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Why it might be a good time to start a career in science

By Maggie Kuo | June 2017

There’s a lot of gloom and doom in the conversations about science careers these days. But a new study in the *Proceedings of the National Academy of Sciences* offers an uplifting message to biomedical trainees: it might actually be a good time for young scientists.

The study—which investigated funding trends at the National Institutes of Health (NIH) but was conducted independently of the agency—confirms that the aging academic workforce is limiting opportunities for younger scientists. Scientists over the age of 55 have grown in ranks and received more of the grant money, the study reports, while younger basic biomedical scientists have decreased in numbers and are getting less of the funding pot. However, the authors also found that NIH’s Early Stage Investigator (ESI) Policy, implemented in 2008 to give young scientists a leg up in the grant review process, is counteracting the trend. This result suggests that NIH’s recent efforts in this direction—including the Maximizing Investigators’ Research Award (MIRA), launched in 2016, and its announcement earlier this month that it would put a cap on the number of grants a principal investigator (PI) can hold (though that plan is in limbo after some backlash)—will help improve the situation further.

“I think this pessimistic message that [students] get is just not warranted right now,” says lead author Michael Levitt, professor of structural biology at Stanford University in Palo Alto, California, and a winner of the 2013 Nobel Prize in Chemistry. “The next few years are going to be a much better time.” Science Careers chatted with Levitt about his findings and their implications for emerging biomedical scientists. This conversation has been edited for clarity and brevity.

Q: This issue that investigators on average receive their first NIH grant when they are 42 years old has been discussed for a while. What does your study add to the conversation?

A: You’re absolutely right; there’s been a lot of attention around the age of people getting their first grant. But, it turns out that it’s a misleading number because some people get their first grant from NIH after getting grants from other places. The much more disturbing number, and the key thing the paper shows, is that the number of young basic scientists has been going down since 1990. And the proportion of basic scientists who are younger than 45 has been going down over time. The future of science is very much the young people. If their numbers are going down, then we are not replenishing our future.

The data also showed that we could have exactly the same proportion of younger people as in 1980, when the drop-off started, if about 15% of the money had been moved from people over 45 to people below 45. It’s not a huge amount of money. We’re not trying to get rid of older people; we’re just saying there needs to be some money for the younger people.

Q: What’s causing the drop in young basic scientists?

A: One factor was that more and more of the money was going to older scientists, over the age of 55, and that left much less money for the young scientists. That phenomenon was caused by the general aging of the scientist population, and also because NIH’s budget jumped quite suddenly in the late 1990s. When you get money from Congress, you can’t keep it in a savings account—it has to be spent. As a result, the money was put into things that could absorb it. And it’s very easy to spend money very quickly on old people because they have grants in place, so all NIH needed to do was increase the grants by some fraction and the money was spent.

You can’t spend money very quickly on young people. Think about how hard it is to hire a young person: You first have to know that there’s money for them, then you have to recruit them, then you have to hire them, then you have to give them a chance to write their own research program. Typically, it might be 4 or 5 or 6 years before they start applying for grants, and if everything is going to double in 5 years, the young scientists hired have missed the boat.

The other problem is the fact that the committees that allocate the grants are drawn from the general population of NIH grantees, so as that population ages, the committees also age. If you’re 40, you can judge 30-year-olds quite
Q: **NIH has implemented policies and programs geared toward helping young investigators. What does your study say about these efforts?**

A: NIH’s ESI Policy seems to be working. We see an increase in PI success ratio [the ratio of successful R01 grantees to total number of basic science PIs in the age group] for younger grantees. We don’t have a lot of data points—the program started in 2008, and our data only go to 2014 and that data is averaged over 4-year periods—but it looked much worse in 2004 than it did in 2008 and 2012. Our analysis shows that NIH needs to make this age-based correction, not as a way of favoring young people, but to undo a bias intrinsic to the way that grants are judged.

Q: **What got you interested in this issue?**

A: I actually got into this work October or November 2013. I was shocked to see this drop in numbers for the younger people in a 2012 NIH blog post and presentation on the topic. Also, to have my colleagues tell me what little money they have although they have lots of money made me want to really understand what was going on and try to help the younger people. Much of my work involves analyzing numbers, so this isn’t out of my realm. And, my brother, who is my co-author, is more in economic and bibliometric analyses, so he was very helpful here. I’m not particularly concerned about my credentials. Ultimately, the numbers speak for themselves. I just turned 70, and my group size is now seven, down from its largest size of 14. I relinquished space when my group got smaller, and I also just converted my two R01 awards into the smaller MIRA award.

Q: **Are you optimistic about young scientists’ futures?**

A: I think it’s a good time to become a scientist. The baby boomers are now 70 plus. It’s harder for them to get grants or have large groups. They’ll be retiring. As a result, there’s going to be a lot of positions opening, and there will be more funding for younger people, which NIH is very conscious of and wants to find. I think this could be another golden period. Young scientists should not be discouraged.

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**What to know before starting your Ph.D. program**

By Maggie Kuo | September 2017

Congratulations! You’ve made it through the first weeks of your Ph.D. program. Right now, it might not feel that different from your undergrad experience. But the full-time research immersion that is soon to come, as well as the independence and required self-direction, will likely be a major adjustment. To help you make the transition, we asked current Ph.D. students and postdocs what they wished they had known about grad school when they started. Their responses have been edited for length and clarity.

**Ask questions**

Alexandra Schober, Fourth-year neuroscience Ph.D. student at Albany Medical College in New York

I came into a neuroscience program with no background in neuroscience, and I was scared that I was going to get kicked out because the department figured out that I didn’t know anything about it. So I never asked my mentor questions. Whenever he was talking about his research and what I’d be doing with my project, if I was confused about something, I would spend hours looking online trying to figure it out instead of just asking him because I didn’t want him to think I was stupid.
But my mentor is really persistent. He would constantly quiz me on certain topics, and it would be obvious if I knew the answer or not, so he’d say, “It’s OK to ask questions. You need to ask questions.” One day, I told him that I was scared to ask questions, and he said, “Oh my gosh, you don’t need to be scared.” There’s so much information that you can’t know every little detail all the time. So it’s OK to not know, and it’s actually better to ask questions.

**Planning is key**

Julian West, First-year chemistry postdoctoral fellow at the California Institute of Technology in Pasadena

I’m pretty excitable scientifically, and when inspiration strikes, it’s always been my first instinct to drop everything, run into lab, and test out my new idea. During my first few years of grad school, I would elatedly set up a 24-hour experiment at 8 p.m., not fully grasping that the experiment would require hours of purification and analysis as soon as it finished. I was repeatedly committing myself to late nights at work while large periods of my normal workday were spent waiting for the experiment to finish and looking for things to do. Realizing this led me to consider what would happen if I waited until the following morning to set up these studies. I put this question to the test and happily found that the purification that used to keep me late at night fit neatly into a slow time in my workday before lunch.

I now have a series of questions that I ask myself to help me take a step back and get the most out of my time at the bench. These include the following: How long will this experiment take? How long will the steps after take? Can they wait until the following day? More importantly, I reclaimed my evenings. Now, while I still get that same excitement when I have a new idea, I’ve learned how to follow it up without sacrificing my time outside of work.

**Take care of yourself**

Cecilia Sanchez, Fourth-year ecology Ph.D. student at the University of Georgia in Athens

The expectations for graduate students aren’t as clear as they are for undergraduates, and there aren’t any “right” answers. You have to develop interesting questions and then try to answer them yourself—hopefully with good input from your committee—and that takes a long time.

