Office of Strategic Alliances and Technology Transfer – Technology Licensing Office

MIT is driven by its mission to make a better world, through education, research, and innovation. The Technology Licensing Office (TLO) contributes to that mission through its work protecting and commercializing new technologies and innovations. The innovations TLO receives from faculty and researchers reflect the broad range of research that is undertaken at MIT.

- In helping address the world's climate crisis, we have licensed Intellectual Property (IP) related to high voltage rechargeable batteries, energy efficient windows, improved materials for water desalination, recycling of lithium-ion batteries using novel membranes, and development of self-healing concrete.
- We are contributing to more efficient manufacturing through licensing improved equipment for optical measurements, software tools for efficiency in manufacturing processes, flexible substrates, and 3D printed new alloys for additive manufacturing.
- In the field of drug discovery, gene therapy, and disease treatment we have licensed screening tools, optogenetics, synthetic biology techniques for cell therapy platforms, magnetic resonance for disease screening, new biomaterial for surgical adhesives, protein sequencing for developing new therapeutics, and diagnostics.
- In support of improved security, communications and transport, there have been technologies licensed related to haptics for computer simulations, high frequency sensing apps, advanced optics for LIDAR, Augmented Reality (AR) and Virtual Reality (VR), sensors for autonomous vehicles, circuitry to support migration of unwanted electro-magnetic interference, high speed transmission, and reception of radar signals for improved air traffic safety.

This is just a small sample of how in FY2023 MIT and TLO through engagement with the entrepreneurial community and commercialization partners contributed to making the world a better place.

Engagement and Licensing Summary

- 593 new invention disclosures
- 52 open-source reviews
- 92 licenses and 23 options to MIT owned technologies
- 23 joint invention agreements
- 104 active trademark licenses including 19 new licenses in FY23, for total revenue of $499K
- 23 startup companies launched based on MIT IP (through 9 licenses and 14 options)
- MIT received equity as partial license consideration in nine licenses
- 57% of the FY23 licensed startup companies in the physical sciences and hardware area, 22% in therapeutics 13% in medical devices, diagnostics and 9% software/other.

- 72 ready to sign software license agreements, of which 45 (62%) were revenue generating, earning $275K
- 13 tangible property agreements of which 10 (77%) were revenue generating earning $400K

Mission and Vision

TLO staff began strategic planning work during FY23 partnering with MIT HR and an outside consultant. One of the first activities was to develop a new vision statement in support of the well-established mission to have global impact through technology transfer. We are pleased to formally share that vision. Strategic initiatives will continue through FY2024.

Mission

> In the spirit of MIT's mission to advance knowledge, the TLO moves innovations and discoveries from the lab to the marketplace for the benefit of the public and to amplify MIT's global impact. We cultivate an inclusive environment of scientific and entrepreneurial excellence and bridge connections from MIT's research community to industry and startups by strategically evaluating, protecting, and licensing technology.

Vision

The MIT TLO will be an equitable, inclusive organization recognized as a global leader in technology transfer dedicated to advancing MIT technologies for societal impact, having:

- People with deep expertise and thought leadership in all aspects of technology transfer
- Partnerships both inside and outside of MIT that facilitate ease of engagement with stakeholders and process excellence through the entire technology transfer value chain
- Stakeholder Focused Teams that provide innovative solutions to challenges that arise which enable high quality work products delivering outstanding value
- Optimized Processes that support each stage of the technology transfer lifecycle

Organization and Staffing

We worked closely with HR in the Provost and Central HR Offices to address the continuing challenge of recruiting and retaining qualified staff to technology transfer positions.

