. This year 47% of those students who enrolled in UPOP dropped out because of this scheduling conflict. This also reflects the environment at MIT with a much richer, perhaps even overwhelming, set of offerings for MIT undergraduates, compared to 20 years ago when UPOP was founded.

Reviewing past efforts and seeing our continued drop in retention, we have learned that our attempts in recent years to accommodate students' schedules through increased flexibility is not the answer. Understanding a virtual fall and IAP await this year's sophomore class, UPOP is challenged to develop a new way to approach engaging students, ensuring that our learning objectives are met, that students feel connected, and that they understand the support we are able to offer them.

UPOP is turning the challenge of running a virtual UPOP into an opportunity. Staff spent this summer assessing the program's offerings, clarified our priorities and goals, and will introduce UPOP 2.0 this fall that we believe meets the needs of MIT students in this unique moment, and also addresses our retention concerns. We are confident that now, perhaps more than ever, UPOP is a necessary resource for MIT sophomores. We believe those students who in prior years may have felt they could acquire their dream internship without the help of UPOP, now seek out our unique combination of an extensive network and a comprehensive and thoughtful professional development curriculum. It is our responsibility to help UPOP students secure a summer internship through the skill-building activities and connections of the UPOP network that is built into the program, and UPOP will also prepare students to excel in this quickly evolving workforce.

**AY2021 Priorities**

- Increase graduated students from AY2020 to more closely align with recent year totals through increased student retention
- Increase UPOP student engagement throughout the year with a more formal structure to establish relationships with more members of the UPOP community

- Provide essential guidance and facilitate relationships to support UPOP students to secure a summer internship/experience and be successful both in their summer role and into their future professional experiences

- Maintain and develop new relationships with UPOP stakeholders, in particular increasing engagement of UPOP alumni/ae

- Track student growth in priority areas through self-assessment surveys or other appropriate measurement tools, and provide a more formal recognition for UPOP completion

- Continue a focus on creating a culture of belonging for people of color in UPOP, for both student participants and program volunteers

- Maintain awareness of UPOP's fiscal health and pursue a multifaceted fundraising strategy to ensure UPOP continues to maintain the resources to meet program needs

## UPOP 2.0: An Updated Student Engagement Strategy

Keeping in mind UPOP's priorities stated above, UPOP will learn from the strength of the program's Team Training Workshop and expand the fall program.

- Students will be distributed into teams of seven to eight students beginning in the fall semester

- Teams are supported by student advisors and new mentors (ideally UPOP alumni/ae)

- Students will attend virtual lectures delivered by staff and employer partners and program volunteers; guided by mentors and student advisors, teams will meet virtually and focus on achieving defined individual professional milestones in the fall and spring semesters

With a new approach to the fall and spring semesters, UPOP will implement a more rigorous assessment process to ensure we are meeting the program's learning objectives for the year. We hope that the team structure will increase earlier connection to UPOP and the community students will be seeking as they start the fall semester remotely. The increased engagement of students as members of a team will also create a built-in alert system to introduce earlier awareness if a student's engagement in UPOP is decreasing and they are in danger of dropping the program. With this new approach, there is a focus on stronger community, continuity in experience, and earlier understanding about the value that UPOP can bring to the enrolled students.

## Accomplishments and Awards: GEL and UPOP

- The combined programs impacted more than 1,000 students throughout the year

- The combined programs earned corporate funding in the form of grants and company sponsorships as well as from a pool of committed individual donors— including program alumni/ae

- Started offering graduate technical leadership training for graduate students, both at the masters and at the doctoral level

### Future Plans: GEL, GradEL, and UPOP

- Expand outreach and increase awareness of GEL, GradEL, and UPOP programs among prospective MIT students

- Continue to perform educational assessments related to the overall efficacy of GEL, GradEL, and UPOP

- Continue to explore and discover new synergies that exist and will benefit the programs under the GEL Program's organizational structure (i.e., GEL, GradEL, UPOP, and also the Communication Lab as discussed in the next section)

## MIT School of Engineering Communication Lab

The MIT School of Engineering Communication Lab (Comm Lab) is a professional development resource that uses discipline-specific peer coaching to improve the technical and professional communication skills of graduate students, postdocs, and undergraduates. Since its successful launch in 2012 within a single department (Biological Engineering), the MIT Communication Lab has grown to include branches within seven departments and institutions: Biological Engineering, Chemical Engineering, Civil and Environmental Engineering, Electrical Engineering and Computer Science, Mechanical Engineering, Nuclear Science and Engineering, and the Broad Institute. Each departmental Communication Lab comprises a team of four to 16 trained graduate students and postdocs—the communication fellows—and one half-time manager. This matrix organization is overseen by one central senior program manager, Diana Chien.

Since 2016, the Communication Lab has been a member of the Gordon Engineering Leadership Program umbrella, synergizing with the other GEL member programs' emphasis on experiential professional development.

### Four Distinctive Features of the Communication Lab

#### *Discipline specificity*

Training grad students and postdocs within a given department to act as communication coaches for their fellow department members means that these communication fellows can engage with their clients about both the communication and the science. Their coaching is informed by a deep understanding of field expectations, language, and culture. Each Communication Lab can also customize its practices and resources according to its department's demographics, rhythm, and culture.

