CellPress

10 Questions: Approaches to Research Funding

Cell Stem Cell Editorial Team[1,*]
[1]*Cell Stem Cell*, Cell Press, 50 Hampshire Street, 5th Floor, Cambridge, MA 02139, USA
*Correspondence: stemcell@cell.com
http://dx.doi.org/10.1016/j.stem.2016.06.015

We asked four stem cell scientists who recently started their labs or expanded their research programs to share their insights and approaches to obtaining funding. We present highlights from their interview responses here.

Obtaining sufficient funding is key to the success of any research program, and this task can be particularly challenging early in a scientist's career as an independent investigator and during career transitions. To get a better sense of how researchers are navigating the current funding environment, we asked four stem cell scientists, Grant Challen (GC), Eirini Papapetrou (EP), Amar Sahay (AS), and Ashley Webb (AW), 10 questions about their approaches to funding their labs. In this issue of *Cell Stem Cell*, we also feature a Forum on the effects of aging in the NIH-funded workforce (page 15), and we chose to interview US-based researchers for this article to provide a complementary perspective from the view of early and mid-career researchers. This article contains excerpts from our email interview, and the full transcripts are available in the Supplemental Information.

CSC: What's the biggest challenge you currently face for funding your lab?

EP: Aligning research timelines with funding cycles is a challenge. Research oftentimes follows unpredictable timelines and does not respect the constraints of funding cycles. Projects can move faster or slower than you predicted. This is more often the case with innovative research that explores new ground. I think it is absolutely critical that investigators are in a position to make decisions based 100% on the science and not on availability of funding—within reason of course—and it is worrisome that nowadays this is often considered a luxury. This includes decisions on which aspects of a project to pursue and which to drop, what additional experiments to do to further explore a new finding, or how much to invest in ascertaining that a result is solid and reproducible.

Another challenge is to find ways to fund more exploratory projects that are fun and can often lead to exciting new avenues of research, but are too high-risk for conventional funding mechanisms. I try to have a couple of projects like this in the lab at any given time, while at the same time pursuing more advanced projects that are funded by conventional research grants.

AS: My laboratory (http://www.sahaylab.com) is 4.5 years old (three postdocs, two grad students, one tech, and one or two undergraduate honors thesis students) and we have established a solid foundation for a multifaceted research program integrating enquiries at molecular, circuit, and systems levels in rodents and humans with several studies that will be published. Given the maturation of my multipronged research program, I now feel the need to expand the size of my group beyond the critical mass that I started with. This is only natural as when you start your lab you want to balance ambition with a sustainable vision. However, once you accomplish that goal, you have many more exciting leads from your work that require more effort on the ground. Consequently, the biggest challenge for me is to augment current levels of funding to support this expansion phase in anticipation of the next 5 years.

AW: I think everyone in the field is facing the same challenge: limited funding for biomedical research. With cuts to federal funding, we all need to spend more time writing grants to maintain our research programs. As an Assistant Professor, it is particularly challenging to balance this with starting the lab. Near constant grant writing takes time away from doing the research, training students and postdocs, teaching, and other responsibilities. In addition, there's pressure to publish at the highest level, and those studies are large and often involve expensive experiments. I find myself writing a lot of small grants to cover everything, and this takes a considerable amount of time. While grant writing can be valuable as it helps scientists develop ideas, we have many other responsibilities that are also important.

CSC: How have you had to adapt your approach as you've progressed through career transitions?

GC: As a junior investigator, I think I have really had to focus on undertaking a more limited number of projects in my independent lab which are kind of natural extensions from my previous studies during my postdoc stint. Due to limitations in time, personnel, and funding, it has been harder to branch out into newer areas of investigation or try "high-risk" projects.

AS: Organization is paramount to anticipating and preparing for the future. At every stage of transition, from grad student to postdoc to young investigator, I have always done my due diligence and have organized information meticulously. In starting a lab, it is critical to determine how you will pursue new directions that distinguish you from those of your mentor's while leveraging your own training background. The low-hanging fruit is tempting to chomp on but it may be bitten off by the time you get to it, or it may lack the sustenance needed to generate long-term impact or advance the field. Therefore, one has to conceptualize a 5-year plan and framework for the lab that encompasses projects that leverage your strengths and integrates new directions and novel techniques. In my case, I first defined several broad questions that

Grant Challen, *Washington University in St. Louis* (top left); Eirini Papapetrou, *Icahn School of Medicine at Mount Sinai* (top right); Amar Sahay, *Harvard Medical School* (bottom left); Ashley Webb, *Brown University* (bottom right).

excited me and then thought through what it would take to address these questions. A key feature of this roadmap was leveraging my background in mouse genetics and behavior while integrating new approaches such as viral expression systems to manipulate gene expression and trace synaptic connectivity, optogenetics, and more recently, optical imaging and human cellular reprogramming. Thus, how you organize your thoughts in terms of first hires (what are their backgrounds and how they relate to the big questions in the lab) and investment of your startup package is decisive in securing traction for your vision and future funding.

