Tapping the crowds for research funding

Crowdfunding, a common practice to support projects in the arts, music or gaming, has also attracted the attention of scientists

Katrin Weigmann

One day early in 2011, Jarrett Byrnes and Jai Ranganathan, both ecologists at the National Center for Ecological Analysis and Synthesis, Santa Barbara, CA, USA, had a great idea about an alternative way to fund research projects. Byrnes was sitting in his office when Ranganathan came in to tell him about a proposal he had seen on the crowdfunding website Kickstarter (www.kickstarter.com) to erect in Detroit a statue of RoboCop, the robot-human hero of a US science fiction action film. “The RoboCop project seemed a little esoteric, but the proposers had done a fabulous job at communicating why it was both interesting and important,” Byrnes said. It took the internet by storm and raised more than US\$65,000 from almost 3,000 backers.

If this could be done for RoboCop, Byrnes and Ranganathan wondered whether it could be done for science as well. They asked friends and fellow scientists whether they would be interested in crowdfunding a research project and, after receiving substantial positive feedback, launched #SciFund Challenge in November 2011 with 59 research proposals. #SciFund Challenge helps researchers put together a crowdfunding proposal, supports their outreach activities and launches coordinated campaigns on the crowdfunding website of their partner RocketHub (www.rockethub.com). “We thought we would do it all at the same time so we could help each other out,” explained Byrnes, who is now chief networking officer for #SciFund Challenge.

Crowdfunding is the practice of funding a project by raising many small contributions from a large number of individuals, typically via the internet. An artist, film-maker or musician would put together an online profile of

their project and choose a platform such as Kickstarter, RocketHub or Indiegogo for its presentation. If people like the project, they can pledge money to it. Backers are usually charged only if the project succeeds in reaching its funding goal before the deadline. Kickstarter is one of the largest crowdfunding portals and focuses on creative projects; in 2012, more than 2 million backers pledged more than US\$320 million to Kickstarter projects (http://www.kickstarter.com/year/2012?ref=what_is_kickstarter#overall_stats).

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The challenge for Byrnes and others is whether crowdfunding works for science. Creative projects always work towards a concrete product—an exhibition, a DVD or a computer game—which is not necessarily the case for science, particularly basic research. Would people donate money for the pursuit of knowledge? In a time of economic crisis and budget cuts, many scientists are eager to give it a try. Crowdfunding of science has exploded in recent years, with funding goals becoming increasingly ambitious; some projects have attracted US\$10,000–20,000 or even more. New platforms, such as Petridish, FundaGeek or Microryza, specifically cater to research projects [1]. The academic system is starting to adapt too: the University of California, San Francisco, CA, USA, has made a deal with the crowdfunding site Indiegogo that

allows backers to make money donated via the site tax deductible [2].

Kristina Killgrove, now assistant professor in the department of anthropology, University of West Florida, USA, became interested in crowdfunding when traditional ways of funding research were not available to her. “At the time, I did not have a permanent faculty job. I was an adjunct instructor, with a contract for only one semester, so there was no good way for me to apply for a grant through regular channels, like our National Science Foundation,” she explained. Her proposal to study the DNA of ancient Roman skeletons to learn more about the geographical origins and heritage of the lower classes and slaves in the Roman Empire was part of the first round of #SciFund Challenge projects and attracted donors interested in ancient Rome and in DNA analysis. She exceeded her financial target of \$6,000 in less than 2 weeks and eventually raised more than \$10,000 from 170 funders.

Ethan Perlstein had also reached an academic deadlock when he first turned to crowdfunding. His independent postdoctoral fellowship at Princeton University, USA, came to an end in late 2012 and his future was unclear. Grants for basic research came in his experience from the government or foundations, and he had never questioned that premise. “But as I felt my own existential crisis emerging—I might not get an academic job—I started to think about crowdfunding more seriously. I searched for other scientists who had tried it,” Perlstein said.

“It is time to experiment with the way we experiment,” Perlstein’s crowdfunding video proclaims. Indeed, he approached crowdfunding in a scientific way. He analysed

various successful projects in search for some general principles. "I wanted a protocol," he said. "I wanted to do as much as I could beforehand to increase the likelihood of success." Together with his colleagues, David Sulzer, professor in the departments of neurology and psychiatry at Columbia Medical School, New York, NY, USA, and lead experimentalist Daniel Korostyshevsky, he asked for \$25,000 to study the distribution of amphetamines within mouse brain cells to elucidate the mechanism by which these drugs increase dopamine levels at synapses. The crowdfunding experiment worked and their project was fully funded.

