

MIT Media Lab

Fiscal year 2020 was shaped by a series of difficult challenges, both internal and external, but also by a spirit of community and determination.

On August 15, 2019, now former Media Lab director Joi Ito issued an open letter acknowledging that he had accepted donations from Jeffrey Epstein, as well as contributions to his own investment funds, and also allowed Epstein to visit the Media Lab. Soon after, MIT president Rafael Reif acknowledged the Institute's role in vetting and accepting both these donations and donations to mechanical engineering professor Seth Lloyd.

Ito resigned on September 7 under intense media scrutiny regarding the Epstein donations and visits; on September 10, the Institute appointed an executive committee of faculty and senior staff to lead the Media Lab through a transition period that will continue until a new director has been hired and has a chance to settle in. The five members of the committee and their areas of responsibility are as follows:

- Pattie Maes: future lab governance model and search for new director
- Deb Roy: executive director of operations and communications
- Tod Machover: community engagement and culture change
- Maria Zuber, MIT's vice president for research: policies, practices, and research culture
- Ramona Allen, the School of Architecture and Planning's assistant dean for human resources and, as of October 1, MIT's vice president for human resources: administrative organization

In an email to the Media Lab community, Maes wrote, on behalf of the committee: "Right now, our entire focus is on managing the Lab, restoring the health and rebuilding the trust of our community through a process of introspection, conversation, and reform that includes Media Lab students, staff, and faculty." To that end, the committee established five working groups, each consisting of at least two faculty members, two staff members, and two students, with an additional staff member to assist with administrative tasks, provide accountability, and serve as a liaison with the committee. Each of the working groups focused on a different problem area: culture, governance, student-advisor relationships, research, or funding. The groups met throughout the year and provided recommendations to the committee, many of which have been or are being incorporated into the lab's operating procedures and documentation.

Also on September 7, *Business Insider* reported that Open Agriculture Initiative head Caleb Harper had misrepresented or exaggerated the capabilities of the initiative's food computers. The *Chronicle of Higher Education* reported additional allegations on September 11, stating that it had spoken to five people connected with the initiative. On September 20, WBUR and ProPublica reported that the initiative had dumped wastewater in excess of legal limits at its facility in Middleton, known as Bates. MIT halted most of the initiative's work in October, and the initiative itself closed in April.

Despite these difficulties, the Media Lab hosted a successful member event in October, with many member companies expressing their desire to help the lab emerge from this period of turmoil as a stronger, more equitable community. Additionally, we established Future Sketches, under adjunct professor Zach Lieberman, as a new research group in fall 2019.

In late February, the lab received the go-ahead to begin the search for a new director. As part of the ongoing work to shift the culture of the lab toward greater community participation and transparency, the search committee was expanded to include senior and junior Media Lab faculty members, Media Lab staff members, one Media Lab student, and two MIT faculty members from outside the lab. Also, the lab community was invited to contribute suggestions for the job description. The search, being conducted by Russell Reynolds Associates, officially opened in June.

Outside of MIT, the emerging threat from the novel coronavirus had begun to make itself clear by late January; as of this writing, students, researchers, and other members of the MIT community are beginning to return to campus as part of a phased research ramp up, with appropriate safeguards in place. As is the case with everyone else at MIT, the Media Lab community has sometimes struggled with the dislocations and disruptions created by the COVID-19 pandemic but has also risen to the occasion with characteristic enthusiasm and creativity. For example:

- Drawing on preexisting research, principal research scientist Shuguang Zhang and collaborators published a paper on “designer molecular mops” — modified proteins that may bind to cytokines as a possible treatment for the cytokine storm associated with COVID-19.
- Canan Dagdeviren’s “Lean Lab” approach, which allowed her research group to ramp down their YellowBox cleanroom in just 15 minutes on March 13, was featured in *MIT News*.
- With Saving Face, researchers from groups across the lab are developing a suite of easily scaled technologies to warn people when they are about to touch their faces.
- Researchers in the Human Dynamics and City Science groups prepared a preliminary report visualizing the impact of social distancing policies in the New York City area. The report suggests that the strict “stay-in-place” policies had a dramatic effect on people’s daily mobility and their number of social contacts.
- OPT Industries Inc., a Media Lab spinoff co-founded by alum Jifei Ou, collaborated with spinoff Formlabs to develop 3D-printed nasopharyngeal swabs for COVID-19 testing. The work was based on Ou’s Tangible Media Group dissertation.
- Using computational models of protein interactions, researchers in the Molecular Machines group and the Center for Bits and Atoms designed a peptide that binds to coronavirus proteins and shuttles them into a cellular pathway that breaks them down.

The COVID-19 pandemic also inspired numerous collaborations both across and outside of MIT.

