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GRADUATE SURVEY

Uncertain futures

Graduate students dream of academia but are keeping their career options open, according to a 2015 Nature survey.

BY CHRIS WOOLSTON

Graduate students in the sciences generally keep a tight focus on their area of study, whether it is mice, molecules or lasers. But when it comes to plans for the future, they are willing to take a wide-angle view.

The 2015 *Nature* survey of graduate students, which drew more than 3,400 responses from early-career researchers across the world, uncovered a strong and far-reaching enthusiasm for jobs in academia (see 'Academic expectations'). Some 78% of respondents said

that they are "likely" or "very likely" to pursue a research career in academia, a bold stance given the global shortage of permanent positions at universities.

But the survey also revealed uncertainty and ambivalence. More than 60% of respondents said that they are "likely" or "very likely" to pursue a job in industry (see 'Industry appeal'). And 61% said that they are "likely" or "very likely" to pursue a research job with a government or foundation, which makes it clear that many graduate students are unclear about their futures.

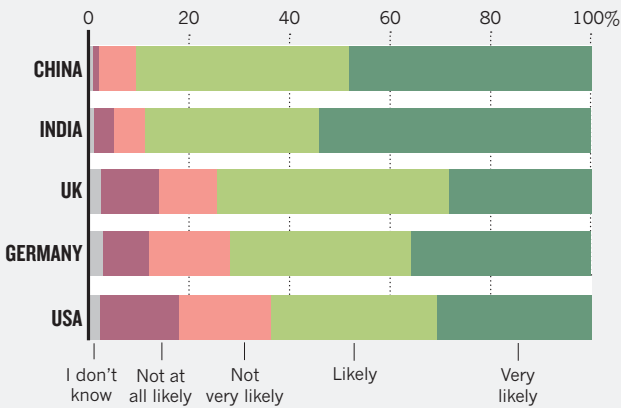
Indeed, when it comes to job plans, even a firm conviction can quickly fade. Daria Bulanova, a PhD student in molecular biology at the University of Helsinki, noted in her survey response that she expected to pursue a career in industry. "I was influenced by friends and relatives who had careers in big pharma and big biotech," she explains. "They all had a really good career track."

Yet in the several months since she took the survey, Bulanova, who studies mutations in breast cancer, reveals that she has taken a 180-degree turn towards academia. Through ►

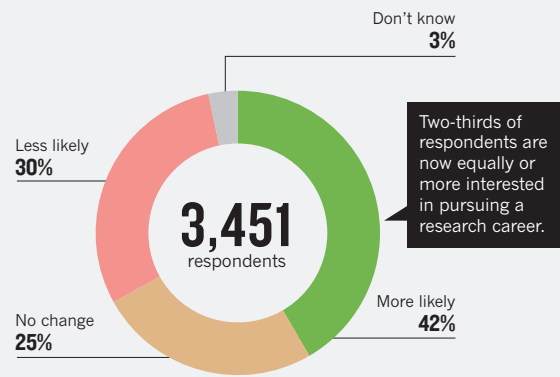
Academic expectations

The 2015 *Nature* graduate-student survey found that today's research trainees plan to pursue futures in academia. But they also have an enduring interest in research and receive only limited exposure to career training.

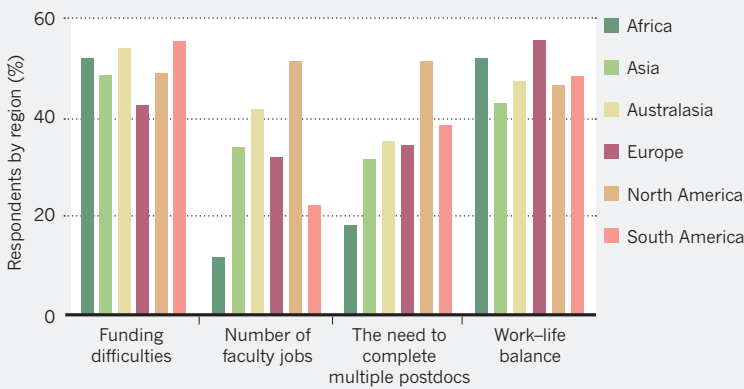
Q How likely are you to pursue an academic career after you finish your programme?