- Recruitment and retention of both administrative and support staff
    - 13 (26%) vacancies in TLO during FY23
- Recognizing the difficulties in the labor market
    - Completed market reviews and salary adjustments for 56% of TLO staff
    - Promoted 9 staff including reclassification of three jobs
    - Engaged a recruitment firm to assist in hiring licensing team members

- Diversity in Recruitment/Retention
  - TLO staff make up: 58% F/42% M, 62% White/38% Minority
  - Applicant Pool Gender: 52% F/43% M/4.6% Unknown,
  - Applicant Pool Ethnicity/Race 48% White/43% Minority/8% Unknown
- Engaged consultant Tandem Solutions to begin a TLO Strategic Planning Initiative including training assessment needs for TLO staff

TLO encourages a culture of support and inclusion. We achieve that in a number of different ways including a few Committees that enable staff to participate in creating and maintaining the culture necessary to succeed in a high performing environment. These committees include:

- Activities Committee - providing monthly social activities for TLO staff including relaxation time, celebration of cultural and national holidays, and other revitalizing efforts
- Curriculum Committee - organizing education opportunities supporting TLO work through presentations, webinars and meetings with internal and external organizations
- Administrative Process Improvement Committee (APIC) – to ensure all TLO processes and practices have up-to-date standard operating procedures and review of proposed new processes.

Recipient of MIT Excellence Award for Innovative Solutions

The 2023 MIT Excellence Awards recognize outstanding employees across MIT who have made significant contributions to their departments or the Institute as a whole. TLO is proud that Abram Barret was selected as a recipient for the Innovative Solutions Excellence Award.

Abram is the TLO's IP Special Projects Manager. One of his most significant contributions to the TLO was improving the handling of communications from outside law firms and other constituents to relevant TLO staff. His ingenuity and extensive knowledge of patent prosecution led him to implement a mail sorting software solution and develop routing matrices for over 100 types of communication, which amount to over 1,500 weekly communications related to MIT's IP portfolio. With zero software experience, Abram trained himself to create these intricate matrices that accurately sort 80% of incoming communications. Thanks to Abram's effort, the TLO is able to manage critical, time sensitive communication with a reliable and efficient system.

Information Technology Infrastructure Project

Work on the Forrester IP database replacement to a Salesforce Platform "Shirley" has moved to the development phase, with certain modules being rolled out in Fall FY24 including a new disclosure portal on the Research@MIT app. This portal will allow all inventors to efficiently and effectively submit their inventions and discoveries to TLO for evaluation and potential commercialization. Additional functionality such as viewing additional portfolio information will be available in subsequent updates. Support for this project is provided through IS&T, two IS&T project managers, and a team from EpiUse.

Licensing and Patenting Activity

The number of technology disclosures submitted to the TLO during FY23 was 593, marking the lowest disclosure numbers since 2010. Lincoln Lab contributed 80 disclosures, that represents a 28% drop over the prior year. Additionally, several programs and institutes that typically contribute large numbers of disclosures saw reductions including SMART and the Broad Institute. There was also a significant drop in the number of tangible property cases. Despite these reductions, MIT maintains the highest invention disclosure rate among US Universities. The IP portfolio remains strong with over 12,000 issued and pending US and foreign patents. Notably, sixty percent (60%) of these patents are licensed or optioned to third parties, a remarkably high percentage compared to peer institutions. This is evidence of the strength of the MIT patent portfolio and diligent efforts of the TLO in licensing MIT IP.

The initial investment in filing and maintaining patents for their 20-year lifespan is a costly business. On average, MIT spends between $35k and $50k per patent filing, and files around 500 US patents a year. Since FY2020, TLO staff has been diligently working to ensure costs of managing the extensive MIT patent portfolio are reasonable. Diligent efforts in all aspects of portfolio management have been employed, from filing and prosecution decisions to law firm selection and billing, to recovery of patent costs from licensees and aging receivables. In FY23, patent costs were $20.5 million versus $21.9 million in FY2022, and net expenditures were $7.4 million. Remarkably, patent costs have been reduced by 21% since FY20. However, we do recognize that investing in protection of MIT's IP is crucial for technology licensing. A large part of the Licensing Officer's role, therefore, is to make these patent investment decisions judiciously, carefully balancing commercialization opportunities, understanding of market dynamics and the likelihood of licensing. During these decision-making processes, inventors are consulted, as their input is essential. Based on TLO data, if a technology is not licensed by year five or six after disclosure, its chances of being licensed are significantly lower.

Revenue Generated through Licensing

The gross licensing income in FY23 was $40.2M which includes equity proceeds ($2.1M) and patent reimbursements ($13M). Of 605 active royalty revenue generating licenses, four licenses generated over $1M and an additional four licenses generated between $500K and $1M. The equity proceeds came from shares held by MIT in three licensee companies. Over $30M will be distributed to 1,271 inventors; 65 departments, labs, and centers; and 61 other entities, and $14.5M to the Provost's Office and General Fund.

