

MIT News

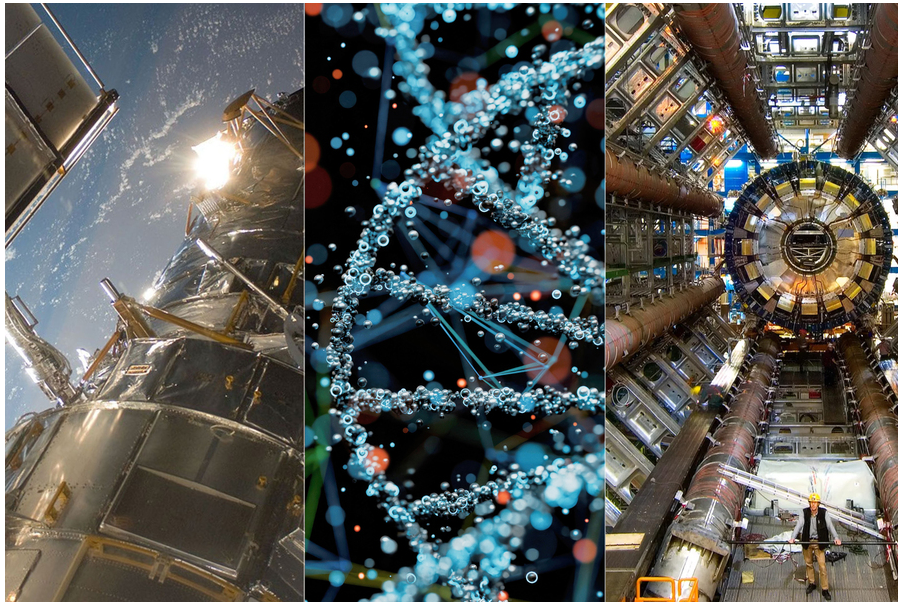
ON CAMPUS AND AROUND THE WORLD

Former MIT researchers advance a new model for innovation

Focused research organizations (FROs) undertake large research efforts and have begun to yield scientific advances.

Zach Winn | MIT News

June 6, 2025



The Hubble Space Telescope, the Human Genome Project, and the Large Hadron Collider/CERN were large-scale engineering projects that inspired MIT researchers to create Focused Research Organizations.

Credit: NASA, iStock, Maximilien Brice/CERN

Academic research groups and startups are essential drivers of scientific progress. But some projects, like the Hubble Space Telescope or the Human

Genome Project, are too big for any one academic lab or loose consortium. They're also not immediately profitable enough for industry to take on.

That's the gap researchers at MIT were trying to fill when they created the concept of focused research organizations, or FROs. They describe a FRO as a new type of entity, often philanthropically funded, that undertakes large research efforts using tightly coordinated teams to create a public good that accelerates scientific progress.

The original idea for focused research organizations came out of talks among researchers, most of whom were working to map the brain in MIT Professor Ed Boyden's lab. After they began publishing their ideas, however, the researchers realized FROs could be a powerful tool to unlock scientific advances across many other applications.

"We were quite pleasantly surprised by the range of fields where we see FRO-shaped problems," says Adam Marblestone, a former MIT research scientist who co-founded the nonprofit Convergent Research to help launch FROs in 2021. "Convergent has FRO proposals from climate, materials science, chemistry, biology — we even have launched a FRO on software for math. You wouldn't expect math to be something with a large-scale technological research bottleneck, but it turns out even there, we found a software engineering bottleneck that needed to be solved."

Marblestone helped formulate the idea for focused research organizations at MIT with a group including Andrew Payne SM '17, PhD '21 and Sam Rodriques PhD '19, who were PhD students in Boyden's lab at the time. Since then, the FRO concept has caught on. Convergent has helped attract philanthropic funding for FROs working to decode the immune system, identify the unintended targets of

approved drugs, and understand the impacts of carbon dioxide removal in our oceans.

In total, Convergent has supported the creation of 10 FROs since its founding in 2021. Many of those groups have already released important tools for better understanding our world — and their leaders believe the best is yet to come.

“We’re starting to see these first open-source tools released in important areas,” Marblestone says. “We’re seeing the first concrete evidence that FROs are effective, because no other entity could have released these tools, and I think 2025 is going to be a significant year in terms of our newer FROs putting out new datasets and tools.”