Creation of a good website with a convincing video is a crucial step towards success. "When crafting your project, it is important to try to put yourselves in the shoes of the audience," recommended Cindy Wu, who founded San-Francisco-based science crowdfunding company, Microryza, with Denny Luan when they were in graduate school. "You as a scientist find your work absolutely fascinating. Communicating this passion to a broader audience is absolutely key," said Byrnes. However, recruitment of people to the website is at least as important as the site itself. Many successful crowdfunders build their campaign on existing social networks to channel potential funders to their own website [3]. "Building an audience for your work, having people aware of you and what you are doing, is of paramount importance," Byrnes explained, and added that crowdfunding can be as time consuming as grant applications. "But it's a different kind of time. I find it actually quite satisfying," he said.

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"Be scientific about it," Perlstein advised. How many donors are needed to reach a funding goal? How many page views would be required accordingly, assuming a certain conversion rate? "If you approach a crowdfunding campaign methodically, it doesn't guarantee success, but at least you implement best practices." Perlstein is now an independent scientist renting laboratory space from the

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Molecular Sciences Institute, a non-profit research facility in Berkeley, CA, USA. "Academia and I were in a long-term relationship for over a decade but we broke up," he explained. With federal and state funding flat or on a downwards trend, he sees his future in fundraising from patrons, venture philanthropists or disease foundations in addition to crowdfunding. Yet Perlstein remains an exception. Most scientists do not use crowdfunding as an alternative to normal funding opportunities, but rather as a supplement. A typical crowdfunding project nowadays would raise a few thousand dollars, which is enough to fund a student's work for a summer or to buy some equipment [3].

Crowdfunding is also ideal to get new ideas off the ground, which was a key incentive to found Microryza. Cindy Wu's experience with the academic funding system in graduate school taught her how difficult it was to get small grants for seed ideas. Together with her colleague Denny Luan she interviewed 100 scientists on the topic. "Every single person said there is always a seed idea they want to work on but it is difficult to get funding for early stage research," she said. The two students concluded that crowdfunding would be able to fill that gap and a few months later set up Microryza. "Crowdfunding is a fantastic way to begin a project and collect preliminary data on something that might be a little risky but very exciting," Byrnes said. "When you then write up a proposal for a larger governmentally funded grant you have evidence that you are doing outreach work and that you are bringing the results of your work to a broader audience."

Crowdfunded projects cover a wide range of research from ecology, medicine, physics and chemistry to engineering and economics. Some projects are pure basic science, such as investigating polo kinase in yeast (<http://www.rockethub.com/projects/3753-cancer-yeast-has-answers>), whereas others are applied, for instance developing a new method to clean up ocean oil spills (<http://www.kickstarter.com/projects/esarminoru/protei-open>

hardware-oil-spill-cleaning-sailing-ro). Project creators may be students, professors or independent scientists, and research is carried out in universities, companies or hired laboratory space or outsourced to core facilities. Some projects aim to touch people's heartstrings, such as saving butterflies (<http://www.rockethub.com/projects/11903did-you-know-butterflies-have-std>) and others address politically relevant topics, such as gun policy and safety (<https://www.microryza.com/projects/gun-control-research-project>).

Some proposals have immediate relevance, such as the excavation of a Triceratops skeleton to display it in the Seattle museum (<https://www.microryza.com/projects/bring-a-triceratops-to-seattle>). Backers can follow the project and see that the promise has been kept. For many projects in basic research, however, progress is much more abstract even if there are long-term goals, such as a cure for cancer, conservation strategies to save butterflies or so on. But will a non-scientist be able to evaluate the relevance of a particular project for such long-term goals? Will interested donors be able to judge whether these goals are within reach? Indeed, science crowdfunding has drawn criticism for its lack of peer review and has been accused of pushing scientists into overselling their research [1,4,5]. "There is a risk that it provides opportunities for scientists who are less than scrupulous to deceive the general public," commented Stephen Curry, professor of structural biology at Imperial College, London, UK.