TLO also manages the revenue distribution process for Sloan Management, EdX, Open Learning and CSAIL online courses. For FY2023 ~$5M of revenue was distributed to creators and contributors to those courses.

Trademark licensing has increased to a higher level than in previous years with $499k revenue earned from 104 active licenses. Updated trademark licenses were put in place a few years ago, and the trademark team is now focused on optimizing opportunities for licensing MIT's trademark for athletic wear and other consumer goods.

The TLO supported over 50 open-source licensing reviews in FY23. These were conducted by TLO staff to ensure that code from third parties was not inadvertently included. Updated open-source educational information is available to MIT Community members about the release process. TLO also worked with the MIT Open Access Task force to ensure processes related to copyrighted material was consistent with the policy adopted in 2009.

MIT Startups

Of the startup companies licensing MIT IP there are:

- 23 new startup licenses and options during FY23
- 595 startups licensing MIT IP launched since 2000
- 434 companies still operating (since 2000) of which 68% still have active licenses with MIT
- From public sources such as Pitchbook
    - Of the 143 startup companies in which MIT holds equity, 17 raised a total of $842M in funding during FY23, with valuations exceeding $2.5B
    - Total funding raised by MIT licensed startups is in the region of $40B, and total jobs created through MIT related and licensed startups ~60k.

For both new and existing startup companies who have licensed MIT IP there were some notable advances beyond fund raising during FY23 demonstrating progress to get MIT technologies to market, these included:

- 4M Therapeutics conducting Investigational New Drug Application (IND) studies for treatment of neuropsychiatric studies
- Acquisitions by Amazon (of Instancio), EMD Millipore (of Erbi Biosystem), Eli Lilly (of Sigilon) Spectaire (of MicroMS)
- Aeroshield built prototype laminated glass and insulated glass units to demonstrate performance and durability of super thermally insulating glass.
- Cognito Therapeutics commenced phase 3 study on device to treat Alzheimer's
- Commonwealth Fusion Systems opened a new 50-acre campus in Devens MA for development and deployment of fusion energy
- Cullinan Amber IND cleared by FDA for targeted oncological therapies
- Elicio Therapeutics merged with Angion Biomedical
- JetCool and Dupont collaboration launched to increase adoption of advanced liquid cooling technology for electronic components in data centers and high-performance computing applications
- Kytopen launched Flowfect Discover™ an automated high throughput gene delivery platform

- Lyndra Therapeutics dosed first clinical trial participant for oral capsules for treatment of schizophrenia and bipolar disorder.
- Routing Company launched Pingo Analytics™ a tool for transit analytics and reporting
- Tissium received marketing approval for a product for peripheral nerve repair

The Federal Lab Consortium recognized Lincoln Labs (LL) with an award for Excellence in Technology Transfer. This recognition was the result of the collaborative efforts between the TLO and LL which lead to the transfer of two technologies to market:

- KeyLime, open-source technology for increasing security and privacy of data and services in the cloud
- Forensic video exploitation and analytics for an expedited process to review and extract information from surveillance videos; this technology is commercially licensed to Doradus Labs

Strategic and Policy Activity

During FY2023, the TLO staff actively participated in strategic and policy initiatives that aligned with both the mission of MIT and the TLO. This work was undertaken alongside staff in Office of General Counsel, MIT Washington Office, peer institutions, and other individual contributors from across campus.

- Approval and adoption of an updated IP Policy to improve clarity for the MIT Community on regarding IP ownership, assignment of IP and obligations to sponsors of research
- Adoption of a new online process for assignments of IP through the MIT onboarding process, using docusign for obtaining signatures
- Participation in a peer university working group to launch a life sciences startup term sheet, US-Bolt
- Contribution to the MIT Open Access Task Force and faculty committee reviewing best practices in response to the federal Open Access Policy (the Nelson Memo)

Regulatory changes also directly impact the work of the TLO, engagement with various federal agencies is also a part of the TLO day to day work.