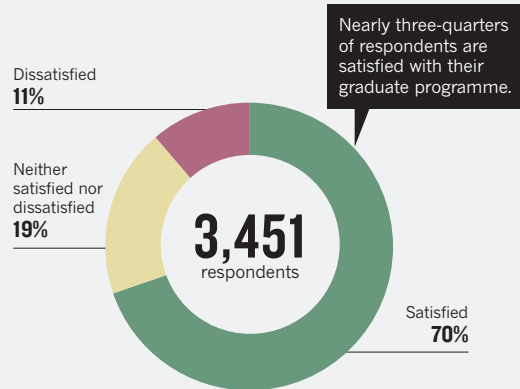
Q Are you now more or less likely to pursue a research career than before you started your programme?



Q Since starting your PhD, which of the following factors has surprised you?



Q Overall, how satisfied are you with your graduate-school experience?



► company visits and consultations, she has been able to assess the reality of taking on an industry job. “I decided that I wasn’t mature enough for that kind of shark tank,” Bulanova says. In retrospect, she also is uncertain that a job in a large company could satisfy her scientific curiosity. “Research in industry is very narrow and settled,” she says. “It doesn’t lead to other questions.” Bulanova’s determination to stay in academia solidified after she attended seminars at which research luminaries — such as Peter Jackson, a microbiologist and immunologist at Stanford University School of Medicine in California — discussed their own career paths. “That was inspirational,” she says. “You start dreaming.”

GLOBAL DREAMS

The survey tapped into an eclectic, global crowd. Respondents were roughly evenly distributed between Europe, Asia and North America, with some respondents living in

South America, Africa and Australia. They are a well-travelled bunch: 40% of respondents live away from their home country, a group that includes Bulanova, who is from Russia. Interest in academia is widespread across the continents. More than 90% of respondents in Asia revealed that they see academia as a possible career option, with more than half declaring that they are “very likely” to go down that path. Enthusiasm for academia is only slightly cooler in North America and in Europe, where 32% and 41% of respondents, respectively, said that they are “very likely” to take the academic route.

Respondents in biology, chemistry and medicine — the most common areas of study for survey participants — reported similar career goals. In all three fields, about three-quarters of those polled ticked the “likely” or “very likely” boxes for following an academic career, compared with more than half indicating that they would opt for a career in industry.

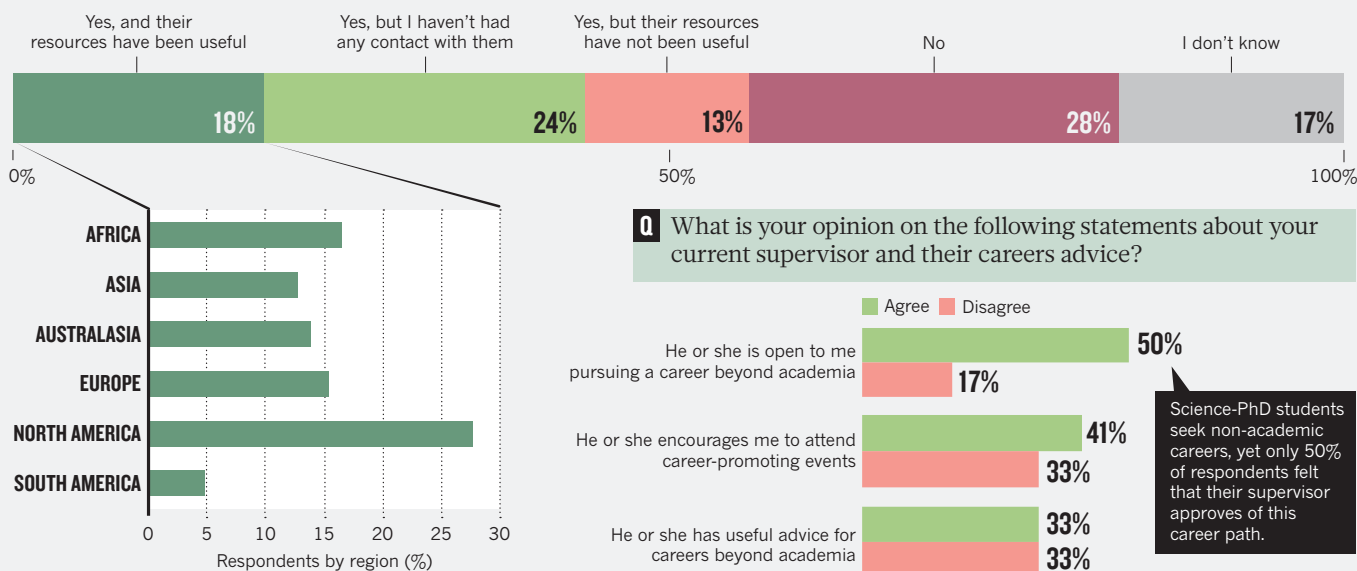
Dreams of academia endure even in parts of