It can be easy to get discouraged when things aren’t going well, because your sense of personhood can get tied up in your research accomplishments. Though you might feel vulnerable, if you talk to your peers, you’ll likely find that they open up in return about times they’ve struggled. I think everyone has thought about quitting at one point or another, even the hotshot professors in your department.

Also, give yourself time to pursue nonwork-related activities. I play roller derby, and it completely distracts me from upcoming deadlines, frustrating meetings, or anything else that’s bothering me. By reframing my workouts as productive because they reset my mental stamina, I don’t feel guilty about not spending all day in front of my computer.

**Don’t take experimental failures personally**

Geoffrey Heinzl, Second-year chemistry postdoctoral fellow at the U.S. Food and Drug Administration in Silver Spring, Maryland

Every time an experiment failed, I felt like it was my fault: “I must have done something wrong, and I’m wasting everyone’s time and money.” It wasn’t until my third or fourth year, when I was putting together an article for publication, that I looked back at all of the work that we had to do to get to that point. I saw how many failed experiments there were, but then eventually we developed a new strategy and new procedures that produced the results we were looking for and analyzed the variables we wanted. I realized, “Oh, not all of those failures were my fault. It wasn’t me screwing up the science, it was the science being more complicated than we had anticipated.” After that, I learned to not dwell on the fact that I was going to have to do an experiment again.

And talk to your adviser about failure. There’s the fear that they’ll say, “Obviously you’re just a terrible scientist and you shouldn’t be here,” but that doesn’t happen nearly as often as you would imagine. They want you to do well. It’s OK when things fail. You just have to learn from it and take something useful from it.

**Mentoring styles aren’t always an optimal fit**

Jessica Nuwer, Fourth-year neuroscience Ph.D. student at Albany Medical College in New York

I didn’t know there were so many different types of mentors—that some people were more hands on and some were more hands off—and you have to find a good fit. My mentor is very supportive, very much “you drive your own project,” and I am very lucky that we get along and I don’t feel like he hates everything that I do. But he’s so hands-off that I feel like I’m fumbling a lot. I would like a little bit more guidance and conversations of “Let’s sit down and talk about the details and the science behind your project.” Going into my thesis proposal, I feel like I don’t know some of the things that I would have gotten had I used him as a sounding board more. But I didn’t have the idea at the time to bounce ideas off him. I feel like I needed him to start it, and then my brain would have started working—but he wanted me to start it.
But at the same time, I’m growing immensely. Even while stumbling through this proposal I’m like, “Oh, I’m starting to make sense of things.” I’m figuring out protocols and techniques and learning how to talk to people who know more than I do. My one friend who has a hands-on mentor worries that she’s not independent enough for a postdoc; I’m not going to have that worry. All mentor-mentee relationships have strengths and weaknesses, and it would have been helpful if I had been more aware of the different styles of mentoring and if they work with how I learn best.

**Remember that you are good enough to be in grad school**

Grad school can be terrible for mental health. You have an intellectually challenging job of doing good science, with the additional pressures of teaching and finding funding. Add in personal stresses such as being in a new place or being away from your extended family, and doing it all on a budget less than what you’d have at a part-time job, and it is exhausting. All of this makes it easy to think we’re not good at science, not good at academics, or overall just not good enough.

So, it’s important to do whatever you need to do to get over impostor syndrome. Have a good cheerleader—such as your partner, a friend, or a family member—to remind you that you’re smart, motivated, and hard-working. Accept the compliment because it is true. And remind yourself that everyone is “faking it until they make it.” Some people are just better at making themselves sound like they know everything. But any excellent academic will attest that they know very little compared with how much is actually out there to know!

**Alyssa Frederick, Fourth-year physiology Ph.D. student at the University of California, Irvine**

Mark Richardson was one semester away from receiving his climate science Ph.D. at the University of Reading when he left the lab—temporarily—for a 3-month policy internship in 2014. His time at the U.K. Parliamentary Office of Science and Technology (POST), during which he helped write a four-page brief about international efforts to reduce deforestation ahead of the United Nations Climate Change Conference in Paris, was a tremendous learning experience, says Richardson, who is now a postdoc at the California Institute of Technology in Pasadena, working at NASA’s Jet Propulsion Laboratory (JPL). “Every big experience has a chance to change how you see the world and how you feel about it and the skills you have.”

Through the internship, Richardson honed his ability to quickly home in on important information, which now allows him to make the most of the short time he has to connect with others at conferences, he says. He strengthened his writing skills and ability to deal with feedback. “Getting 30 different reviews from different backgrounds and then having to go through it with your supervisor line by line and defend everything you’ve done, it’s certainly changed how I write papers and how I communicate with co-authors,” Richardson says. Being exposed to different topics and a range of stakeholders—including company representatives, policymakers, and nongovernmental organizations—helped
him become more well-rounded, he continues. And attending parliamentary sessions gave him “a real ... appreciation for compromise and trying to listen to and understand people and where they might be coming from.”

The experience also helped him during his job search. When putting together a research proposal as part of an application, “everything I learned about formulating and planning and communicating in a non-science-nerd way helped,” he says. He also gained experience doing panel interviews as part of his internship application. And once he got offers, his experience working somewhere other than his Ph.D. lab put him in a better position to make informed decisions. Working at POST reinforced “my general interest in being able to do a variety of things,” he explains, adding that he chose his post at JPL because it offered more freedom to do that. Looking to the future, he feels that the range of skills that he developed during his internship make him a more attractive candidate for an industry or consulting job if he decides to go that route later in his career.

Richardson’s internship opportunity came through an optional program offered by his funding agency, the Natural Environment Research Council. This type of internship for doctoral students is still the exception rather than the rule, but it is becoming more common, particularly in Europe. The specifics vary, but participants’ reflections offer a common theme: The experiences are valuable and rewarding, whether the student plans to leave academia or not.

**Internship enrichment**

Michelle Reeve knew from the start that she was interested in doing an internship as part of her Ph.D. training in spider locomotion at the Royal Veterinary College. That’s one of the reasons she applied for a studentship funded by the Biotechnology and Biological Sciences Research Council (BBSRC), which in 2012 began requiring funded students to do a 3-month internship unrelated to their research. According to Rob Hardwick, senior innovation and skills manager at BBSRC in Swindon, U.K., the BBSRC Professional Internships for PhD Students (PIPS) aim “to develop transferable skills in the students, which perhaps they wouldn’t develop as part of a normal Ph.D., and also to raise their awareness of other career opportunities outside the lab, outside research, recognizing that most students in the longer run will not stay in academia.” To date, approximately 1000 students have done a PIPS placement, with another 660 in the pipeline, Hardwick estimates.

Reeve spent her 2014 internship at the Royal Institution of Great Britain (Ri), where she helped produce the Christmas Lectures that are broadcast every year on national TV. “I wanted to know whether it was something that I would enjoy full time, and I came away knowing that it was,” says Reeve, who took a publications officer job at the Institution of Environmental Sciences in London after submitting her Ph.D. in October 2016. She believes that having one of her managers at the Ri as a reference and learning how to stick to brand publication guidelines helped her secure the position. “It is a difficult transition coming away from academia into a job because employers don’t necessarily know what skills you can bring, ... so having that internship and kind of doing a normal job, I think that definitely helps,” Reeve says. The internship also taught her how to work across different teams and got her used to “having to get to work at 9 o’clock,” she adds.