AW: I spend more time writing. These days I try to set aside a couple of hours of uninterrupted time first thing in the morning just to work on grants and manuscripts. That means no email (sounds radical, I know). I have also worked to improve my writing through grant writing workshops. Not only has my writing improved, I also write faster than I used to. The increased efficiency allows me to complete drafts in advance and get feedback from colleagues before I submit.

***CSC:* What's been the most helpful solution to your funding challenges? Or are there any choices you wish you had made differently?**

AS: As stated earlier, I invested my startup in a multipronged research program. While such an approach may take a little bit longer in getting all your studies out that reflect the different facets of your program, it engenders multiple opportunities for funding. In my case, because of our investment in pursuing questions relating to hippocampal memory functions with implications for healthy aging, Alzheimer's disease, and PTSD, we were able to compete for funding opportunities in aging and mental health.

AW: Writing more grants! One thing I have found helpful is to communicate frequently with the Foundations Office at Brown to identify potential funding mechanisms for my work. I try to keep them up to date on the projects in my lab, particularly if we move into a new area. It helps to have someone else keeping an eye out for potential opportunities for my lab.

Early on it was difficult to finish grants in time to get feedback from colleagues, which I've realized is so important. Now, I try to get feedback on the Specific Aims long before the deadline.

***CSC:* If you could change one thing about current funding mechanisms (besides a higher funding rate), what would that be?**

GC: I would like to see an increase in the length of the award. This would allow projects to really mature and produce the most impactful results rather than forcing researchers to rush and potentially cut short experiments because the funding period is ending. A couple of great examples are the New York Stem Cell Foundation Investigator Award, which is 5 years (at $300,000 direct costs/year), and the Alex's Lemonade Stand Foundation A-award, which has recently been increased from 3 years (at $150,000 direct costs/year) to 4–5 years (at $200,000 direct costs/year).

EP: I would try to make the funding process better integrated with the science. Right now it is rather disconnected from it as a separate task. This could be accomplished by adopting different funding models similar to the HHMI model, in which continuous funding is the default but is contingent upon ongoing productivity and other criteria measuring the contribution of the PI to his/her field and the impact of his/her research, evaluated at regular time intervals. Based on this, funding can be continued or adjusted to a lower or higher level or even discontinued. This way PIs wouldn't have to apply separately to fund each one of their projects. Although there are many things to be worked out, I think a model like this would be at least as fair as the current system and save a lot of time for both PIs and reviewers. It would also give investigators flexibility in following their science where the science takes them, which would arguably provide better grounds for more discoveries.

***CSC:* What do you think of collaborative grants? What factors do you consider when deciding whether to join a collaboratively funded project?**

EP: My opinion about collaborative grants is the same as my opinion about setting up new collaborations. A good collaboration is sometimes one of the most wonderful things that can happen in a PI's career. The best collaborative projects are the ones that bring together people with different expertise and these often happen very naturally and effortlessly, because they are mutually beneficial. They also usually make for very strong grant applications. The overarching factor thus to join a collaboration is that it makes sense for your science, in the sense that your science would benefit from a different set of skills that you don't have yourself in your lab.

AW: Collaboration is one of my favorite aspects of the job. But as a young investigator, I recognize that I need to balance collaborative work with building my own independent research program. So while I do submit some collaborative applications, many of my grants are independent. As my lab becomes more established, I hope to apply for more collaborative grants that will take my research in new and exciting directions I might not be able to pursue on my own.

When a collaboration is involved, I always consider how the project will benefit everyone involved. Ideally, a collaborative grant involves individuals with complementary expertise or tools that come together to make discoveries that otherwise would not be made. When applying for a collaborative grant, it also helps if there's a track record of collaboration. For example, co-authored publications demonstrate that the groups involved are likely to be successful as a team in the future.

***CSC:* Have you benefited from more specifically targeted funding for your research area or career stage? For example, funding to study a specific disease, to support early careers or researchers with families, or to address gender inequality? Have these been valuable to you?**

GC: Yes, I have been very fortunate to benefit from awards specifically targeted to new independent investigators (typically less than 3 years as an independent PI) from foundations such as Alex's Lemonade Stand, the V Foundation, and the Sidney Kimmel Foundation.

AS: Absolutely. The NIMH Biobehavioral Research Awards for Innovative New Scientists (BRAINS) and the Ellison New Scholar for Aging award for new faculty really catalyzed our efforts to pursue several exciting, high-risk ideas that incorporated newly established approaches in the lab. These grants gave us the resources to generate several studies (under different stages of preparation and review) and importantly, build a very strong foundation for future funding and further enquiries.