the world in which prospects seem daunting. Parisa Naeli, a PhD student in molecular genetics at Tarbiat Modares University in Tehran says that so far, her vision for the future exceeds her actual opportunities. “I don’t want to just be a doctor or a professor,” she explains. “I want to be a great researcher. I want to have a fully equipped lab and work on my dream project, but I don’t have that.”

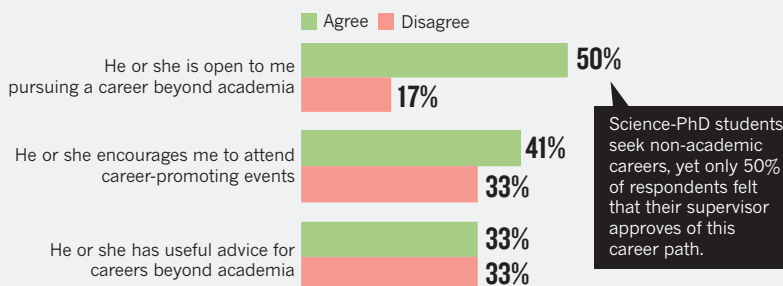
Naeli is keenly aware of the obstacles ahead. “I think the academic market is better in other countries than in Iran,” she observes. “It’s hard to find a teaching job, but it’s even harder to get a research job. I could do a lot for people, like drug discovery. But I can’t because I don’t have the facilities.”

Enthusiasm for academia is not evident everywhere, however, and it certainly has not swept the Pennsylvania State Milton S. Hershey Medical Center in Harrisburg, says Robert Nwokonko, a PhD student in molecular biology there. “It doesn’t seem like a lot of people

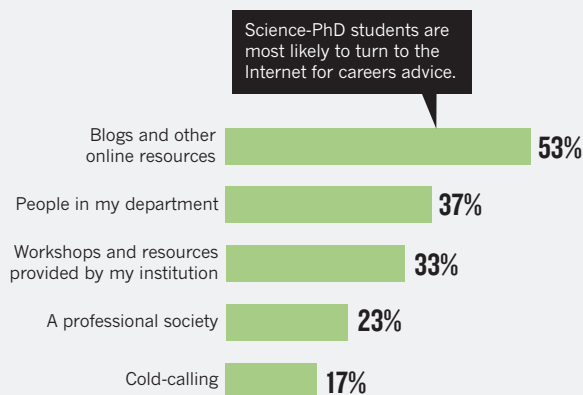
Q Does your institution have careers advisory services for students pursuing science PhDs?



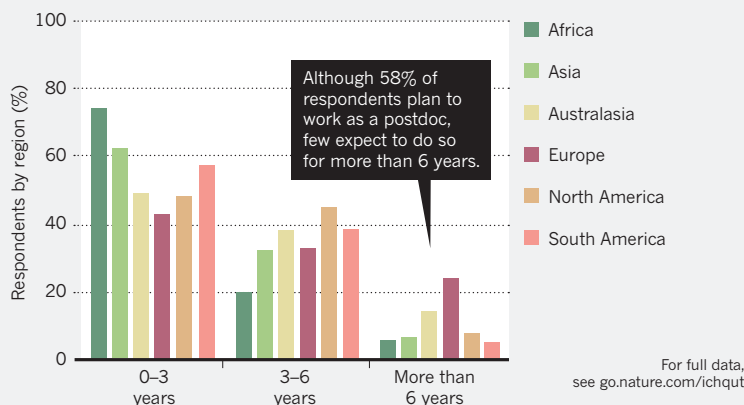
Q What is your opinion on the following statements about your current supervisor and their careers advice?



Q How do you learn about career opportunities beyond academia?



Q After completing your PhD, how long do you think it will take to find a permanent position?



here think that an academic career is the way to go," he says. "I know a lot of students who decided to finish with a master's degree and get into industry as soon as possible."