Perhaps counterintuitively, completing the internship also put her in a better position to see her doctoral through. “When I started my Ph.D., I was having a few issues, and having the time away from it [allowed me] to work through them almost subconsciously, so when I went back, I had some fresh ideas on how to approach the problem,” Reeve says. Having clarified her career plans and gained the support of scientists who had made the same transition also helped her refocus, she adds.

The 600 or so completion reports that BBSRC has received so far echo Reeve’s experience. Students highlight teamwork and communication among the most important skills they gained, Hardwick says. And “there are signs that, yes, [doing an internship] does influence the way [that Ph.D. students] think about their careers and possibly even land them some jobs,” he adds.

In France, all Ph.D. candidates with a doctoral contract are entitled to take up to 32 days a year away from the lab to do paid work in teaching, science communication, technology transfer, or consulting—an option which Rym Boudjemaa took advantage of. Through her Ph.D. supervisor, Boudjemaa—a Ph.D. candidate in physical chemistry at the Institut des Sciences Moléculaires d’Orsay in Paris—heard about a bladder cancer diagnosis startup that needed a literature review about fluorescence. Doing the consulting work allowed her to become more familiar with industry culture, where the need to respect confidentiality and “get results very fast” is very important, she says. The project also taught her “how to communicate with people that are not necessarily aware of the specific details” of the science behind a company product, she adds. The experience helped her confirm her decision to work in industry once she completes her Ph.D. in September, and it boosted her CV and professional network, she adds.
Interested students must consider how they will secure the necessary funding, which may be negotiated with the employer or in some cases provided by your university, funding body, or professional society. “The students would have to do their homework and understand what pots of money are available ... to support these sorts of training activities,” Hardwick says. It is important to make sure that your doctoral contract or university agreement and research funding allow you to take the time away.

You must also talk with your supervisor about whether they are comfortable with you leaving the lab for a while. In places where there is no culture of internships, students are likely to encounter resistance from their supervisor. “It’d probably be an easier sell to start with if it was a research-relevant placement, so going to a company to do some research activity [or to] a policy setting perhaps where they can apply their research in different ways” can be good options, Hardwick says. Highlighting the opportunity for your supervisor to expand their network and collaborate with industry may also help convince them, Boudjemaa suggests.

For students who want to pursue nonresearch internships, “they’d have to really prepare a case as to why that is important to their development as an individual and … how it benefits their supervisor and the delivery of the Ph.D.,” Hardwick says. Students who want to do a teaching internship, for example, could emphasize how the experience will allow them to improve their communication and presentation skills, which will be valuable if they end up deciding to take the academic route, he says.

However excited a student is about an internship, it’s essential to never lose sight of the bottom line: their research. Richardson notes that his supervisor was supportive, but “I imagine that had I been in a situation where my Ph.D. was struggling, he would have legitimately told me to focus on the Ph.D.,” he adds. As a doctoral candidate, “that’s the number one thing” you have to do.

The challenges of fitting an internship into a Ph.D. can also generate creative solutions to balancing lab and internship responsibilities, with potential mutual benefits. Boudjemaa decided to stay in the lab to have access to the library and continue with her experiments while doing her consulting work, which required her to sharpen her organization and time management skills, she says. The work also paid some direct dividends for her graduate research. “It gave me ideas for my own experiments,” she says.

**Create your own opportunity**

As these stories demonstrate, completing an internship as part of your research training can be a great career development opportunity. "Even if you want to stay in academia ... it just adds a different dimension to the Ph.D.,” Reeve says. She recommends that all Ph.D. candidates do an internship, though she acknowledges that arranging a good time to leave the lab for several months can be stressful.

If your funder or institution doesn’t offer specific programs, that doesn’t mean that you don’t have options. Other funding agencies, institutions, charities, and professional bodies may offer the opportunities you’re looking for. To name just a few European examples, The Nuffield Foundation in the United Kingdom supports doctoral internships at POST, the British Science Association offers media fellowships, and the German Bundestag and three Berlin universities jointly run an International Parliamentary Scholarships scheme. And some nonprofit and industry employers have their own internship programs; Microsoft, for example, offers internships open to students all over the world. You can also try to create your own opportunity by asking your personal and professional networks, meeting employers at career fairs, or volunteering.
Transitioning fields between a Ph.D. and postdoc

By Alaina G. Levine | August 2015

Switching fields midstream requires thoughtful analysis, research, and due diligence. Hear advice from researchers who have made the transition.

It takes guts to pursue a career in science and even more to switch fields midstream. Executing a disciplinary change between the Ph.D. and postdoc appointment requires thoughtful analysis, research, and due diligence. You have to demonstrate to your new colleagues how your expertise can be a potential boon for their research group, and you have to gain an understanding of the new field and its culture and language. For researchers who have the fortitude to start over in a new discipline and can effectively market their abilities, changing fields can lead to a career homerun.

Amir Erez is a theoretical physicist who yearned to change the world. “People would ask what I do and I had trouble explaining what impact my condensed matter research could have on our lives,” he says. As a grad student at Ben Gurion University in Israel, he had the chance to work on a collaborative project at Princeton University for a few months when he heard that a biophysics professor from his alma mater was on sabbatical at Memorial Sloan Kettering Cancer Center (MSKCC), about an hour away in Manhattan. He reached out to the scientist and the two hit it off, remained in contact, and 2 years later, Erez suggested that he work with him, under a fellowship from the Human Frontier Science Program, an international nonprofit that support postdocs who move into the life sciences from other disciplines. Now a postdoc at MSKCC, Erez uses techniques from the physics of complex systems to study the dynamics of immune response in the context of cancer. “Suddenly I could ground my research in the real world and not just keep it in the Ivory Tower,” he notes.

The decision to change fields is not always about personal preference. Some professionals do so to ensure their employability. Maria Patterson had been concerned about the narrowing career opportunities for astronomers who wanted to remain in academia. “I knew it was a rough road ahead,” she says, where less than 10% of astronomy postdocs land tenure-track positions in the field. So she began looking at other vocations, including data science. As a graduate student, she was accepted into a fellowship program that exposed her to big data problems, and it was during this experience that she met her future principal investigator (PI), a computational biologist, with whom she began corresponding and discussing potential collaborative projects. She ended up at the University of Chicago in the Center for Data Intensive Science, Knapp Center for Biomedical Discovery, where she currently uses her expertise in spatial analyses to mine electronic medical records for patterns of geospatial clusters of disease. She describes her move as enjoyable as she now uses her skills in novel ways. “In astronomy, as you move up, the topics become very narrow and if I had an impact it would be small and only a few people would know about it,” she says. “But in medicine, the research has the potential to have a great impact on a lot of people.”

Other scientists discover and delve into new disciplines while trying to solve the classic “two-body problem,” in which two academics who have a personal relationship must job search at the same time. Such was the case with Shaun McCullough, a postdoc at the Environmental Protection Agency (EPA). When his wife landed a post in Research Triangle Park (RTP), North Carolina, he became the “trailing spouse” and cast a wide net to find a job in the region. Educated in biochemistry and molecular genetics, McCullough found a home in the Clinical Research Branch of the EPA’s Environmental Public Health
Division in RTP, where he conducts both clinical and in vitro cell-based research in toxicology. It wasn’t what he expected to do when he originally chose the life sciences, but he finds his research to be extremely rewarding since toxicology “is constantly evolving to emphasize a broader range of sub-specialties in molecular biology,” he notes. “It needs emissaries from these different fields to work together to find novel and creative ways to answer critical and pressing questions in the field. This need has created opportunities for someone like me, to apply my skills in epigenetics and molecular biology to solving the next generation of problems facing this field.”