A new model

Marblestone joined Boyden’s lab in 2014 as a research scientist after completing his PhD at Harvard University. He also worked in a new position called director of scientific architecting at the MIT Media Lab, which Boyden helped create, through which he tried to organize individual research efforts into larger projects. His own research focused on overcoming the challenges of measuring brain activity across large scales.

Marblestone discussed this and other large-scale neuroscience problems with Payne and Rodriques, and the researchers began thinking about gaps in scientific funding more broadly.

“The combination of myself, Sam, Andrew, Ed, and others’ experiences trying to start various large brain-mapping projects convinced us of the gap in support for medium-sized science and engineering teams with startup-inspired structures, built for the nonprofit purpose of building scientific infrastructure,” Marblestone says.

Through MIT, the researchers also connected with Tom Kalil, who was at the time chief innovation officer at Schmidt Futures, a philanthropic initiative of Eric and Wendy Schmidt. Rodriques wrote about the concept of a focused research organization as the last chapter of his PhD thesis in 2019.

“Ed always encouraged us to dream very, very big,” Rodriques says. “We were always trying to think about the hardest problems in biology and how to tackle them. My thesis basically ended with me explaining why we needed a new structure that is like a company, but nonprofit and dedicated to science.”

As part of a fellowship with the Federation of American Scientists in 2020, and working with Kalil, Marblestone interviewed scientists in dozens of fields outside of neuroscience and learned that the funding gap existed across disciplines.

When Rodriques and Marblestone published an essay about their findings, it helped attract philanthropic funding, which Marblestone, Kalil, and co-founder Anastasia Gamick used to launch Convergent Research, a nonprofit science studio for launching FROs.

“I see Ed’s lab as a melting pot where myself, Ed, Sam, and others worked on articulating a need and identifying specific projects that might make sense as FROs,” Marblestone says. “All those ideas later got crystallized when we created Convergent Research.”

In 2021, Convergent helped launch the first FROs: E11 Bio, which is led by Payne and committed to developing tools to understand how the brain is wired, and Cultivarium, a FRO making microorganisms more accessible for work in synthetic biology.

“From our brain mapping work we started asking the question, ‘Are there other projects that look like this that aren’t getting funded?’” Payne says. “We realized there was a gap in the research ecosystem, where some of these interdisciplinary, team science projects were being systematically overlooked. We knew a lot of amazing things would come out of getting those projects funded.”

Tools to advance science

Early progress from the first focused research organizations has strengthened Marblestone’s conviction that they’re filling a gap.

[C]Worthy is the FRO building tools to ensure safe, ocean-based carbon dioxide removal. It recently released an [interactive map](#) of alkaline activity to improve our understanding of one method for sequestering carbon known as ocean alkalinity enhancement. Last year, a math FRO, Lean, released a programming language and proof assistant that was used by Google’s DeepMind AI lab to solve problems in the International Mathematical Olympiad, achieving the same level as a silver medalist in the competition for the first time. The synthetic biology FRO Cultivarium, in turn, has already released software that can predict growth conditions for microbes based on their genome.

Last year, E11 Bio previewed a new method for mapping the brain called PRISM, which it has used to map out a portion of the mouse hippocampus. It will be making the data and mapping tool available to all researchers in coming months.

“A lot of this early work has proven you can put a really talented team together and move fast to go from zero to one,” Payne says. “The next phase is proving

FROs can continue to build on that momentum and develop even more datasets and tools, establish even bigger collaborations, and scale their impact.”

Payne credits **Boyden** for fostering an ecosystem where researchers could think about problems beyond their narrow area of study.

“Ed’s lab was a really intellectually stimulating, collaborative environment,” Payne says. “He trains his students to think about impact first and work backward. It was a bunch of people thinking about how they were going to change the world, and that made it a particularly good place to develop the FRO idea.”

Marblestone says supporting FROs has been the highest-impact thing he’s been able to do in his career. Still, he believes the success of FROs should be judged over closer to 10-year periods and will depend on not just the tools they produce but also whether they spin out companies, partner with other institutes, and create larger, long-lasting initiatives to deploy what they built.

“We were initially worried people wouldn’t be willing to join these organizations because it doesn’t offer tenure and it doesn’t offer equity in a startup,” Marblestone says. “But we’ve been able to recruit excellent leaders, scientists, engineers, and others to create highly motivated teams. That’s good evidence this is working. As we get strong projects and good results, I hope it will create this flywheel where it becomes easier to fund these ideas, more scientists will come up with them, and I think we’re starting to get there.”