

Mini-Grants, Major Benefits

Sometimes scientists need just a little bit of money for a small project. But cumbersome conventional grant-review processes can't always help. Enter the mini-grant lottery.



by **JEFF KANIPE**

FQXi Mini-Grant Program

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Not every scientist needs money to build a particle accelerator, an innovative materials laboratory, or a giant radio telescope array.

Instead, many their sights set on smaller, but nonetheless important, endeavors, such as collaborating with other scientists on a project, developing a workshop, and finding better ways of communicating their results.

Unfortunately, in order to fund even these modest proposals, scientists must run the same gauntlet of red tape, fill out the same ponderous grant forms, and even compete for the same federal government funds as their big-science counterparts. Obstacles like these make it difficult for scientists to obtain moderate funding for small projects from conventional sources.

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- *Max Tegmark*

So until recently, scientists found themselves in one of two positions: (a) redirecting part of a big grant to a smaller project, or (b) flat out of luck. Too often, it was the latter: dedicated sources for funding small science ventures were once virtually nonexistent.

But not any more. The Foundational Questions Institute (FQXi) has developed a unique program to award its Members

"Mini-Grants," ranging between US\$1,000 and US\$15,000, to help realize or supplement small science projects that otherwise would be left in the lurch.

Winning Small

In this spring's Inaugural round, 29 of 84 FQXi Members applied for a Mini-Grant, and 20 proposals won, totaling just over US\$122,000.

One of the Mini-Grant Winners was John Baez, a mathematical physicist at the University of California, Riverside, and, like all Mini-Grant Winners, an FQXi Member. Baez plans to use his US\$2000 Mini-Grant to update his public outreach website, "This Week's Finds in Mathematical Physics," widely recognized as an important resource for the mathematical physics community.

Baez admits that his Mini-Grant won't revolutionize fundamental physics, but he does think the funding will make his website a more effective resource for students and teachers. "I hear that lots of people find [the website] a useful resource, so I'm eager to improve it," says Baez.

A requirement for accepting a Mini-Grant is that each Winner produces a "product": a tangible result or outcome of the proposal. The product can be almost anything, including written proceedings of an event, slides of a PowerPoint presentation, an animation produced for research or public outreach purposes, a paper or a book.

In Baez's case, his product is an improved webpage. "I'm not sure a conventional grant would be easy to come by for this purpose," he says.

Winning Novel

The Mini-Grant program was mandated in the Institute's founding Charter, at <http://fqxi.org/Scientific%20Charter.pdf>. The program's three goals thus represent

a continuation of efforts by FQXi to honor the Charter's directive to break new ground in funding of scientific research.

The first goal of the Mini-Grant program is to enable FQXi Members to better communicate and collaborate with each other and the wider scientific community. This may seem like a straightforward task, but for busy scientists strapped for time and funding, it is often not.



GRANT BY LOTTERY

Would you trust a lottery to fund your scientific program?

"Most of our Members have not met each other or previously worked together," says Kirsten A. Hubbard, the Institute's Scientific Program Manager. "So Mini-Grants are meant to bring together people who should collaborate, but don't, because they haven't met or can't afford to spend a week together."

Goal number two is to maximize the Institute's existing research programs with a minimal amount of money. For example, since only FQXi Members may apply for Mini-Grants, relatively small amounts of money can have a disproportionate impact on precisely the people intended to benefit from FQXi funds.

It also means that grants can be awarded faster, which brings us to the most novel of the three Mini-Grant goals: Streamlining the grant process so that Members aren't flailing in forms and red tape.

"Simply 'scaling down' big grants does not make sense," says Anthony Aguirre, the Associate Scientific Director of FQXi. "You would end up with lots of people spending huge amounts of time writing and then reviewing grants, very likely consuming an amount of money rivaling what the grant is worth."

Winning the Lottery

Three features of the program help streamline the grant process. First, since FQXi Members are nominated by other Members on the basis of credentials and previous accomplishments, each Mini-Grant applicant already has an established reputation for quality research and effective use of funding. In a sense, each Member is "pre-qualified" to submit a proposal, so time needn't be wasted reviewing each applicant's particular know-how.

Second, the grant application itself is very straightforward, allowing applicants to complete it in just a matter of hours. But simple grant applications have a downside, which is why they are rare: it is hard to distinguish between equally good proposals. That's where the third novel feature of the program comes in.