Noting differences between fields

As you adjust to a new discipline, there are many challenges to be met. One major difference in any new field is how the experts think about problem-solving. Each field has its own research approaches, which you have to learn quickly when transitioning areas. This requires an abundance of reading papers, speaking with experts, learning techniques, and shadowing colleagues. “The first few months into my postdoc, the only thing I wanted to do was sleep, because it was so much to learn and incredibly mentally exhausting,” says Elizabeth George, a postdoc at the Max Planck Institute for Extraterrestrial Physics near Munich, Germany, who migrated from cosmology with the cosmic microwave background (CMB) to infrared astronomy.

The cultural differences between disciplines can be surprising, even if the science seems to overlap. George’s culture shock manifested as she realized the different approaches to solving scientific problems in astrophysics versus astronomy. “Infrared astronomy is much more traditional astronomy, where you look at objects and try to understand what you are seeing,” she says. “But in CMB cosmology, you start with a model of the universe and only measure one thing—the cosmic microwave background radiation—and try to fit your data to the model.”

In making her transition, Patterson noticed a difference in how data itself is perceived and handled in different subjects. Astronomers are very open with their results, and since astronomical data is shared often, it has a uniform format, no matter the source. But in medicine, the tables are completely turned: data is sensitive and since it is drawn from medical records, there is much more concern over who has access to what. Additionally, “people don’t want to share their data as much, because it is valuable for commercial purposes,” she notes.

Moving from a lab-based science to one that involves patients requires nimbleness and flexibility. “I had never worked with humans before,” says McCullough. “As a molecular biologist, I worked with cells in a dish. They didn’t talk, and they didn’t have to be informed” about the nature and risks of the studies. But in investigating how environmental factors contribute to disease, he had to learn a new protocol and ensure that the subjects understood everything that was taking place. When Ewan Cameron, an astronomer-turned-epidemiologist, “jumped ship” (as he puts it) to become a senior computational statistician in the spatial ecology and epidemiology group in the Department of Zoology at the University of Oxford, he not only began working with human subjects but he also had to learn how to collaborate with nonscientists, such as policy makers and representatives of nongovernmental organizations and nonprofits.

With any disciplinary switch, there’s usually a new language to master. “The jargon barrier can be quite formidable,” notes Erez. “I’m 8 months in to my postdoc, and I’m just beginning to know the right jargon for my neck of the woods, and what the right questions are to ask.” Diego Fazi, a theoretical physicist who migrated to renewable energy via a postdoc at Argonne National Laboratory (ANL), had to adapt to variances in the manner in which professionals share information. “I used to communicate using quantitative information and theoretically rigorous approaches, but during my postdoc I had to deal with more qualitative information and empirical approaches.”

Day-to-day differences can also pop up, especially for those who switch from theoretical to experimental fields. Both Erez and Fazi had never done wet lab work. “Before I came here, I was a theorist with clean hands,” says Erez. Adds Fazi: “I had to learn basic chemical techniques, such as making a solution and setting up an experimental apparatus.”
And of course, “when you switch fields, you incur a time penalty;” notes Erez. “It takes time to settle into a new field,” to learn its nuances and then be able to be productive enough to publish. Adds George: “Changing disciplines feels like you are starting grad school all over again, except that you are a much better learner.” It took her 6 months to “start feeling productive, and to be able to begin asking questions that pushed knowledge forward and were as useful to my colleagues as they were to me.” Erez recommends giving yourself a break as you ramp up your knowledge. “Don’t expect to be as productive in your first year as you would have if you stayed in the same field;” he says.

Making the switch

Whether your switch seems radically different, like physics to immunology, or something seemingly more related, like astrophysics to astronomy, it is important to be ready to market your talents and show what you can offer a new field based on your background. This is especially crucial given the fact that as you transition, you are not necessarily going to be acknowledged for your research reputation, as George discovered as she plotted her move. “In my new discipline, I am a completely unknown quantity. People haven’t read my papers,” she says. To land a postdoc, she pitched her PI that her experience in building and deploying astronomical instruments, unusual for an astrophysicist, could serve as an asset for the new research group.

“You might find that your advisor is inclined to send you to a conference in the field you are interested in,” says Eric Brown, acting deputy division leader of the Materials Science and Technology Division at Los Alamos National Laboratory, whose doctorate is in physics. Furthermore, he recommends leveraging the resources offered by the professional association of your new field. “Many science societies issue reports on demographics, career paths, and employment statistics,” he says, which can be invaluable in the career planning process.

As you transition, you have to establish a connection between your past and your desired future. “Those bridges, of taking what you learned from one area and applying it to another, need to be visible,” says Jason Cooley, who switched from biology to biochemistry and then eventually found his way to the chemistry department of the University of Missouri as a solution to his own two-body problem. He equates it to telling a story with a narrative that explains the natural progression of how you got to where you are today. Without it, “people will think that if you get bored, you will jump somewhere else,” he adds. In George’s case, her narrative showcased her desire to build high-quality scientific instruments, which she had demonstrated as a grad student and which she planned to do as a postdoc.

No matter your story, your publications are your “scientific currency”, so “before you move, write a paper that relates, even in a tangential way, to your future field;” urges Joel Cavallo, a postdoc in psychiatry with a dual appointment as a fellow in the Program of Clinical Pharmacology and Pharmacogenomics at the University of Chicago. As he completed grad school in neuroscience and psychology, Cavallo authored an article on the erasure of associative memories in a sea slug. Because maladaptive learning and associative memories can play a role in mental disorders, this work helped show his dedication to his desired discipline of psychiatry.

Getting the appointment

It’s not surprising that, despite your best intentions, it can be difficult to change fields, especially right after grad school. “It wasn’t easy to get a postdoc because most biologist PIs wanted someone with experience in biology,” admits Erez. He was lucky to have found a mentor who appreciated his background in physical science and had experienced a similar transition into the field. “I needed a PI who had a good background in biophysics because otherwise it would be very difficult to communicate, since I didn’t speak the language of biology and he wouldn’t have spoken the language of physics.” But as more STEM fields become interdisciplinary, sources say that there will be growing opportunities for innovators who can understand and unite multiple universes. Brown notes that it is becoming more common for early career scientists to switch subjects between the Ph.D. and postdoc, as “it’s an opportunity to jump into something that is new and fresh and exciting,” he says. And having the capacity to connect seemingly disparate fields can hold other advantages. Indeed, Fazi, who recently leveraged his postdoc into a full time position at ANL as a technology innovation strategist with a focus on green tech, says that changing course for him “gave me more perspective in science,” he says. “I came out a more complete scientist with more cards to play.”

CAREER TRENDS: RESOURCES AND ADVICE

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TRANSITIONING FIELDS
Your CV cover letter is both an introduction and a sales pitch. “It should show what sets this individual apart from all others,” advises Jeffrey Stansbury, vice chair of the Department of Craniofacial Biology at the University of Colorado School of Dental Medicine in Aurora. Like any good sales pitch, your cover letter should motivate the customer to learn more about the product—in this case, you.

A good cover letter, like a good sales pitch, has several characteristics. First, like a good doctor, it does no harm: It avoids making a negative impression. Second, it demonstrates that the product suits the consumer’s—your future employer’s—specific needs. Third, it assures the customer that the quality of the product (you) is superb. Accomplishing all this is easier said than done. So how do you write a cover letter that will do you justice and earn an interview? First you need a plan.