#### *One-on-one peer coaching*

Communication fellows ask their clients strategic questions to help them analyze high-level communication principles, such as audience, message, and structure. The communication fellows do not provide line editing or grammar fixes. Their high-level focus encourages clients to create their own solutions and learn transferable communication skills.

### Authentic tasks

Clients can bring any professional or technical communication task to the communication fellows for input, including papers, presentations, faculty applications, and lab reports.

### "Just in time"

Working on authentic, deadline-driven needs gives clients immediate and genuine motivation to learn communication principles. Hence, the Communication Lab aims to provide clients with resources in a manner tied to real deadlines—for example, offering workshops four weeks prior to the National Science Foundation Graduate Research Fellowship deadlines, and encouraging attendees to come to the Communication Lab for one-on-one coaching during the subsequent weeks.

## Impact on Department Members beyond Clients

The peer coaches, who are carefully selected and paid a modest stipend, receive valuable skill development from the training workshops and additional professional development activities, from their experience in coaching their clients, and from the experience of working together as a team.

Many faculty members have stated that the program results in better publications and presentations, and also reduces their workload.

The cross-departmental model allows the overall program to develop, evaluate, and refine a repository of tested material. This has already led to a website that is widely used both within and external to MIT (the CommKit), a research paper that has been published and presented at the ASEE, and a weeklong Summer Institute to help share this knowledge with other universities.

Altogether, the Communication Lab is a lean, flexible, and adaptable program that uses student leadership and minimal staffing to support diverse communication initiatives. Since opening for coaching in 2013, the Communication Lab has served more than 2,900 unique clients with over 6,900 hours of one-on-one coaching across more than 8,500 appointments. In addition, the lab has partnered with over 100 subjects and academic programs, and offered hundreds of workshops to audiences including academic subjects, undergraduate research programs, and interest groups for women and members of underrepresented minority groups. Finally, to date, 166 communication fellows have been trained, representing a think tank of exceptionally articulate and creative student leaders. The Communication Lab continues its outreach and coordination efforts with other complementary programs at MIT, such as the Writing, Rhetoric, and Professional Communication program.

## Staffing Updates

During AY2020, the Communication Lab's staff comprised one full-time senior program manager (Diana Chien), seven 50% full-time equivalent (FTE) departmental managers, a 15% FTE administrative assistant (increased from 10% FTE during AY2020), and a 20% FTE curriculum designer/instructor (converted from an hourly position during AY2020).

### *Departmental management*

The senior program manager trained two new departmental managers during AY2020, one to replace the previous Electrical Engineering and Computer Science Comm Lab manager and one for the newly launched (spring 2020) Civil and Environmental Engineering Comm Lab.

### Accomplishments and Awards

- In AY2020, the Communication Lab continued to thrive in its core mission of providing one-on-one communication coaching, hosting a total of 1,808 appointments for 767 unique clients (an average of five appointments per day)

- Following pandemic shutdowns, the Comm Lab successfully transitioned to offering online coaching, workshops, and events

### Selected AY2020 Data

- Depending on the department, 37% to 67% of clients were repeat users, showing that users find value in working with the communication fellows

  - Again, depending on the department, 58% to 90% of users reported that the Communication Lab is helping them acquire the skills that they need to be successful at MIT

- New Comm Lab launch: Civil and Environmental Engineering launched the newest Communication Lab in spring 2020, hiring and training seven new communication fellows

- Department Communication Lab teams refined existing communication initiatives and launched new ones, including the following:

  - Approximately 30 workshops and events such as career boot camps, grant-writing contests, writing support groups, and an academic subject supporting the faculty application process

  - New online communication guides, templates, and blog posts (also popular with audiences beyond MIT, receiving over 250 hits per day)

- Cross-departmental Comm Lab service: Limited coaching and workshops are being offered to the departments that do not yet have Comm Labs, by discipline-relevant existing Comm Labs—Chemical Engineering and Civil and Environmental Engineering Comm Labs are supporting Materials Science and Engineering and Earth and Planetary Sciences, respectively; this is a new experiment in extending existing Comm Lab services in a discipline-relevant, à la carte manner

- The senior program manager led cross-departmental initiatives and outreach to other organizations, including the following:

  - Launch of new educational development and training formats, such as an educational hackathon and increased training opportunities for experienced communication fellows

  - Completion and publication (American Society of Engineering Education) of an extensive educational assessment demonstrating Comm Lab coaching's strong impact on strategic communication skills in particular

  - Partnerships with Career Advising and Professional Development and the Teaching and Learning Laboratory

## Selected Future Plans

- Increasing offerings to support community building while MIT operates virtually, such as mentorship programs and writing support groups

- Diversity, equity, and inclusion efforts, including increasing support to affinity groups and other programs for students from underrepresented minority groups

- Strengthening training opportunities for experienced communication fellows, emphasizing mentorship, management, and visual design

- Developing curricular offerings to offer more long-term, in-depth communication education experiences, planning on an IAP 2021 pilot of a course on public-facing communication; there is a possibility that the Comm Lab may offer new classes or workshops as part of the GradEL certificate in technical leadership

- Continuing to research and build relationships with potential funders, both corporate and academic, to increase the organization's financial stability

**Reza Rahaman**
**Bernard M. Gordon**
**Industry CoDirector**
**Senior Lecturer**

**Olivier de Weck**
**Faculty CoDirector, GEL, UPOP, and Communication Lab**
**Professor of Aeronautics and Astronautics and Engineering Systems**