- Participation as an early user for use and adoption of the new federal compliance reporting system, IEdison, providing ongoing user feedback to National Institute for Standards and Technology (NIST)
- Changes to Utilization reporting requirements for all federally funded patented inventions being announced early FY24
- Feedback to Office of Science and Technology Policy (OSTP) and other offices of the Federal Government on processes related to university compliance with Bayh-Dole and newer Determination of Exceptional Circumstances (DEC)

- Changes to the EU Patent System with adoption of a Unified Patent Court (UPC) intended to reduce costs and simplify patent prosecution process in EU

The TLO staff contributed their policy and practice expertise in other ways to the MIT Community and nationally, including:

- TLO staff serve in roles on committees and advisory groups for Professional Associations such as the Association of University Technology Managers (AUTM) and the Licensing Executive Society (LES), as well as local organizations such as Massachusetts Technology Transfer Offices (MATTO), and MassBio
- Participation in Ten-U Collaboration with Stanford, Columbia and 5 UK Universities (Oxford, Cambridge, Manchester, Edinburgh, Imperial) and Leuven in Belgium. Funded by UKRI and Research England this initiative aims to share best practice and knowledge on tech transfer
- Participation in Breakthrough Cancer Collaboration as member of Tech Transfer Committee
- Support of programs and initiatives such as MITEI, SMART, Climate Grand Challenge, JWAFS, Corporate Sponsors with master research agreements, Sandbox, Martin Trust Center's delta v, Faculty Founders Initiative

Engagement with Entrepreneurial Ecosystem

Deshpande Center for Technological Innovation

While MIT stands out among all US universities in terms of the sheer number of new inventions received from its faculty, not all of these inventions are immediately ready for licensing. Many require additional resources and investment to mature the ideas or mitigate risks to make them more attractive for licensing. Recognizing this need, the Deshpande Center for Technological Innovation was established in 2002 through the generosity of Gururaj "Desh" Deshpande and his wife, Jaishree. The center provides crucial research grants, mentorship, and education to MIT faculty and researchers. This year, the Deshpande Center has supported exceptional projects aimed at driving innovation in both a carbon-free world and human health. All of the inventions behind these projects were disclosed to the TLO in prior years.

- Developing a high throughput platform for high resolution imaging and quantification of drug uptake within target cells. Impact: More effective drugs that get to the right place inside human cells. Laurie Boyer, Professor of Biological Engineering - TLO Case #: 22339, 16900
- Development of a new hybrid solid-liquid cathode. Impact: increased energy of lithium batteries. Betar Gallant, Professor of Mechanical Engineering - TLO Case #: 24100
- Improved catalysts using artificial intelligence-based platform. Impact: discovery of new catalysts, reducing costs in industry and improving development of lifecycle. Rafael Gomez-Bombarelli, Professor of Materials Science & Engineering -TLO Case #: 22905

- Improving electrochemical carbon dioxide reduction. Impact: reduced CO2 emissions and converting CO2 into feedstock for use in industrial applications. Ariel Furst, Professor of Chemical Engineering - TLO Case #: 24712
- More efficient antibody discovery against viruses and membrane protein targets. Impact: New membrane protein targets and creation of new medicines. Brandon Dekosky, Professor of Chemical Engineering - TLO Case #: 23890
- New space propellants to fit smaller spacecraft. Impact: More usable payload for small spacecraft. Paulo Lozano, Professor of AeroAstro - TLO Case #: 22282, 21144
- Selective conversion of oxides to sulfides for carbon free metal production. Impact: reduction in carbon intensive mineral and metal processing methods. Antione Allanore, Professor of Materials Science and Engineering – TLO Case #: 21958

Communications and Marketing

TLO staff continued to engage and ramped up face to face meetings in mid-FY23. Work began on a new TLO website led by the Marketing and Communications Manager with planned key improvements for clear usability and enhanced features. A variety of activities and engagements with the MIT and Cambridge communities continued to increase through use of Twitter, LinkedIn, and communicating via communication-focused Slack channels. Outreach via newsletters and email with colleagues in the ecosystem also increased, including presence in:

- I&E Email & Newsletters
- Office of Innovation HQ Website & Newsletter Listing
- RAS Email & Newsletters
- MIT Events Website
- Martin Trust Center Orbit Platform

MIT Community awareness and support continued through:

- Spring & Fall Semester Entrepreneurship & Innovation Resource Fairs
- Martin Trust Center In-Person Office Hours
- Office of Innovation HQ In-Person Office Hours
- TLO Virtual Office Hours
- Other E&I event sponsorship and support

In FY2023, the TLO website received over 96,000 users. This has been a consistent trend over the past few years—we hope that with the release of our new website and enhanced features will be a value add for our researchers and increase the exposure of MIT inventions and technologies.

