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Launching an academic research career

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Directing an independent research program in academia or industry is, and will continue to be, a highly sought-after occupation. However, like science itself, the careers in science are dynamic and sometimes elusive… take the initiative to prepare yourself for the transition to a permanent career position. It will be an effort well spent

Directing an independent research program at an academic institution may be one of the most rewarding careers today. However, highly qualified young scientists increasingly opt out of an academic career because they find that navigating a successful career track towards becoming research faculty is challenging at best and confusing, or disheartening, when at its worst (see the 'Fact and figures' insert). The preparation for an academic career includes didactic training, the acquisition of technical skills, and specialization within a field. Whereas these aspects of scientific training are usually well defined for students, subsequent postgraduate career development diverges dramatically depending on the professional field. Although career development is well defined for graduates in legal, policy and medical fields, it remains relative poorly defined for the academic scientist. How does one secure a faculty position, run a research lab, and become a successful member of the larger academic research community? In the biological sciences, new graduates are facing extensive postgraduate training followed by a grueling job search. Once that elusive faculty position is secured, the race for funding and publishing fully occupies the scientist who was previously trained primarily to work at the bench.

The purpose of this editorial, and some that will follow, is to illuminate the hurdles and issues that are faced by postdocs as they navigate the research track and break ground on their pristine research labs. Each article will address fundamental questions that are vital to the survival of junior faculty but, in many ways, apply to all young scientists venturing into career paths that were not so long ago considered 'alternative'. The intent of the series is to provide insight and an understanding of that elusive pathway to independence. Here, we address the choice to become an academic scientist and how to prepare for the job search.

Who is the young scientist?

The canonical path for a young research scientist usually involves a postgraduate education, PhD, MD, DVM, or some combination thereof (~4-7 years), followed by postdoctoral training (2-8 years) and entry into a tenure-track faculty position (achieving tenure after 5-7 years). The career transitions are murky and many non-academic careers for postdoctoral scientists are gaining popularity. Still, many young scientists envision their future in academic laboratory research but do not know how to make their career dreams a reality.

Why choose an academic career track? Industry vs academia

In making their career decisions, young scientists frequently have a misguided notion that, early on, they must choose either industry or academia, and believe that industry and academia are mutually exclusive, non-compatible entities. In truth, industry and the ivory tower are no longer at odds with each other (and maybe they never really were). Today, there is significant job fluidity and communication between academia and industry. They are intertwined heavily because they rely extensively on each other for collaborations, resources and intellectual consulting. The biggest difference between industry and academia lies in their respective intent (see 'Facts and figures'). Academic institutions focus primarily on basic research and discovery, whereas the

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focus of industry is on product development (less than 5% of industry effort is dedicated to basic research compared with 75% in academia). The unique directions reflect different funding mechanisms. Industry is mainly self-funded. To recover the cost of doing science, industry must develop and sell a profitable product. By contrast, academia is funded primarily by government and non-profit sources, and does not function on a cost-recovery model.

The scientific training required to land a job in academia or industry is the same. I could have chosen to pursue a career in industry and many of my colleagues did. But, I chose academia for three reasons. First, it allows me the intellectual and technical pursuit of the unknown mechanisms underlying pathology and normal physiology (discovery). Second, academia gives me the freedom to design and implement my own research interests. Third, I can engage in unencumbered participation within the research community of my choosing in the form of collaboration and teaching. In other words, I have the freedom to decide on the focus and depth of my research. Naturally, the development of my career occurs with guidance from my peers, my funding agency and my department chairperson, but it is not constrained by an executive board or net profits.

Young scientists choosing to pursue an academic career track can benefit greatly from the successes and failures of those who come before them when approaching their job search. Although every opportunity and each candidate is unique in their own right, there are some basic fundamentals. Here are some basic principles that I believe are shared among colleagues during their successful transition to faculty.

Find the right position (for you)

Every institution/department looking to fill a faculty position has specific requirements in mind. Although you cannot change the job description, you can improve your chances by matching yourself with the most appropriate position. As a consequence, career development really starts with a little soul searching. It is important to identify your own strengths, your weaknesses, and your specific research interests. Matching them to the job greatly increases the potential of your application.