The objective

“A successful candidate impresses the committee right off with the cover letter and makes the committee members actually want to dig through the CV and recommendation letters to pull out the details that start to validate the positive claims,” Stansbury says. “It also provides a glimpse into the applicant’s personality and gives some guidance as to whether or not they can communicate in an organized, effective way.”

One of the most important jobs of any good sales pitch is to avoid doing harm. Some cover letters inadvertently convey negative impressions of a candidate, especially if they “look sloppy or indicate an inability to communicate in English,” says H. Robert Horvitz, who shared the 2002 Nobel Prize for physiology and medicine and has chaired search committees at the Massachusetts Institute of Technology in Cambridge. “These things can kill someone’s chances,” adds Kenton Whitmire, chemistry professor and former chair of the chemistry department at Rice University in Houston, Texas. Horvitz adds that cover letters “should be neat and professional,” and should fit on one page. Whitmire would allow applicants a bit more room: The letter, he says, should be “no longer than one to two pages.” To keep it short, “the cover letter should not reproduce the information in the CV, publications list, or other documents provided,” Whitmire says, “but it should be used as a vehicle to highlight those things that the candidate believes will make him or her a good match for the position at hand.”

The match

An effective cover letter doesn’t just emphasize your best qualities; it also shows how well those qualities are likely to mesh with the open position. “Applicants should begin by reading advertisements for faculty positions carefully and be sure that their background and goals are appropriate for the position in question. You lose credibility if you can’t make a case that you fit the ad,” Whitmire says. “If the cover letter is to be effective, it must definitely be tailored to the particular institution.”

“There’s no excuse for not writing a cover letter that shows how your education, experience, and interests fit with what the institution is seeking,” warns Julia Miller Vick, coauthor of the Academic Job Search Handbook, which is now in its fourth edition. “Not doing this would reflect laziness,” Horvitz observes. At best, Vick adds, “a form letter or one that is generic doesn’t accomplish much and leaves how the application is reviewed completely up to the reviewing committee.” At worst, a generic cover letter can make you seem undesirable.

“While many people applying for academic positions tend to think that the review process is an evaluation of their previous work—how good is it?—the issue that is as important is the match,” Whitmire says. “How will this person fit in here? The former is necessary, but the decision to interview will often be made upon research area or some other measure of fit to the department’s needs at that moment in time.”
Planning

Begin by learning about the department in general and the open position in particular. Department websites are a good starting point, but don’t stop there. Go beyond the public information, and seek a sense of perspective. “It is best if candidates speak with their advisers and mentors to get some feel for the institution where they wish to apply,” Whitmire suggests. Close senior colleagues can serve the same purpose. Read beyond the job ad, and figure out what they’re really looking for.

Once you’ve got a fix on the institution, the department, and the open position, ask yourself what abilities or special qualities a candidate needs to excel in that position. Then determine which of your qualifications and accomplishments will particularly interest this department. Think about your research accomplishments, past research accomplishments, special projects, and previous employment.

What evidence can you put forward that your background and plans prepare you well for this opening? How well do your research interests match those described in the advertisement? How well will they complement the work of the current faculty? How will your presence there make the department better? All this information will determine what to emphasize in your cover letter.

Writing the body of the letter

Your research accomplishments and plans should constitute the body of your cover letter for a research university position. At institutions where teaching is the primary emphasis, your primary focus should be your teaching experience, philosophy, and goals—and the suitability of your research program to a teaching-focused environment.

“An outline of plans for teaching and research needs to be specific to be meaningful,” Stansbury says. Focus on your most important two or three examples of proposed research projects and innovative teaching plans, such as developing novel courses. These examples should change from one cover letter to another, as you customize your letters for different jobs.

The opening

After the body of your cover letter has been drafted, you come to the most critical step: writing an attention-getting introduction. Salespeople call this “having a handle.” Your handle is what you offer that makes you especially well qualified for a particular faculty opening. For example, summarizing how well your research interests match the ones the department advertised provides an effective letter opening.

The opening paragraph should be short but more than one sentence. After you’ve captured the reader’s attention with the handle, clearly but briefly summarize your most important—and relevant—qualifications. Anything less than a sharp focus and your readers will quickly lose interest and move on to the next application.

Closing the letter

End your letter decisively. Don’t let it meander to an indefinite or weak close. A decisive close projects an image of you as assertive, confident, and decisive. It never hurts to close by requesting an interview.

Editing

Make your cover letter an example of your best writing by editing it carefully. It must be easy to read. Focus and clarity of expression in your letter imply focus and clarity of thought—very desirable qualities in a faculty member.

Then return to the critical issue: whether your research interests, other qualifications, and personality meet the search committee’s requirements. Anything that doesn’t accentuate the match should be deleted ruthlessly.

Now, set your letter aside for a day or two before editing it again. The detachment you gain from this short break will help you see what you’ve written more clearly. Detachment makes it easier to determine whether your paragraphs flow smoothly from one to the next. The logic that seemed so obvious when you were writing may seem much less so a day or two later. Carefully review both your cover letter and your CV to be sure the information in them is perfectly consistent. Often, a committee won’t bother to try to resolve any discrepancies they find; they’ll just move on to the next application.

Finally, Whitmire advises, “be sure to have your cover letter reviewed by someone [who] can be trusted and who has experience. Often, getting a second opinion about how something sounds to the reader—i.e., what they got from reading the letter, not what you intended in writing it—can be very valuable.”
I’ve seen it a dozen times or more. The best candidate for one of the jobs that I am filling walks away with a polite “thanks” instead of a job offer. Another prospect gets the job because of an outstanding presentation at their invited job talk. These talks are important! You need to make a winning presentation that will help you stand out. And you’ll find that, just as with any other aspect of your job search, the way that talks work at companies is often completely different from what you’ve experienced in academia.

The suggestions that follow have very little to do with the science that you present in your job talk. It’s expected that you will do well on that side of the equation. After all, you’ve been through graduate school and have presented your science many times in the past. However, when it comes to giving a standout job talk, there’s a lot more than science to consider.

Why companies ask you to give a job talk

You’ve received your interview agenda. Lo and behold, first thing that day—after a brief meeting with human resources—you’re delivering a presentation. That’s an indicator right there that your talk is important!

But it’s not an audience with the same expectations that your peer group in the lab would have. A cell biologist delivering a talk at an academic meeting would likely be presenting only to other cell biologists. That same person presenting a job talk to a company, on the other hand, could be speaking to a regulatory staffer, an engineer or two, and maybe even a business developer—in addition to the cell biologists.

Some of these more unusual attendees will be there because they are technically engaged with the cell bio lab at the firm, perhaps scaling up the scientists’ work in the case of the engineers or writing technical documents in the regulatory person’s case. Others will be there not because they have a direct technical connection to the research, but because the hiring manager has asked a few important voices in the company to attend and provide feedback. Sometimes, an official hiring committee with members from various departments will be present in the conference room.

The company has a mixed audience attending the presentation because you will be expected to work well with people of many different backgrounds. Some academics fail in this regard. They go into a job talk and deliver the old standby presentation, using the same material as if it were just another part of their Ph.D. studies. That’s a deal killer!

The question you need to ask yourself is this: What would a Ph.D. chemical engineer, or a regulatory affairs officer, or a representative from the business team have to say about your hardcore cell biology talk? It’s not about the science—it’s about you. It’s about the critical thinking skills you exhibited in your work, and it’s also about how you sound and how you carry yourself as you speak and handle the Q&A. There are decisions being made in the background about your “believability,” as one of my favorite books, Bert Decker’s You’ve Got to Be Believed to Be Heard, describes it.

