“Publish or perish” is the scientist’s maxim—with good reason. Career advancement hinges on publications. But data generation requires dollars. And as the time it takes for investigators to become financially independent grows, the old adage may also motivate early-career researchers to capitalize on their youth. By Virginia Gewin

Science is one of the few vocations in which a mid-life crisis could coincide with a career gaining traction. A National Academy of Science report highlighted that the average age for a biomedical researcher to secure the famed R01 grant is 42 (www.nap.edu/catalog.php?record_id=11249). The R01 grant is considered the gold standard of biomedical funding, and is often a criterion to gaining tenure. And as the pressure to secure funding mounts, an early-career researcher may forego risky aspirations for a more bankable application. Unfortunately, this may reduce the potential for scientific breakthroughs.

In recent years, several funding programs have been created specifically to help young investigators reach funding goals during the critical two to eight years when a researcher is expected to launch independent lab operations. In fact, the Howard Hughes Medical Institute (HHMI) established its early-career scientist efforts to help researchers focus on their laboratory research. “HHMI thought it was ironic that researchers were spending a decade of their most productive years—when the energy level to make new discoveries is highest—on grant writing,” says Jack Dixon, HHMI vice president and chief scientific officer.

Getting a grant funded as soon as possible is one way to prevent creativity from becoming a casualty. Yet, as the number and types of funding mechanisms grow, so does the competition for them. Therefore, early career investigators should mount multiple strategies as they master one last talent—the ability to secure a funding stream.

Early-Career Awards

“Failing to take advantage of designated early-career programs is one of the biggest mistakes that early-career scientists make when applying for grants,” says Thomas Blackburn, a former program officer with the American Chemical Society Petroleum Research Fund and now president of Science Funding, a Washington, D.C.-based grants consultancy for early-career science faculty.

Most of the largest, often government, funders—for example, US National Institutes of Health (NIH), US Department of Energy, HHMI, and European Molecular Biology Organization (EMBO)—sponsor early-career fellowships. These awards are highly competitive given their national scope. The prestige that comes with these high-profile grants is a key stepping stone to secure future grants funding.

But, says Blackburn, focusing only on the high-profile funders is limiting. “Researchers should not neglect smaller, private foundations that may provide seed money to collect the data and publish papers that will help a person later secure larger grants,” he says.

In fact, many of the private, often smaller, funding foundations offer a valued component: freedom. “We created our program to give those newly selected scientists the freedom to pursue their most creative, often risky, ideas,” says HHMI’s Dixon. Freedom, apparently, is coveted among young researchers; over 2,100 people applied for the 50 early-career awards given out in May of this year.

The McKnight Scholars Award was implemented in 1976 by the McKnight Foundation, a Minneapolis, Minnesota-based family foundation started by the long-time leader of the 3M Company, specifically to identify and encourage creative experimental neuroscientists. “The scholars program has had an impressive impact on experimental neuroscience over its 30-year existence—including advancing the careers of future Nobel Prize winners and members of the National Academy of Sciences,” says Thomas Jessell, a Columbia University neuroscientist in New York City and member of the McKnight Board of Directors.

A growing number of philanthropies are particularly motivated to sponsor...
early-career investigators eager to conduct exploratory research. Often these organizations focus specifically on one disease or technological area. The Alliance for Cancer Gene Therapy, the Lance Armstrong Foundation, Leukemia Research Foundation, and the Scleroderma Foundation are just a few examples of the organizations supporting new investigator grants.

Philanthropies, however, are often looking for potential cures as well as pioneering science. “The most important thing at this stage of a young person’s career is to make an important scientific discovery. If you have the wherewithal to make that in a more narrowly defined area of research supported by philanthropy, do it,” says Dixon.