- Matt Carney, a PhD candidate in the Biomechatronics group who successfully defended his dissertation in December, worked with a range of collaborators on an open standard respirator as an alternative to the N95 face mask. The device, which is reusable, sterilizable, modular, and filter-media agnostic, is designed for mass manufacture and rapid deployment.
- The Pandemic Response CoLab, a collaboration among the MIT Center for Collective Intelligence, member company MilliporeSigma, and the Community Biotechnology Initiative, is leveraging an open online collaboration platform to mobilize innovators, communities, businesses, and others to develop actionable solutions to real problems created by COVID-19.
- Safe Paths, an effort involving faculty across MIT and input and expertise from a variety of government agencies, academic institutions, nonprofits, and companies worldwide, is a privacy-preserving open source technology platform for contact tracing.
- Beat the Virus, which aims to help guide people through these extraordinary challenges with critical, trusted, and engaging public health messages, is a collaboration among the Laboratory for Social Machines, Media Lab advisory committee member and former US assistant surgeon general Susan Blumenthal, New America, McKinsey & Company, CAA, and other contributors in public health, media, technology, research, education, sports, entertainment, and professional services.

In the same spirit of collaboration, Cynthia Breazeal launched Innovating Learning and Education in the Era of AI in April. This partnership among the Media Lab, the MIT Stephen A. Schwarzman College of Computing, and Open Learning is designed to highlight the diverse work by faculty, staff, and students across the MIT community at the intersection of artificial intelligence (AI), learning, and education.

Although our usual schedule of events has been suspended for the foreseeable future, the Media Lab has worked to create a variety of virtual events for our extended community as well as the general public, including semi-weekly virtual research discussions allowing our member companies to connect with our ongoing research; a wholly virtual member meeting that spanned two weeks of workshops, virtual demos, and online office hours; and regular online seminars hosted by the Open Ocean Initiative and the Space Enabled research group.

As the fiscal year drew to a close, the lab launched a series of charrettes, hosted by a team of students, staff, and faculty members, to build on what we have learned from conversations and work over the last year, look forward, and engage our community in articulating large, cross-disciplinary themes that reflect a unique Media Lab vision about the future and seed new initiatives or smaller collaborations with greater involvement across different groups.

Finally, the Media Lab said goodbye to two members of our community who passed away in 2019 and 2020. Alum Steven Keating, [who died on July 19, 2019](#), was a member of the Mediated Matter group who received his master's degree and PhD in mechanical engineering and became an advocate for open source patient data as he studied his own

brain cancer. Michael Hawley, [who died on June 24, 2020](#), was one of the first graduates of the Program in Media Arts and Sciences and went on to lead the Personal Information Architecture research group at the lab and co-found the Toys of Tomorrow and Things That Think consortia.

Research

- **A Counting:** A remotely accessible participatory public art project that captures “voice portraits” of major American cities to reflect the linguistic and ethnic diversity of the United States
- **How to Train Your Robot: A Middle School AI and Ethics Curriculum:** Curricula for middle and elementary school children to learn more about artificial intelligence, from technical concepts to ethical considerations and real-world impacts
- **[bike] swarm:** A light system for bicycles (and one of the 10 projects chosen for the 2020 MITdesignX cohort) that uses an open source synchronization protocol and algorithm to create “swarms” of synchronized lights, enhancing riders’ sense of community and safety
- **Deep Learning to Develop and Analyze Computational Hematoxylin and Eosin Staining of Tissue Images for Digital Biopsies:** Training and clinical validation of explainable deep neural networks to digitally stain and de-stain biopsy slides
- **Deep Reinforcement Learning for Pain Management:** A method to quantify pain in patients using deep learning and functional near infrared spectroscopy, which could help doctors diagnose and treat pain in unconscious and noncommunicative patients
- **Designing Social Robots for Older Adults:** A long-term study to inform robot design by helping older adults better engage with social robots, with a priority on developing robot interactions that can be tested long term in older adults’ homes to better inform how they can shape aging in place
- **Detect DeepFakes: How to Counteract Misinformation Created by AI:** A project designed to answer lingering questions about and identify techniques for counteracting AI-generated misinformation
- **Hybrid Living Materials:** A new method of printing 3D objects that can control living organisms in predictable ways
- **Living Bits:** Inspired by Hiroshi Ishii’s work on Tangible Bits, a project that rethinks the boundaries between biological cells and computers
- **Material-Robot System for Assembly of Discrete Cellular Structures:** Developed by researchers from the Center for Bits and Atoms, miniature robotic systems that can build large, complex structures out of tiny, identical pieces called voxels
- **Mice Against Ticks:** An ongoing project, in collaboration with local communities, that aims to immunize mice against Lyme disease through gene editing
- **Population Imaging of Neural Activity in Awake Behaving Mice:** A new method for imaging multiple neurons in awake subjects that could be combined with optogenetics or expansion microscopy