It’s best practice to ask your host or the human resources contact person what departments and disciplines will be represented in the audience for your talk. Depending upon how much information you get, you might be able to look up individuals and find out about their scientific backgrounds and interests. Knowing the audience makeup in advance—or at the very least knowing that there will be people from varied disciplines in the room—will allow you to take steps to ensure that the audience is following along. Pause every now and again and look at your audience members. If they look confused, consider how you can adjust your approach or whether you should open the floor to questions to get everyone back on board. Think about the words you are saying and the way you look and sound when you deliver those words. It’s that whole package that sends signals about your believability, and your value as a prospective colleague.
The question your audience members are asking themselves—subconsciously perhaps—is, “Would I enjoy working with this person?”

**Key ingredients of your job talk**

If there’s any one element of a successful job talk that stands out, it’s whether the presenter comes across as a problem solver. Your entire thesis work was one big problem, with your work illuminating some aspect of a scientific niche. And along the way, you came across a great number of hurdles. You need to talk about those hurdles and how you got over or around them. Don’t just talk about the results. Even though you might think they’re the most interesting part of your work, they’re probably not relevant to a potential employer.

Instead, it’s important for you to make sure the audience members understand the issues you were tackling and what your approaches were to solving those problems. Make those hurdles clear, and then show them the critical thinking skills you brought to the table in order to work up a solution. Let your focus on creative solutions impress them with an unspoken point: that you would be an effective part of their problem-solving squad if they were to hire you.

Another must-have element of your job talk is the passion that you demonstrate for your subject matter, as I was reminded when a client recently debriefed me on two good job talks. About the first, the client said, “He delivered a steady, workmanlike talk; kept to the requested time; and answered questions well. But it really didn’t stand out to our chemists who felt that his niche was a bit too far afield to translate well to what we do here.” The second review, on the other hand, went something like this: “Her presentation was well done, and she seemed to have a good handle on the steps it takes to deliver results. She was very passionate about her work. It was clear that when she’s on the trail of something that interests her, she can produce. We’d like to bring her in to meet the executive leadership.”

Both talks started and ended in the requested 40 minutes, with 20 minutes of solid Q&A. No stumbles, and they both had good presentation skills. Both candidates’ fields of expertise were somewhat arcane to the company’s interests. What was different?

Perhaps it was a smile, better eye contact with the audience, or a bit more enthusiasm about describing problems and solutions. Those little differences brought the message home. As a result, the job talk that day was the single most important element of that candidate’s successful interview.

Jon thought that he had it licked; the interview nervousness that had so affected him at the beginning of his day had finally dissipated. It was 4 p.m. and things were winding up. As he entered what was billed as a wrap-up meeting with his prospective boss, he felt relaxed and confident. He had gone through the trial by fire of his first interview, and it looked like he would emerge unscathed. Sure, he was a bit tired, but he was ready to seal the deal. His spirits rose as he entered Dr. Johar’s office and saw her smiling from behind her desk.

“Well, Jon, tell me how it went today,” Johar said. Jon provided a brief overview of the day’s agenda, the people he had met, and his positive feelings about them and the company. He closed by saying that he really hoped to have the chance to continue the discussion, because ABC Biotech was just the kind of place where he’d like to work.

“Terrific,” Johar said. “I’m happy to hear that your impressions were positive, Jon. I’ve received some feedback from those you met, and they are generally quite positive as well. But there was one issue that we didn’t discuss in enough detail.”

Uh-oh. Jon felt his face begin to flush as his nerves kicked back in. Mentally he had been halfway out the door, but it was apparent that he needed to get back into interview mode—quickly.

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“We get a great deal accomplished here due to our organizational structure, which relies on strong teamwork,” Johar continued. “Jon, you mentioned in an earlier interview that you’ve been a great collaborator, but I need to know that our team concept is not out of sync with your work style.” Johar began to move back into the behavioral interviewing mode that Jon thought he had left behind after completing his human resources interview. A number of questions focusing on Jon’s behavior, or projected behavior in theoretical circumstances, ensued.

Jon tried to mentally reenergize himself to take on these questions again, but he later suspected that his halfhearted responses would prove to be his undoing.

**It’s not over until it’s over**

Jon’s gut feeling was correct. His incoherent rambling about team experiences from his grad student days reversed his entirely positive interview. He didn’t get the offer because the last impression he left behind was negative.

In his wrap-up meeting, Jon should have steered the conversation by asking questions he still had about the job or company. Sometimes an interview void just needs to be filled, and it could have been Jon’s questions—as opposed to additional behavioral interviewing—that did the job. But if you don’t fill the empty space, your interviewer will find something else to insert into that gap—which might not be to your benefit.

Jon also lost sight of the fact that, during an interview, you are constantly being judged by clues that come from what you say, how you say it, and the way you look while you say it. Is your voice quavering a bit, or do you sound a bit too rehearsed? Does your confidence (or insecurity) show in your physical appearance? One of my favorite writers, communications expert Bert Decker, calls this triftecta the “believability factor” in his excellent book You’ve Got to Be Believed to be Heard. The important thing to remember is that this believability factor is in play for the entire interview—4 p.m. on interview day is not the time to mentally check out.

The best approach is to plan to stay sharp, to remember that it’s not over until you’re back in your car. Even lunch or dinner is a part of the interview. Nothing should change your focus on presenting yourself in the most positive way possible.

**Starting off on the right foot**

In hundreds of books about interviewing skills, one fact holds true: First and last impressions are the two most important things you leave behind after your interview day. It’s tough for me to address the topic of first impressions, though, because there has been some pretty disconcerting research done on this topic.

In one such study, conducted by Frank Bernieri, a professor of psychology at the University of Toledo at the time, participants professionally trained in interviewing spoke to nearly 100 people of various backgrounds and filled out an extensive six-page interview questionnaire about each. Initially, Bernieri was looking to find out whether there were any “tricks” that some interviewees used to ingratiate themselves with the interviewer, but he couldn’t find any, so the videos of the interviews were put away without publication. That is, until one of Bernieri’s undergraduates asked whether he had considered another direction for all that work.

This student wanted to test the old adage that “the handshake is everything.” So Bernieri and his team went back to the interview footage and selected just a few seconds of tape for each applicant: that moment showing the candidate knocking on the door, walking in, and shaking hands with the interviewer. An entirely new group of interviewers, watching only these 15 seconds of each applicant, rated them on the same checklist that the earlier interviewers had used. On nine of the 11 traits evaluated, the second set of observers significantly predicted the outcome of the full interviews. As Bernieri told Malcolm Gladwell, writing for The New Yorker, “The strength of the correlations was extraordinary.”

Decker pulls out another Gladwell gem in a blog post about the same subject of judgments made solely based on first impressions.

So, what does this mean for you? I hope it reinforces the importance of these first few moments. If you are scheduled to meet with eight people over the course of an interview day, you have eight chances to make a good first impression. You have eight chances to walk into a room; introduce yourself; shake hands with your interviewer; and have that friendly, confident posture that indicates you are there to be successful. That means, of course, that you also have eight chances to make a bad first impression—which, if you believe the research that Bernieri and others have conducted, is enough to sink your chances.