Collaborations Are Key
Collaborating is essential to long-term success as science becomes increasingly interdisciplinary. And building fruitful scientific collaborations can offer an effective strategy to making career-defining connections. In fact, the European Research Council now offers the Starting Investigator Research Grant Scheme. Based on the European Science Foundation’s (ESF) previous European Young Investigators Award, this program may supersed it by providing a larger number of awards. The ESF is currently placing a greater focus on creating opportunities, such as workshop and conference participation grants, to promote the integration of young investigators into collaborative research networks. “In Europe, research is all about collaborative networks of researchers working together to optimize resources efficiently,” says Ana Helman, a science officer in the ESF Physical and Engineering Sciences Unit based in Strasbourg, France.

Indeed, some funding organizations place great emphasis on helping early-career researchers learn how to form productive collaborations. For example, EMBO, based in Heidelberg, Germany, offers networking and mentoring resources which can often mean more than the three-year €45,000 research award given to young investigators. “Our strategy is not so much to award a single project, but rather to help talented young scientists grow,” says Gerlinde Wallon, manager of EMBO’s Young Investigator Programme.

The Human Frontiers Science Program (HFSP), a funding organization based in Strasbourg, was created to foster international collaboration and training in life sciences. It awards postdoctoral fellowships that encourage those trained in classical life science or biology departments to broaden their skills by moving into a new research field. “We want to help molecular biologists move into crystallography or physicists to become geneticists,” says Guntram Bauer, HFSP director of fellowships.

That mission became the basis for a cross-disciplinary fellowship program designed to help mathematicians, physicists, chemists, or material scientists bring new expertise to a biology-based laboratory.

Because HFSP wants to see these young researchers have a chance to establish independent laboratories, the fellows are then solely eligible for career development awards. Having funded nationals from over 60 countries, these awards are a way for international scholars to build collaborations that will later help them become established in their home countries.

Some areas of science, such as nuclear physics, are driven by collaborations. Often, projects are simply not feasible with only one or two researchers. However, Brad Tippens, program manager at the US Department of Energy’s Office of Nuclear Physics, says while most of these collaborations are not hierarchical, they can create an environment that fosters mentoring of early-career researchers and accelerates their maturation as scientists. As a result, early-career scientists develop a reputation in the community more rapidly, which helps them make a mark in the field.

In fact, mentoring can greatly speed career independence. Vaia Papadimitriou, scientist and assistant division head of the Accelerator Division at Fermilab in Batavia, Illinois, says Lederman fellowships, Wilson fellowships, and postdoctoral positions are designed to help a researcher obtain an assistant professor position. “We prepare them to apply successfully for a job by making sure they cultivate a broad spectrum of experience,” says Papadimitriou. For example, she says, young investigators are encouraged to work on both hardware and software and to hold leadership positions, to best advance their careers.

The fact that organizations make mentoring a priority is a strong sign that they have a vested interest in an awardee’s career longevity. The NIH K, or career development, awards, particularly the so-called Kangaroo awards (dubbed that because of their K99/R00 nomenclature), are designed to offer a pathway to independence by providing mentored research positions to help a postdoc become a stable independent researcher.

As well, the Helmholtz Association of German Research Centres, a collective of 16 research centers throughout Germany, continued »
“We want to instill the attitude that a researcher’s job is not simply publishing papers.” —Ming-Ying Wei

also offers management training to its early-career awardees. While the €25,000 award offers five years of stable funding, it also provides access to the association’s extensive laboratory infrastructure. Helmholtz is also unique in that it offers a career option not typically found in Germany: tenure.

Teaching Tactics
Wherever it is granted, tenure is a lifetime contract based on the expectation that the grantee will secure grants to support research over the long term. So the pressure to sustain funding levels remains strong. Consequently, competition among new faculty is fierce and tends to reward candidates able to bring in research dollars, resulting in less emphasis placed on teaching.