In FY2023 TLO continued its IAP Speaker Series cohosted with MIT Libraries. We also introduced a new Golden Speaker Series where eight high-profile faculty discussed their story and path to startups. The metrics for these sessions were:

- Thirteen IP Speaker Series Session
- Eight IP 'Golden Speakers'
- One panel with three external panelists to talk about resources required for entrepreneurs and commercialization
- The IAP Speaker Series in total had 1,643 Registrants with 938 Unique Registrants (705 people registered for more than one session)

Over the whole event speakers included TLO and Libraries staff, representatives from The Engine, Schwartzman College of Computing, Lincoln Labs, law firms, other VC groups, OSATT Core, and Research Administration Services staff.

Our internship program continues to develop, employing 14 interns during FY2023. These interns have advanced degrees and work on TLO technology briefs, or non-confidential technology summaries which are placed on the TLO website.

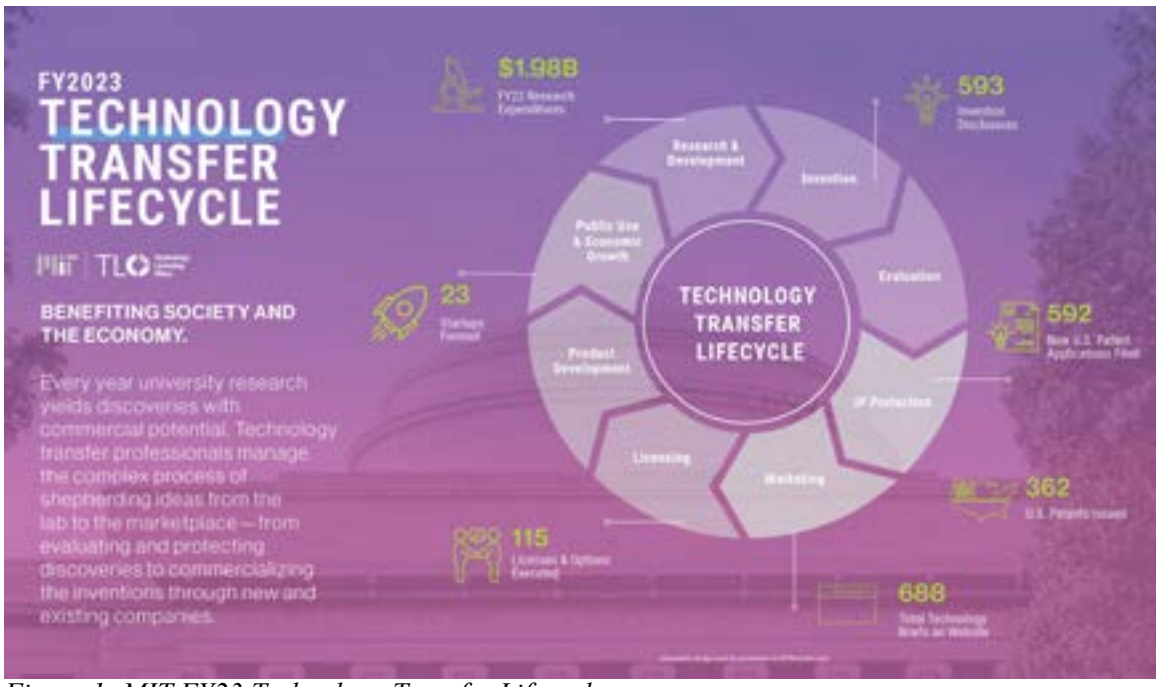

Figure 1: MIT FY23 Technology Transfer Lifecycle

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