- RF-EATS: Food and Liquid Sensing in Practical Environments Using RFIDs: A new system that uses radio frequency identification (RFID) tags and an AI model to verify the authenticity of foods and liquids in closed containers
- Robust Genome Editing with Broad Targeting CRISPR Enzymes: A method, developed via computational biology, that expands the range of CRISPR nucleases to over 70% of DNA sequences
- A Tailored, Electronic Textile Conformable Suit for Large-Scale Spatiotemporal Physiological Sensing in Vivo: A method of embedding electronic sensors into stretchy, machine-washable fabrics, enabling the creation of comfortable clothing that can monitor the wearer's vital signs
- TRANS-DOCK: A docking system for pin-based shape displays that expands human-computer interaction capabilities in terms of both output and input
- Venous Materials: Towards Interactive, Fluidic Mechanisms: An approach to integrating interactive fluidic mechanisms and tangible user interfaces that expands on the fields of human-computer interaction and material design
- Wireless Communication from Underwater to the Air: A system that enables underwater-to-air communication using a translational acoustic RF communication transmitter that sends SONAR signals or standard sound

Events

On July 25, 2019, the Space Exploration Initiative hosted a panel discussion titled To the Moon to Stay—From the Moon with Love. The discussion, moderated by Dava Newman, former deputy administrator of the National Aeronautics and Space Administration (NASA) and MIT Apollo Professor of Aeronautics and Astronautics, included Jessy Kate Schingler, lunar policy and governance advisor; Alex MacDonald, NASA senior economic advisor; and Cady Coleman, retired NASA astronaut.

Ninety percent of 21st-century urban growth is expected to happen in informal settlements or in cities with insufficient or unreliable infrastructure. What if heavy infrastructure can be replaced with lightweight, distributed, autonomous systems? In October, the City Science group hosted the Cities Without event, in which a diverse group of speakers and panelists convened to discuss such opportunities in Hamburg's Elbphilharmonie, followed by a day of workshops and conversations.

The two-day Cryptoeconomic Systems: Field-Building Summit in October focused on collaboratively building an interdisciplinary field of cryptocurrency and blockchain technology research in preparation for the launch of *Cryptoeconomic Systems*, a new open access journal that will be published by The MIT Press.

A daylong event by and for the Media Lab community, the Festival of Learning debuted in 2012, was revived in 2019, and will now be an annual event. This year's festival, organized by a collaborative team of students, staff, and researchers with support from the Media Lab Learning Initiative, was held in January.

The Media Lab Venture Summit, a full-day event highlighting dozens of Media Lab startups and offering an opportunity for member companies and other interested parties to visit spinoffs in the Boston area, also took place in January. The event was co-organized with the E14 Fund, an early-stage fund that supports and invests in the Media Lab startup community.

The Wearable Biotech and Growable Interfaces workshop, held in March, aimed to explore biodigital interfaces in, on, and around the body and push the conversation forward by stimulating a dialogue among technologists, biologists, engineers, artists, designers, startups, and industry.

Exhibits and Performances

In July 2019, the Space Enabled research group presented *Earthrise: A 50 Year Contemplation* at the Intrepid Sea, Air & Space Museum.

The MIT List Gallery exhibited two works by Director's Fellow Christine Sun Kim: *The Sound of Obsessing* (displayed in the lobby of Building E14) and *Off the Charts* (displayed in the List Gallery). The exhibition opened February 7 and was scheduled to run through April 12. After MIT closed due to the pandemic, the works were featured in a virtual exhibition, *The List at Home*.

The Museum of Modern Art featured work by Neri Oxman and the Mediated Matter research group in *Neri Oxman: Material Ecology*. The exhibit opened February 22 and was scheduled to run through May 25. After the museum closed due to the pandemic, the exhibition was included in its Virtual Views program.

The MIT Symphony Orchestra was scheduled to present the US premiere of *A Toronto Symphony* by Tod Machover that included a new section written in collaboration with the orchestra's student players on March 13—the day MIT closed due to the pandemic. The players voted to come in for what would have been the dress rehearsal on the evening of March 12, to play together for one last time before dispersing, and to record the music for the concert. Arts at MIT streamed the recording on May 8 along with Machover's *Chomsky Suite*, which was originally presented at the MIT 150 Festival of Art, Science and Technology. On May 16, the Philadelphia Orchestra streamed Machover's *Philadelphia Voices* as part of its Virtual Philadelphia Orchestra program.

Making Digital Tangible: The Battle Against the Pixel Empire, an exhibition of Hiroshi Ishii's work with the Tangible Media group, opened at the MIT Museum on November 7, 2019, and was scheduled to run through August 31, 2020.