There are, of course, other parts of interview day where you’ll need to shine, such as proving that you are the right fit for the technical aspects of the job. But remember that this lengthy middle element is sandwiched between two other pieces of the day, the first and last impressions. After 30 years of talking to both candidates and employers at the close of an interview day, my feeling is that each of these elements—first impression, last impression, and all the rest—are weighted equally. You can have a wonderful day answering technical questions perfectly and find that someone else—someone less qualified on paper than you are—got the offer. The bottom line is that, when you’re preparing for your interviews, it’s crucial that you don’t neglect those first and last interactions as trivial, because they can make all the difference. ■
After initially resisting invitations to online communities from coworkers, Aḵṣit says, “my supervisor finally said, ‘at least use LinkedIn.’” The professional networking site was his social media gateway.

Today, Aḵṣit is finishing an electrical engineering Ph.D. at Koç University in Istanbul, Turkey, and using social media to explore his postdoctoral options. He also shares about his work and life on Facebook, Twitter, Instagram, Google+, and his own blog. He has 500+ LinkedIn connections and self-describes as “kind of a sharefreak.”

But even researchers who aren’t daily visitors to online social spaces benefit from occasionally dropping by. Networking sites can help scientists stay current in their field, keep track of colleagues, and build a community of advisors and collaborators. Social media lets researchers participate in conferences remotely, sparing travel time and budgets. Professional networking services make it easy for reluctant scientific networkers to create an online profile, which career consultants say is a professional obligation.

Is it for everybody?

“You simply must have an online presence,” says Karen Peterson, director of Scientific Career Development at Fred Hutchinson Cancer Research Center; in fact, she adds, you already have one (just try an Internet search of your name), so you might as well curate it. This advice is especially important for researchers who are thinking ahead to a transition: graduate to postgraduate work, postgraduate to job, or perhaps a career change.

Peterson recommends that, like Aḵṣit, researchers start with LinkedIn. A complete, updated LinkedIn profile conveys your background, experience, and accomplishments to potential employers and people with common interests. Peterson says that LinkedIn is especially useful for setting up informational interviews, which are informal conversations with experts in careers or research areas in which you’re interested. Use LinkedIn to find personal or institutional connections to someone you want to talk with and use those ties to ask for an introduction. (Or use SciVal Experts if your institution has a subscription.) Set up a meeting or phone conversation and be prepared with a short summary—an elevator pitch—about your research and some specific,
Facebook and Twitter for scientists? Really?

Social network services emerge, evolve, and go extinct like influenza viruses. But right now, researchers use Facebook for personal contacts. Early career scientists, who move often, might use Facebook to maintain friendships with former lab members. Facebook can reveal fun, nonprofessional insights about a colleague—maybe a potential collaborator is an especially good fit because of a common love of fly fishing, knitting, or manga. Universities, corporations, and even research groups have public Facebook pages that can be useful for news about former and potential employers. However, Facebook is static compared to the real-time interaction of Twitter.

“The number one area for the ScienceOnline community is Twitter,” says Traphagen. Twitter use is growing in academia, across disciplines, for scholarly and nonscholarly use. And if you think Twitter is just for celebrity gossip, you might be surprised at the range of professional applications.

“I use social media to get scientific inspiration,” says Akşit. His thesis project is improving motion capture, for example for films, so he follows the electronics industry on Twitter to hear about new products and developments. Other scientists follow research groups to avoid overlapping projects or to find collaboration opportunities. Twitter is supplementing or replacing automated search and alert services, for example for relevant literature. “I often hear about important papers on Twitter as soon as they are released or even before,” says Jonathan Jacobs (@bioinformer), principal scientist in biosurveillance at MRI Global, a nonprofit contract research organization. “Especially in the bioinformatics community, tweeting communicates not just news but actual science.”

“The easiest way to see the power of Twitter,” says Traphagen, “is to follow a conference hashtag.” (For example, search for #AAASmtg for news about the annual American Association for the Advancement of Science conference.) If you are attending a meeting, Twitter and other networking tools can connect you, before arrival, to people who share your research interests. If you can’t attend, Twitter can tell you what talks and posters caught people’s attention and where to find shared resources such as websites or slides. Jacobs says he gets almost as much information from following a conference via Twitter as actually attending. If you’re presenting, Groth advises having a Twitter account and putting your handle on slides and posters. That helps people tweet about your presentation, which increases your impact, maybe even attracting the attention of potential collaborators or group and department leaders.

People of all ages, experience levels, and career paths are embracing online tools, says Karyn Traphagen (@kTraphagen), cofounder and executive director of ScienceOnline, a nonprofit organization for science outreach, networking, and community building. She sees advanced networkers, novices, media mavens, students, postdocs, and professors at national and local ScienceOnline meetings and says that social media sites can create genuine, interactive, and far-reaching communities. Social media is a great equalizer.

Most social networking sites are global, so they are excellent tools for making and maintaining international connections. For early career scientists trying to make a splash with their work, no platform has a greater reach than the big three networking sites: LinkedIn, Facebook, and Twitter. Compare a talk at a conference attended by a thousand people to reaching hundreds of millions of users a month. Open-ended questions. Ask about others you might talk with and follow up with a written thank-you note. This is a classic way to grow your network, says Peterson. LinkedIn and similar services just make the initial contact easier because the major networking sites have a surprisingly vast membership representing all scientific careers and both young and established researchers.

A common assumption is that early career scientists are the most enthusiastic users of social media. However, preliminary results hint that established researchers are also quite active. A study of computer scientists, which mainly focused on methods for determining online activity, found that many scientists with an online presence were tenure-level, judging from their high-impact publications; they also used multiple networking sites. Plus, participation in online communities is growing. “The scientific discourse is moving online,” says Paul Groth (@pgroth), assistant professor, Department of Computer Science, VU University Amsterdam, and one of the study’s coauthors. “And it’s going to keep moving in that direction.” This means that networking sites are virtual venues where students and postdocs can connect to leaders in their field.

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experienced online networkers say a little exploring will uncover networks with a community and functions that enhance your work.

**Should I blog?**

Then there’s blogging, which is varsity-level online sharing. Blogs require a regular time commitment and a deep passion about a topic. If you’re considering a blog, try guest posts on other sites. Kiran Dhillon (@Indigal9), a postdoctoral researcher at Fred Hutchinson Cancer Research Center, started blogging about her breast cancer work when Angelina Jolie spoke about inheriting a BRCA mutation and having prophylactic surgery. Dhillon considers her blog to be professional development: “It’s a good exercise in finding my voice and learning how to communicate science to the public.”

Even if you don’t blog, Dhillon encourages all scientists to have a professional website to highlight accomplishments and show examples of soft skills such as leadership and management. “LinkedIn is good for connecting and summarizing your research, but it’s limited. Your own website gives people a better sense of who you are. Plus, you can post videos or images, like great immunofluorescence results.” Some researchers modestly say they want their science to speak for itself, but Dhillon says to think about the buzz around certain talks or posters at a conference. In those cases, the scientists worked hard to present their work in a way that got people excited. A professional website can pay off in the same way.

**Is real life still necessary?**

Yes, say social media experts. For all the linking, sharing, and networking that online resources offer, Peterson says, “For a true connection, you still need to meet face-to-face.” LinkedIn and other sites just facilitate what early career scientists should be doing anyway, says Peterson: meeting people with common interests, professional and otherwise. Even networking with non-scientists is part of career development, she says, because you never know who is connected to whom. Jacobs found jobs through LinkedIn, mainly by finding events to attend and people to contact for in-person interactions.
Firing a member of your lab is difficult. Fortunately, it’s also rare. The first and only time cell biologist Samara Reck-Peterson had to do it, in her laboratory at Harvard University, she felt prepared. She had practiced the difficult conversation during a lab management course she’d taken in 2009, and she had a script ready. “Practicing is really the most important thing,” she says. It helped her anticipate which parts of the conversation were likely to trigger emotional responses so she could head them off in the real conversation.

