

UNIVERSITY OF MICHIGAN

STIMULATING CROSS-DISCIPLINARY BASIC RESEARCH: THE UNIVERSITY OF MICHIGAN'S MCUBED SEED FUNDING PROGRAM

Founded in 1817, the University of Michigan (U-M) today has a total research volume of over one billion dollars annually—more than any other public university and second among all universities. With nineteen schools and colleges, many of them ranked among the top ten in the country, and a range of research institutes, the university is known for the excellence as well as the size and breadth of its research enterprise. In addition, it is widely recognized for its culture of cooperation across disciplines, which has led to major initiatives that bring together faculty across schools and colleges in such areas as nanoscience, energy, the life sciences, and the social sciences.

Today's basic research requires teams of skilled investigators, each with deep knowledge in his or her particular field, coming together to address the full complexity of basic scientific questions. Whether it is determining the fundamental limit of solar energy capture, understanding the complex dynamics of the human microbiome, or elucidating the mechanism of molecular recombination in polymerization, Michigan is one of the few places where the broad expertise and the spirit of cooperation across disciplines exists to address such pressing topics effectively.

A key challenge is how to encourage and strengthen this cooperation and harness this creativity in a time when traditional funding sources are becoming tighter and can require months or years for support to materialize. In today's fast-paced research environment, where ideas and information are shared immediately around the world, such delays can cripple creativity and limit opportunity. This emerging paradigm of scientific discovery and exchange requires a transformational approach to seed-fund distribution. We believe that MCubed is leading the way.

MCubed: Real-time funding for high-risk research

To nurture the intellectual talent and the spirit of cooperation at U-M, the faculty who conceived MCubed devised a new way for research programs to self-generate instantaneously without any roadblocks or impediments. This approach eliminates the gap between idea conception and the ability to produce initial results, opening the way for bold, risky experiments that lead to either the illuminating successes or the instructive failures that are all a part of scientific discovery.

The MCubed concept is simple. Each faculty member participating in the program receives a single token worth \$20,000 for the duration of the two-year funding cycle. The faculty member cannot spend the token independently; instead, he or she must find two other faculty members willing to commit their tokens to a joint research project. Once a team of three researchers forms, involving at least two different campus units, they can immediately "cube" to collect \$60,000 to begin their research. Faculty also have the option of forming blocks of cubes around a single topic—i.e., five cubes involving three collaborators each for a total of fifteen faculty can secure \$300,000—enabling the instantaneous creation of a sizable research team.

The first cycle of MCubed investment, begun in 2012, totals \$14M. The funds for the program were provided approximately evenly among the Provost's Office (with a one-time contribution of \$5M), the participating campus units, and the individual faculty researchers. The pilot cycle involves researchers from 25 different units on campus, including all 19 schools and colleges as well as several interdisciplinary research institutes—a testament to the broad institutional support for MCubed.

Several unique features set MCubed apart from other seed-funding programs. First, the program is run entirely through an interactive website (mcubed.umich.edu) that draws upon elements of Kickstarter and Facebook. All participating faculty investigators and their tokens are loaded into the system so that faculty can search the website to identify potential collaborators with research expertise essential to their project. Proposed projects are also loaded into the website so they can be viewed by all participants. In addition to using the site to form cubes, faculty report that the site serves as a useful clearinghouse for identifying U-M's expertise around emerging research topics.

Second, there is no formal peer review. Once the investigators form a cube around an innovative project concept, they can speedily access the \$60K to advance their ideas. However, the acts of posting a research project for all MCubed faculty to consider and of contributing your one and only one token to a single research project are very powerful deterrents to frivolous research. In essence, this program relies upon the purest form of peer review in which investigators analyze the project concept and their potential collaborators to determine if they are worthy of token investment, as well as their precious research time. Unlike more traditional peer review processes, this method also invites innovation and risk-taking, and does not discourage untested ideas that may lead to true breakthroughs, as some other approaches do.

Third, MCubed supports training and education. The bulk of the money must be used to support graduate students, undergraduate students, or postdoctoral researchers—a substantial investment in the next generation of innovators. The mission of an academic research institution is to generate new knowledge and educate students, and MCubed accomplishes both, offering a unique opportunity for cross-disciplinary mentoring and offering students firsthand experience with pioneering research.

MCubed Successes: Only the beginning

Perhaps the most attractive characteristic of MCubed is that, although it is just three-fourths of the way through its pilot cycle, it is already producing results. MCubed was designed by a faculty committee with vital input from deans and their administrative teams, and we continue to consult those leaders to ensure that MCubed supports the many ways that path-breaking scientific research is accomplished across schools, colleges, and institutes. We regularly gather data on the research and educational impact of MCubed, and we have engaged U-M's Institute for Social Research to study the impact of MCubed to inform further refinements to the program.

Early data speaks to the success of this first cycle of MCubed:

- Over 2000 faculty are participating in the MCubed system, and over 200 cubes have been funded.
- More than 750 faculty are involved in these cubes, showing that many cubes report teams that include faculty beyond the official three token-holders. Cube participation, which continues to grow, involves 30 undergraduate students, 160 graduate students, and 85 postdoctoral fellows.
- 353 distinct projects were created and posted on the MCubed website. The limitations of unit-specific capacity for investments prevented all of the cubes from forming—a challenge that could be overcome with private funding.
- Over 1200 participants attended the inaugural annual MCubed Symposium in the fall of 2013, where all funded cubes reported on their progress. Attendees described the gathering as an “innovation accelerator in and of itself.”

- 75% of faculty in cubes report working with at least one new collaborator—a colleague with whom one has had no prior collaboration on teaching, an internal proposal, or external proposal—as a result of MCubed.
- \$8.5M of additional funding from other sources has already been secured by 15 cubes (7% of total cubes), well before the project end date of December 31, 2014. We project that 30% of cubes in this first round will bring in a total of \$20-30M.

Focusing on the Physical and Life Sciences

Thus far MCubed has consciously worked to engage the entire campus. By partnering with the Science Philanthropy Alliance, we propose to strengthen our emphasis on basic research in the physical and life sciences. With the growing emphasis among traditional sponsors for funding research that has clear potential to lead to new products, processes, and services with market potential, our ability to pursue unfettered intellectual inquiry is being curtailed. But basic science is not only at the heart of the mission of the university, it is also what has led to dramatic breakthroughs in our fundamental understanding of ourselves and the world around us. And these basic studies of everything from the molecular basis of biology to the behavior of materials at the atomic level, for example, have literally transformed our society.

To spur innovative collaborations in this arena, we plan to create and actively promote a special MCubed fund devoted expressly to supporting cubes that address basic research in the physical and life sciences. This will lower the barriers and open up entirely new opportunities for faculty seeking to explore novel ideas and approaches to fundamental challenges in their fields.

At the same time, we plan to expand MCubed to provide opportunities for undergraduate and graduate students to obtain support for their own innovative ideas. This will allow us to nurture the enthusiasm, the creativity, and the spirit of innovation we see so often in our students, with the hope of inspiring them to pursue careers in research.

And based on queries from other institutions, we also plan to explore MCubed collaborations in partnership with other universities. Many of our faculty work regularly with colleagues at other institutions. MCubed could allow them to build even more novel and productive relationships in scientific discovery.

It has never been more important for us to invest in the spirit of inquiry that is the special domain of academia. MCubed has already demonstrated that it is an effective and efficient mechanism for stimulating new ideas and new collaborations. With the support of the Science Philanthropy Alliance, we believe we can further bridge the barriers among disciplines, unleash the creativity of faculty and students, and imagine new solutions to scientific challenges.