The MIT Press launched its virtual book talk series on March 31 with a coloring workshop for research assistant Alex Berke's *Beautiful Symmetry: A Coloring Book About Math*.

In a July event moderated by Dalia Habib Linssen (Museum of Fine Arts), research assistant Alexis Hope discussed contemporary design and COVID-19 with Paola Antonelli (Museum of Modern Art) and Michelle Millar Fisher (Museum of Fine Arts).

Communications

While much of the media coverage in FY2020 focused on the donations of Jeffrey Epstein and the resignation of Joi Ito, Media Lab research still received extensive coverage in print, broadcast, and online outlets. Items of particular interest included:

- A feature in *Nautilus* about the Black Rock Atlas, a project that mapped social networks at Burning Man by tracking the decentralized journey of a multitude of vessels through the gift economy using GPS technology and generative photography
- A *PCMag* profile of alum Saul Griffith and his spinoff company, Otherlab
- An op-ed in the *New York Times* by researchers Chelsea Barabas and Karthik Dinakar, with Harvard attorney Colin Doyle, regarding problems with algorithmic risk assessments
- A *Quartz* profile on the AI and ethics course for middle school students developed by research assistant Blakeley Payne and Cynthia Breazeal
- Two Netflix series that featured Media Lab professors: *Abstract* (Neri Oxman) and *Unnatural Selection* (Kevin Esvelt)
- A profile of research assistant Jaleesa Trapp in *MIT News*
- A PBS documentary, *Articulate*, that featured alum Ani Liu
- A Bloomberg TV profile of research assistants Everett Lawson and Matt Carney, who worked with Hugh Herr to fit Everett with a bionic prosthesis after he opted to undergo the Ewing amputation procedure developed by researchers at the Media Lab and Brigham and Women's Hospital
- A *Wired* cover story featuring research specialist Maggie Coblentz and her experimental gastronomy research

Other media outlets covering the lab included *Adweek*, *AIGA Eye on Design*, BBC, the *Boston Globe*, CBC, the *Christian Science Monitor*, the *Chronicle of Higher Education*, CNET, CNN, *The Conversation*, *Die Welt*, *Essence*, *Fast Company*, *Forbes*, *The Guardian*, *Korea Times*, the *Los Angeles Times*, *MIT Technology Review*, *Nature*, PBS, *Quanta Magazine*, *The Standard*, *TechRepublic*, *Vanity Fair*, *Variety*, *VentureBeat*, *VICE*, the *Wall Street Journal*, the *Washington Post*, and WGBH.

Finance

The Media Lab's annual operating budget of approximately \$78 million was a decrease of about 12% from FY2019. With surpluses from prior years, our net asset balance is \$20 million. Roughly 30% of funding (\$23 million) came from our consortium, which started the year with approximately 80 members. Sponsored project funding was \$18 million, accounting for 23% of the FY2020 budget. Gift income came in at \$18 million as well.

Members

In FY2020, the Media Lab welcomed four new member companies and organizations: Temasek, Truist, SOCAR, and the US Air Force.

Patents

The Media Lab filed 74 patent applications between July 1, 2019, and June 30, 2020, and 51 patents were issued during that period.

Directed Research

In FY2020, the Media Lab submitted 126 proposals for new or continuing directed research projects, including postdoctoral fellowships and no-cost collaborations. Approximately 24% of these proposals were for sub-awards in collaboration with other research institutions. Fifty proposals remain under consideration, and 38 have resulted in awards. Forty-seven percent of the proposals submitted were in response to government solicitations (e.g., National Science Foundation [NSF], National Institutes of Health [NIH], Department of Defense [DOD], Defense Advanced Research Projects Agency, and NASA), while the others were submitted to foundations and nongovernmental sponsors. The new awards ranged from \$3,000 to \$3 million with durations of six months to five years.

In addition, the Center for Bits and Atoms submitted 11 proposals for new or continuing directed research projects. One of these proposals was for a sub-award in collaboration with other research institutions. Five of the 11 proposals resulted in awards, four resulted in rejections, and we are still awaiting decisions on the other two. Nine of the proposals submitted were in response to government solicitations (e.g., NSF, NIH, DOD, and NASA), while the other two were submitted to foundations and nongovernmental sponsors. The new awards ranged from \$75,000 to \$6 million with durations of five months to seven years.

Human Resources

Lorrie LeJeune accepted the role of interim director of communications. Andrea Porras, who was recently promoted to administrative support coordinator, received an Infinite Mile Award from the School of Architecture and Planning. Kevin Davis was promoted to director of facilities with the departure of Jessica Tsymbal. Principal research scientist V. Michael Bove's employment was terminated in September following a determination that he had violated the Institute's policies against sexual harassment.

Media Lab Members

Consortium Research Lab Members

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Consortium Lab Members

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