Mini-Grants are selected by a lottery, not a traditional review panel. Each proposal is assigned a probability inversely

related to its monetary value, ensuring that inexpensive proposals are more likely to be selected. For example, of the twenty winning proposals in the Inaugural round, three-quarters budgeted US\$9,000 or less. Winners are then selected from the weighted pool of applicants via computer using random numbers – in this case, random quantum numbers for a bit of fun (see Sidebar).

"[The lottery] process ensures that we have a tight budget, that we spread the funds equitably, and that we have a higher rate of success than our available funds would suggest," says Aguirre.

This expeditious approach is specifically intended to enable programming that otherwise might not occur, says Max Tegmark, the Scientific Director of FQXi. "Many excellent small projects never happen because regular grants are a huge hassle to apply for. Our idea was to address this with the most hassle-free grant program we could imagine."

Win-Win

Often, conventional grant programs come with time constraints, requiring a research agenda to cover protracted time scales. This, says Abraham Loeb of Harvard University, and Mini-Grant Winner for a proposal to use computers to visualize the future of the local group of galaxies, restricts innovating thinking.

"Creative science is often done in a steps that cannot be forecasted well in advance. The Mini-Grant program is an ideal, and original, solution to this mismatch. It can support these steps one at a

time, when the funds are actually needed."

Other winning proposals include a movie to illustrate the future evolution of the universe (US\$2400); the creation of a prediction market to gauge the frequency of habitable earth-like planets in the galaxy (US\$3000); and support of a workshop investigating quantum effects in biological nanostructures (US\$12,000).

"The awarded projects illustrate that lots of great science can be done with such modest support," says Tegmark.

The Mini-Grant approach may thus appeal to grant-makers outside the insular world of cutting-edge physics research. "Philanthropic and charitable organizations will be keenly interested in this approach to grant making," says Amanda High, Vice President of the National Philanthropic Trust, and member of the FQXi Board of Directors. "Although there is a wide range of accepted 'best practice' in this area, novel and streamlined applications are always being sought. This strategy has very good prospects for replication – the key to its uptake will be rigorous evaluation and dissemination of findings."

"As far as how much good it will do, I think time will tell," says Aguirre. "But I strongly suspect that the collaborations, products, and so on that result from this program will push a number of projects forward."

Mini-Grant lotteries are expected to run every six months. The next deadline for Mini-Grant proposals is in the early fall of 2007.

Quantum Leap

(Adapted from newscientist.com/blog/space/2007/05/quantum-roulette-science-funding.html)

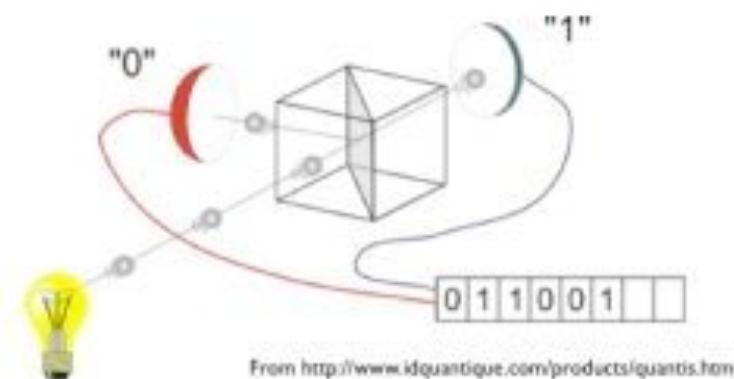
Unlike the bingo balls pictured on the previous page, FQXi Mini-Grant Winners are not picked from a hat. Instead, a computer using quantum-mechanically generated random numbers selects winning proposals.

Each measurement is performed by firing a single photon through a half-silvered mirror, as shown in the diagram to the right, and recording whether it was transmitted or reflected.

According to the "many worlds" interpretation of quantum mechanics, each of the two possible outcomes for the photon takes place in a different, parallel universe, which pops into existence during the experiment.

When the grant lottery's 15 quantum measurements were complete, at about 0100 GMT on 20 April 2007, the universe split into 32,768 nearly identical copies.

So, those who lost out on the grants can take solace in the fact that at least they won in a parallel universe!



QUANTUM-MECHANICAL RANDOM NUMBER GENERATOR Image Credit: IdQuantique