Make an honest evaluation of your interests and limitations

Determine whether you prefer to work in a team or by yourself. Do you enjoy the physical bench work or do you prefer the literature search, experimental design and post-experimental documentation? Does the stress of deadlines and grants improve your focus or does it paralyze you? Do you enjoy leading a group into unknown territory, or do you prefer to support your peers in a common endeavor?

Maximize your training

It is difficult to anticipate all the things that you might need to learn for any specific job. However, the appropriate experience will help prepare you for the job. This experience includes the selection of an appropriate graduate program, research topic and mentor. You can further maximize your experience by cultivating independence, leadership and grantsmanship by writing your own fellowship, attending national meetings and developing collaborations. In addition, it will become important to identify your limitations and compensate for them with your strengths. Learning how to apply yourself effectively and productively is crucial.

Identify your style

You are probably aware that no two scientists are alike. Similarly, each job environment will have its own unique nature. It is important to know yourself for two reasons: first, it is crucial for matching you to your (future) job. This not only includes determining which job is best suited for you, but also identifying compensatory strategies for areas where you and your (future) job do not 'gel' fully. Second, when building a research team, you and your team will need to function as a cohesive unit. Knowing your own style is an important factor in identifying the people who will work best with you. Equally important, it will help you define your expectations of your team and provide transparency in the interactions with your team members.

Focus your hard work in the right places

Whether it is working at the bench, writing grants and manuscripts, or applying for your next position, working hard is an integral component to being a scientist. Since there is no doubt that it has become increasingly difficult to obtain jobs and funding in science, the best way to compensate is to work in a smarter manner.

Focus your efforts

Focusing your efforts on the most appropriate elements of your training/job search will maximize your success. For students, this involves an appropriate curriculum and the laboratory/mentor who are best suited for their future career. For postdocs, the projects, lab culture and mentor are key. For junior faculty, their relationship with the chair, as well as the culture of the institute/department and their interactions with the funding agencies are the most important elements. Well-placed effort will not only maximize your ability to complete a task successfully, it also limits the chances of you becoming diverted and diluting your energy.

Do not fear failure: mistakes are a great way to learn

Although it is difficult to publish negative results in science, they often help us to redefine and refocus our research. The same is true for your career in general. Applying for jobs and funding carries an inherent risk and likelihood of rejection. It is important not to let a fear of rejection limit your effort. Get feedback from interviews, even if the job does not come your way. Ask why you were not offered the job or why the grant was rejected. People are usually happy to discuss it with you. Thus, your experience can increase the chance of future success.

Communicate well with your colleagues: let people know what you want to do in your career

Some talent is self-evident, but in most cases you will need to communicate your skills to your potential employer.

Know your value and how you would fit into an organization

Try to go beyond the basic job description and determine the interests of the hiring institution. Identify the areas that apply best to you. Next, determine the best mechanism to communicate your value.

Keep an updated curriculum vitae (CV)

In addition to the standard CV and a compilation of your most relevant manuscripts, the package you send to your prospective employer should provide some insight of how you envision your future. A description of your prospective research program and funding strategy is always appreciated.

Identify and cultivate a mentor

It is difficult to overstate the importance of a senior advocate who can speak on your behalf. Your future employers want to validate your ability and commitment from an established member in the scientific community. Traditionally, this is a thesis or postdoctoral advisor but it is not limited to these people. Any senior colleague in your field with whom you have developed a rapport can fill this role. Ask them how they feel about speaking as your advocate. Then provide him/her with hard facts that they can use to support their claims. Give them your CV, relevant grant proposals, manuscripts and possibly an outline of your future research program. Go into your interviews knowing who is on your team.

Harness each opportunity

In a dynamic and limited job market such as academic research, you need to be ready to engage your resources whenever a job prospect presents itself.

Identify an opportunity

The most straightforward 'opportunity' is an advertisement in a relevant journal. However, many job opportunities come up during peer-peer discussions or are mentioned during public presentations. These are best addressed in person or through your mentor/ambassador. In some instances, the perfect job for you is not posted in public. Contacting a prospective institution/department through your own person-to-person network, with a convincing argument for your value, can create an opportunity. Scientific peers at potential institutions, new colleagues who have been met at national meetings, or your own local ambassador are often the source of a fruitful lead on a potential opening for which you are well suited.