***CSC:* How broad of a range of programs do you approach for funding?**

EP: Quite broad. My research sits in the interface of different fields, including stem cell research, hematology, cancer, and disease modeling, specifically modeling of myeloid diseases like Myelodysplastic Syndromes and Acute Myeloid Leukemia with patient-derived iPSCs. I have therefore over the years obtained funding from programs specific to each of these areas. This has been obviously useful as it provided me with more funding opportunities to apply for. It was also useful in another way, as it exposed me to feedback from reviewers with different backgrounds, which made me better in speaking the language of different fields and learning which aspects of my research appeal more to different people based on their field and training background.

AS: Always let the science lead the way. If you want to enter a new field, make sure you generate preliminary data to make a more persuasive argument for funding. I invested my startup in a multipronged research program. While such an approach takes a little bit longer in getting all your studies out, it engenders multiple opportunities for funding. In my case, because of our investment in pursuing questions relating to hippocampal memory functions with implications for healthy aging, Alzheimer's disease, and PTSD, we were able to apply to aging related and mental health funding opportunities.

***CSC:* Stem cell researchers face some specific challenges when it comes to funding and restrictions in the US. How has this impacted your career and research choices?**

GC: Our lab focuses on adult hematopoietic stem cells, so we do not run into the ethical concerns presented with ESC and iPSC work. However, in the future, we are hoping to branch into these areas, so this must be taken into consideration.

EP: Regulatory issues had more of an impact in my funding earlier on. My lab now works with patient-specific iPSCs to model diseases, for which the regulations and ethical concerns are minimal. I am also fortunate to work in New York and benefit from NY State's program (NYSTEM) dedicated to funding stem cell research.

***CSC:* Science funding relies on strong advocacy and communication of the value of research with the public. How can scientists be more effective in communicating the importance of science funding to the general populace?**

GC: This is a big deal! As scientists we spend so much time presenting our work to other scientists and medical professionals, but we do a terrible job of explaining to the general public the significance of our work. We really need to make a concerted effort to get out in the community, share our work, and find advocates who can help further our causes. All aspiring PIs should practice 60 s elevator pitches in language that should be understood by your grandmother so you can quickly tell lay people the importance of the problem you are studying and why they should give their hard-earned money to you for you to do so.

AS: When you are excited about the work you do, you are happy to share the implications of the work in broad strokes to a general audience (family, friends, fellow aircraft passengers and travelers, potential donors, seminars to lay audiences etc.). But I also take every such opportunity to share the impact of basic science research on medicine (for example, how Yamanaka's seminal work on reprogramming transformed our approach to studying/modeling human disease or how the discovery and implementation of optogenetics has

revolutionized our approach to understanding brain functions), and then I remind the listener to tell their local congress member to increase funding for basic science. I think that outside of major cities there is a general breakdown in communicating the link between basic science and human health. Consequently, the layperson in smaller towns and cities does not readily appreciate the need to fund many areas of biology that to them may seem foreign and remotely related to the future of medicine. We need to do a lot more local, grassroots-level outreach across America to convey how basic science is the engine of discovery and critical to improving human health. Maybe as part of the NIH R01 grant mechanism, PIs should do at least one town hall meeting to convey their science and how it may impact the human condition.

***CSC:* What advice would you give to graduate students and postdocs to help prepare them for the funding environment of the future?**

EP: Being a good scientist does not by default make you good at writing grants. This is a separate task that you need to master. These days, grants are very competitive, so the bar is set high and only grants with absolutely compelling rationale and perfect narratives have a high chance to be successful. Therefore taking grant writing seriously and investing time and effort in writing high-quality grant applications will almost certainly pay off.

This notwithstanding, it is important to appreciate that, especially with funding lines now set so high, the review process has inherent flaws and randomness, and so a grant that is not funded by one funding mechanism may be successful with another.

Grant writing is mostly a tedious thing that no one particularly enjoys doing, but since it is something you have to do anyway, try to use it as an opportunity to collect your data and organize your thoughts, read the literature more carefully, and reevaluate research priorities. A lot of this work will also be used down the road to prepare a manuscript or a different grant.

Lastly, the most important lessons by far in grantsmanship are learned by serving in review committees or engaging in reviewing grants in some capacity; for example, by helping your PI. The early career reviewer program of the NIH is also such an opportunity for early career PIs.

AW: Take the time to develop your writing and scientific communication skills. As a trainee, take advantage of the many career development opportunities in these areas without losing sight of your goals in the lab. It seems that these days, graduate students and postdocs can spend all day bouncing from one career development activity to the next. Be sure to get involved, but don't lose focus. Your scientific ideas are the most important element in your career, but you need to be able to communicate them to succeed in the long term.

SUPPLEMENTAL INFORMATION

Supplemental Information for this article includes full interview transcripts and can be found with this article online at http://dx.doi.org/10.1016/j.stem.2016.06.015.