But teaching aspirations can prove lucrative. In fact, teaching is an important component of some funding awards. A number of early-career awards exist to help the researcher who wants also to be an outstanding teacher. For example, the Research Corporation for Science Advancement, a Tucson, Arizona-based philanthropy created in 1912, offers scholar awards to those scientists working at research institutions. “The foundation’s idea was to fund people with impeccable research credentials who were destined to be leaders on the research front and are also breaking new ground in teaching,” says Jack Pnadaziewicz, the organization’s vice president.

In a similar way, NASA’s Earth Science program’s new investigator funding scheme—which promotes interdisciplinary research—includes a provision to conduct educational activities related to research. “We want to instill the attitude that a researcher’s job is not simply publishing papers,” says Ming-Ying Wei, manager of NASA’s Office of Earth Science education program in Washington, D.C.

US National Science Foundation (NSF), based in Arlington, Virginia, offers CAREER awards to individuals who view themselves as teacher-scholars. These are challenging applications because they require a research plan integrated with an education plan, including an assessment of activities, all in 15 pages. As such, these awards require backing from the applicant’s institution, and are considered the most prestigious award for young faculty that NSF gives, says program director Mary Chamberlin.

Strategic Success
Whether an applicant has five pages or 50 in which to propose research, the successful grant application must include two things above all else: a clear problem to solve and a novel way to solve it.

“Early-career scientists often present a continuation of their doctoral work without a clear distinction of how the research will advance the science to the next stage,” says Heather Macdonald, a geoscientist at the College of William & Mary in Williamsburg, Virginia. Macdonald runs two career development workshops each year for early-career geoscientists. She says early-career investigators need to find creative ways to differentiate their future work from their past mentors.

In this regard, as NIH’s acting deputy director for extramural research, Sally Rockey, describes it, young investigators often face a catch-22. If they propose a safe research idea, they can get rejected for not distinguishing their evolution as a scientist; and if they propose risky research, they can get rejected for overestimating their abilities. “Being both a young investigator and proposing risky research is a double whammy when the proposal is being considered,” says Rockey. “But we do promote high-risk research if the applicants can mitigate concerns about their ability,” she adds.

Science Funding’s Blackburn warns early career investigators not to play it too safe, however. “More proposals are denied for being too safe than for being too risky.” But, he continues, applicants have to make sure a proposal reflects both prior experience and achievements as well as a demonstration of how one is growing beyond them. “This combination credentials you as someone who proposes research that you are capable of carrying out and that is worth carrying out,” he says.

Rockey advises applicants who have doubts about a proposal’s possible merit or appropriateness for the program to contact the relevant program officer for advice.

Beyond relevance, clarity is key in proposal writing. “If you do not write clearly, you may not be thinking clearly, and that may not allow a reviewer to evaluate your ideas clearly,” says Blackburn.

Finally, persistence pays. It will be disheartening when proposals are not funded, but persistence is critical. Says HHMI’s Dixon, “Lots of good ideas have champions who persisted even when they didn’t get research funded on the first try.”

Resources
Lederman Fellowships

Wilson Fellowships
www.fnal.gov/pub/forphysicists/fellowships/robert_wilson/index.html

Do’s and Don’ts for Grant Applications

DO make a compelling case for why the question is important and must be addressed, and place this early in the proposal; after one page, the reviewer should be excited about the proposed research.

DO describe in detail who will provide the requisite expertise needed to accomplish the proposed research; establishing a collaboration is one of the easiest ways to ensure that the proper expertise is represented on an application.

DO write the proposal in such a way that any reviewer can understand it. Applicants should remember that proposals are evaluated by multiple reviewers with varying scientific expertise and backgrounds.

DO follow each and every rule of the funding guidelines.

DO make the proposal relevant to the program’s core objectives.

DO NOT present a continuation of doctoral work without a clear distinction of how this will advance the science to the next stage.

DO NOT propose too much; it is easy for a young investigator to become overly ambitious—and to be criticized as a result.

Virginia Gewin is a freelance writer based in Portland, Oregon.
DOI: 10.1126/science.opms.r0900077