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Many scientific crowdfunding sites have systems in place to check the credibility of research proposals. "At #SciFund Challenge we have what we like to call a gentle peer review. If an undergraduate is promising to overthrow their theory of gravity we will have some questions about that," explained Byrnes. Microryza would also not let any project pass. The team checks the proposal creator's identity and

evaluates whether the proposal addresses a scientific question and the project goals are within the capabilities of the researcher. "We plan to have some sort of crowd-sourced peer review sometime in the future," said Wu. Other platforms, such as FundaGeek, have discussion forums where potential donors are encouraged to debate the merits of a proposal. As crowdfunding does not involve spending large amounts of public money, it might be an ideal way to try out new forms of peer review. According to Curry, however, there are important aspects of academic peer review that cannot be provided by these systems. "The advantage of grant committees considering many applications in competition with one another is that it allows the best ones to be selected. Details of prior work and expected feasibility are necessary to judge a project," he said.

Crowdfunding is selling science to the crowd, and, just like in any outreach activity, there might be cases of conveying

projects too optimistically or overstating their impact. Yet, a main advantage of crowdfunding is that it allows donors to stay involved in projects and that it encourages direct interaction between scientists and non-scientists [3]. If a crowdfunding project does not live up to its promises, the donors will find out. "Microryza is really about sharing the discovery process directly with the donors," Wu explained. "Every time something happens in the lab scientists post an update and an email goes out to all donors." Perlstein also maintains close contact with his backers, having met many of them in person. "If we accept their money we are going to give them front row seats to the science," he said. Research is a labour-intensive, slow process that includes technical difficulties and reconsideration of hypotheses, a fact that might come as a surprise to non-scientists. "We are actually doing a service here to enlighten the non-scientists that this is the rhythm of basic science," said Perlstein.

Crowdfunding is by no means a gold mine, with most research projects raising only a few thousand dollars. Byrnes, however, is optimistic that it will grow and inspire a larger crowd to get involved. "Now you see \$10 million projects in gaming technology and the arts. That took some years to happen. We will get there, but we still have a lot to learn. I think science crowdfunding is still in the early growth phase," he said. As crowdfunding increases, scientists will find themselves confronted with some questions. The open sharing of the scientific process with a broader public is a key aspect of crowd-funded projects. In many cases, scientists make the primary record of a research project publicly available. What does this entail when it comes to publications or patents? "Most journals don't have a policy on open notebooks," acknowledged Wu. Filing of patents could also become difficult if scientists have already made all their work and results public.

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Crowdfunding also enables projects to be undertaken outside the academic system where rules and regulations are less well defined. uBiome, a citizen science start-up, draws on crowds not only for funding but also for providing data. The company collected more than US\$300,000 through Indiegogo to sequence the microbiome of its donors (<http://www.indiegogo.com/projects/ubiome-sequencing-your-microbiome>). Whereas academic biomedical research involving humans has to be reviewed by an independent ethics committee, this requirement would not apply to the uBiome project. “[P]rojects that don’t want federal money, FDA approval, or to publish in traditional journals require no ethical review at all as far as we know,” Jessica Richman and Zachary Apte, cofounders of uBiome, wrote in an invited guest blog on *Scientific American* ([http://blogs.scientificamerican.com/guest-blog/2013/07/22/crowdfunding-](http://blogs.scientificamerican.com/guest-blog/2013/07/22/crowdfunding-and-irbs-the-case-of-ubiome/)

[and-irbs-the-case-of-ubiome/](http://blogs.scientificamerican.com/guest-blog/2013/07/22/crowdfunding-and-irbs-the-case-of-ubiome/)). The researchers worked with an independent institutional review board to provide ethics oversight. Some crowdfunding websites, such as Microryza, make sure their researchers have approval from an institutional review board. Greater consistency is needed, however, to ensure that research is carried out according to ethics standards.

Crowdfunding is not a one-size-fits-all revenue stream for science. It might be easier to get support for ‘catchy’ topics than for investigation of molecular interactions or protein structures. Crowdfunding is not going to substitute public funding either; rather, it would coexist as a more democratic form of philanthropy. But for those who embrace it, crowdfunding can be a rewarding experience. “I had a lot of fun being part of #SciFund—I got to meet a lot of other interesting scientists, I raised some money, and I learned a bit about working with journalists and science writers to get my ideas and results disseminated to the public,” Killgrove said. Crowdfunding provides an opportunity for public engagement, raises public awareness, and gives scientists an incentive to communicate

their research to a broader public. “In many cases, scientists do not receive any real incentive for doing outreach work” Byrnes said. “Crowdfunding can be seen as a means to reward them for their effort.”

CONFLICT OF INTEREST

The author declares that she has no conflict of interest.

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