Seize the opportunity

Once an opportunity is identified, be prepared to act and follow through. Do not make jobs conform to your schedule. Connect with the decision makers and provide them with all the information they need. Engage your ambassador to contact the institution on your behalf. Once contact has been made it is important to maintain communication. Remember that the application process can take a long time, so update your potential employer with new manuscripts, grants or other changes that are relevant to your application.

Conclusion

Directing an independent research program in academia or industry is, and will continue to be, a highly sought-after occupation. However, like science itself, the careers in science are dynamic and sometimes elusive. Identifying, preparing for, and landing the right job/funding requires you to be proactive. Success demands the right education, preparation and initiative. Since most scientific education focuses on technical training, take the initiative to prepare yourself for the transition to a permanent career position. It will be an effort well spent.

Facts and figures

Recent trends in science careers

Approximately 30% of doctoral graduates in the life sciences attain tenure-track positions.

Since 1995, an increasingly smaller proportion of doctorates choose to complete postdoctoral training, but this training has increased in duration.

Only 50% of the postdocs actually attain the tenure track that they had hoped for (http://sciencecareers.sciencemag.org/career_magazine/previous_issues/articles/2008_08_29/science.opms.r0800058).

Although the biological sciences comprise less than 4% of the overall science and engineering occupations, an overwhelming majority of postdocs are in this field (48.9%).

Mathematics and information technology have driven the growth of employment in science and technology, whereas other fields have reached a plateau.

Of all the employment in science and engineering, only around 28% of doctorate holders occupy professional, scientific and technical service positions, whereas around 11% are in education (i.e. teaching jobs) and about 10% occupy government positions.

Between 1993 and 2006, academic employment in research increased by 22.7% but, during that same time frame, the proportion of tenure research positions decreased by 10% and the number of postdoctoral positions and non-tenure positions increased by 33.7 and 48%, respectively. In other words, growth in the research sector of academia is primarily in non-faculty appointments.

The status of research funding

Basic research is almost exclusively performed in academia and is sponsored by the US government. Industry outspends the government by 3:1 in research and development (R&D) funding and is focused primarily on product development.

After a rapid expansion in 2000-2002, the National Institutes of Health (NIH) budget has remained level for the last 6 years (at US$220 billion).

In the NIH, the number of new investigators has remained stable over time, and the funding rate for both new and prior principal investigators (PIs) has declined in recent years. The number of R01s, or other competing research project grants, received by new awardees declined from 12% in 1980 to 7% in 2005.

The average age of new doctoral investigators receiving their first NIH research grant rose from 37 in 1979 to 42 in 2002. The proportion of NIH research grant recipients under the age of 40 dropped from 50% in 1980 to 17% in 2003.

As part of the overall American Recovery and Reinvestment Act (ARRA), US$8.2 billion will be provided to the NIH. It is currently unclear what the long-term impact will be or how it will affect the funding of young investigators (http://grants.nih.gov/recovery/).

The bright side of science funding and career opportunities

NIH funding remains stable and has improved under ARRA.

NIH created the Pathway to Independence award in 2006 to improve funding for young investigators; this award combines funding for up to 2 years of training in a postdoc position and up to 3 years for independent research as a faculty member (http://grants.nih.gov/grants/new_investigators/pathway_independence.htm).

New NIH guidelines for grant review have improved the emphasis on funding new investigators.

Unemployment in all fields in science and education has been, and remains, significantly lower than the overall unemployment rate.

Industry spending continues to rise and is independent from government spending. As universities and companies continue to expand their collaborations, academia will benefit increasingly from these funds.

Unless indicated otherwise, all facts and information are based on the USA and derived from the 2008 Science and Engineering Indicators from the National Science Board (chapter 5), available online at http://www.nsf.gov/statistics/seind08/

Andries Zijlstra is an Assistant Professor with a joint appointment in the Department of Pathology and the Department of Cancer Biology at Vanderbilt University. He became junior faculty after his postdoctoral work at Scripps Research Institute in the laboratory of James P. Quigley, where he trained to use the chick chorioallantoic membrane (CAM) as a cancer model. He currently researches the molecular underpinnings of tumor cell motility that lead to metastasis. This is the first of a series of articles that will identify career hurdles for developing scientists and some ways to address them. Let us know your comments or suggestions at dmmreviews@biologists.com.