Reck-Peterson is one of many aspiring and established principal investigators (PIs) who have participated in formal lab management or leadership training courses. Such courses were once rare, and they’re still not widely available. Access depends on your location and ability to pay. But if you can find one, attending such a course is well worth the effort. Most scientists who did find one say they came back with helpful people skills and a network of colleagues with whom they can share difficult situations and discuss solutions. “It’s a mandatory course for young PIs,” says molecular biologist Raz Zarivach of Ben-Gurion University of the Negev in Beer-Sheva, Israel, speaking of a lab management course offered by the European Molecular Biology Organization (EMBO)—one of two he has attended.
A growing trend?

Offering courses to PIs in management or leadership is not new. In the United States, neuroscientist Michael Zigmond began offering “survival skills” workshops including those topics for researchers at the University of Pittsburgh in Pennsylvania, in 1985, in connection with a National Institutes of Health training grant; Beth Fischer joined him in the “Survival Skills and Ethics Program” in 1993. Biologist Carl M. Cohen and his wife, psychologist Suzanne L. Cohen, have been conducting training workshops for researchers since the 1990s. (The Cohens are the authors of several Science Careers articles.) Carl Cohen believes that “there’s a growing recognition of the need of this” kind of training. In 2002, the Burroughs Wellcome Fund (BWF) and the Howard Hughes Medical Institute (HHMI), with help from AAAS (publisher of Science Careers), launched a course in scientific management for postdocs and newly appointed PIs. BWF and HHMI repeated the course in 2005, adding a “train the trainers” component to help other organizations offer such training to their scientists. The University of California, San Francisco implemented a 2-day Scientific Leadership and Management course and continues to offer it most years; about 100 people participate each time it is offered. The course was expanded in 2011 to include clinical and translational junior faculty. Organizations such as Harvard Medical School, Cold Spring Harbor Laboratory, and Oak Ridge National Laboratory have all hired consultancies to deliver such courses, and at the University of California, Berkeley, grad students have organized their own SLAM: Science Leadership and Management seminar series.

A similar picture emerges in Europe. Courses on leadership and management training remain sparse, but those offered are popular. EMBO reports that the 15 laboratory management courses it announced for 2014 were fully subscribed within a week of their announcement; the organization added three more. This year, it counts more than 250 registered participants, up from 62 in 2005, when the courses were first offered. One of the training companies it hires—hfp consulting, which taught the 2009 course Reck-Peterson attended—has tripled the number of courses it offers since 2005, its first year of operation. Starting in 2009, Vitae, the U.K. organization for the professional development of researchers, launched a 2-day Leadership in Action course.

Scientists, not managers

The main reason lab management and leadership training courses exist is a gap in traditional scientific training curricula, Carl Cohen says. PIs often rise to their positions based on the excellence of their research, their publication records, and the fellowships they win. Yet, they go on to become managers, needing to distribute their lab’s workload, motivate junior colleagues and defuse tensions, keep the lab on budget, and ensure that everyone is working toward common goals, among other daunting challenges, according to trainers and senior scientists Science Careers interviewed for this story.

These days, most doctoral programs and university career offices supplement scientific training with transferable skills, says Anne-Marie Glynn, program manager for EMBO courses. But to get that training you need to be “fortunate enough to work at one of these institutes”—and those programs often lack the basic financial accounting and people-management skills required of PIs, Glynn adds. Many early-career scientists recognize the need for that extra training; feedback from young scientists prompted BWF and HHMI to design such a course in the first place. Today, early-career scientists are recognizing this need earlier in their training, Glynn says. While EMBO first developed courses for scientists who had already been appointed as research group leaders, lately more postdocs—and even doctoral students—have been signing on, Glynn says. In 2007 EMBO started offering 3-day courses for younger scientists in addition to the beefier, 4-day courses for research group leaders.

What will you get from the course?

Lab management and leadership courses range from on-campus classes organized by your university, to off-site courses delivered by consultancies with participants from a range of research institutions. Dedicated courses tend to be an immersive experience lasting between 1 and 4 days.
Choosing a course

In choosing a lab management course—assuming you have access to more than one—important aspects to consider are the time commitment and the format. Some courses bring instructors to a university for an afternoon seminar, for example, or even for a couple of days. Zarivach did a 2-day on-campus lecture-heavy course organized by his university, followed by a 3-day EMBO course in Heidelberg, Germany. At the second course, “we could discuss more,” he says. There was enough time for all the participants to share their experiences and propose solutions.

Another consideration is whether to take such a course alongside institutional colleagues: Do you feel you can open up? Or would you be better off attending an off-campus course and building a remote support network? Because the topics discussed are often sensitive—dealing with recalcitrant colleagues, perhaps—an off-campus course allows you to speak more openly, Glynn says.

Some universities offer free training in lab management and leadership, but other courses cost money. If you are a Ph.D. student or postdoc, perhaps it can be covered by fellowships—but you may have to convince your PI to pay. You can help your case by offering to share what you learn with other group members.

If you are a PI, you can set your own priorities. “If you have a startup package, instead of buying a whatever—a microfuge—spend a few thousand dollars on [the training] instead,” Reck-Peterson recommends. “It is well worth the investment.”

The range of topics varies. The 2002 and 2005 BWF/HHMI courses offered training in grant writing and collaboration, for example. But courses typically cover people skills, setting and meeting goals for the lab, and project and finance management. Carl Cohen says the most popular element of his workshops is the part on negotiations. “At the young PI level there are issues like, ‘How do I deal with my department chair who wants me to take on more responsibility than I’m ready for?’” This includes taking on extra teaching and committee work. During the workshops, he helps young PIs learn to balance departmental responsibilities with time spent on research. Participants also learn how to agree on an appropriate balance with department chairs and senior advisers.

One of the ways instructors teach these and other leadership skills is through role-playing. They set up scenarios that allow attendees to practice together; this is followed by discussions of how the scenarios played out. The idea is to prepare them for similar situations, which are bound to arise in their labs.

Such training proved useful for Zarivach, who says he used to push his staff too hard. Recognizing this, at his second course Zarivach asked his instructor and fellow participants how he might change his approach. They suggested that a lighter hand might stress his staff less and help them learn to work more independently. Zarivach has since begun to trust his junior colleagues more, giving them enough space to make their own mistakes while letting them know he’s around when they need help. The combination of advice from course mates and trial-and-error in the lab has worked, he says.

Another strength of the courses is that they help researchers prepare for hiring decisions, alumni say. Zarivach says he learned “to give more time for the interviewed person to talk” during job interviews and to ask unconventional questions to learn more about their personalities. Reck-Peterson, who took the BWF/HHMI course before she took an hfp course, says she learned to follow up on letters of recommendation with telephone calls to get more nuanced verbal recommendations. She also learned to adjust interviews to accommodate different personality types.

Both Zarivach and Reck-Peterson say that the networks of fellow PIs they formed during the courses continue to provide support. Zarivach now heads a forum of young scientists, some of whom have taken part in leadership courses at his university, who continue discussing lab management issues via email or over coffee. Reck-Peterson and other alumni of lab management training in the Boston area get together from time to time, too, since they trust each other and have a common approach to addressing lab issues.
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