For his part, Nwokonko intends to buck the local trend and become an academic. "I'd like to have my principal investigator's job in the future," he declares. "He gets to set the focus. I want to be able to run my own lab and put out some quality research."

Nwokonko took time to develop that particular ambition. He started out as a medical student but came to realize that he preferred research. A year-long internship at a biotechnology company sealed the deal. "It was very hard work for not much money," he rues. "I figured if I still liked research after that, I should apply to graduate school."

Nwokonko acknowledges that the really hard part might not be over yet. "I believe I have a sense of the challenges," he says. "There are a lot of postdocs in their thirties, even late thirties. It

takes a long time to get a foot in the door."

Some who see professorships in their future are already thinking about back-up plans. Sean Leonard, a 31-year-old PhD student in bioinformatics at the University of Texas in Austin, states that he wants to give academia a try but is willing to consider other options. Before entering science, he spent four years in the US Army, which included deployments in Afghanistan and Iraq. Compared to combat, he notes, there is nothing especially scary about academia. "A lot of my peers are stressed out and worried," he says. "They think, 'If I don't get an academic job, my life is over.' But with my experience, I don't feel that pressure. I'll be able to find something that's fulfilling."

Although he could probably make more money as an army officer, Leonard affirms that he is committed to scientific research. "The intellectual endeavour is a strong motivator for me," he declares. And whereas many students at his university have given up on the

idea of academia, he is sticking with it. "I like the collegiate atmosphere, and I like the idea of teaching." As for his fallback position, he admits that companies might not be especially interested in his current research subject — microbial communities in the gut of the honeybee. But he hopes that the specialized research skills that he is developing will make him more attractive to industry.

MIXED MESSAGES

Where are early-career researchers getting their zeal for academic jobs? Judging from the survey responses, at least some encouragement comes from their mentors. A little more than one-third of respondents revealed that their advisers had helped to shape their career plans. And notably, only half of respondents stated that their supervisor is open to the possibility of their pursuing a career outside academia. The main source of inspiration — reported by more than half of respondents — was their own online research,

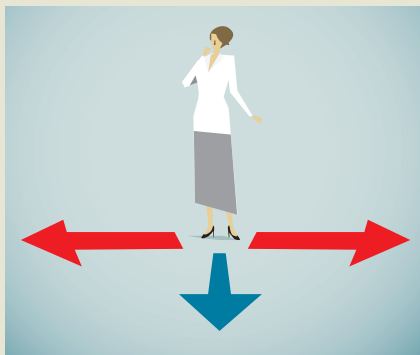
INDUSTRY APPEAL

Instant results

Graduate students who do not foresee a future in university research have their reasons. Among respondents who said that an academic career was unlikely, 55% noted that the field was too competitive, 43% said that it would be impossible to balance work with family life and 34% believed that they would not be able to make enough money.

Laura Lyons, a microbiologist who has just submitted her PhD thesis at Aberystwyth University in Wales, UK, indicated that she intends to pursue a career in industry. She is sticking to that plan — sort of. “The only position that I’ve applied to so far is at the University of York,” she reveals. “I need a job. There aren’t many jobs in Wales.”

Overlooking that one application, Lyons says that an industry position is a more natural fit for her particular area of study: using microbial processes to create fuels and chemicals from renewable sources. More importantly, she is attracted by the ‘get-it-done’ culture of large companies. “Industry is always pushing for results,” she explains. “In academia, if something doesn’t really work, it doesn’t really matter.”



Anna Parker, who is studying chemistry at the University of California, Berkeley, aims to pursue only positions in industry. “I’m not considering an academic career in any way,” she states. “I want to get into industry as soon as possible.” Parker is far from alone in her circle. “The vast majority of the people I know do not want to go into academia. A lot of them are pretty disillusioned.”

Parker says that she essentially had to learn physics and process management before she could get anything accomplished in the

laboratory. She believes that an industry job would make more immediate use of her skills — for the benefit of her employer as well as herself. “I’m holding out hope that I’ll be spending more time doing the kind of science that I wanted to do in the first place,” she says. “I’m driven by basic science.”

Ideally, Parker would like to work at a US technology giant, such as IBM — one with enough money to invest in projects that might not pay off for 20 years. Yet, she concedes, it is tricky to find out what such companies are pursuing because so many business details are proprietary. “You can’t just look that information up on their website.”

Parker echoes other survey respondents in her reasons for eschewing academia: too much competition, too many work-life balance problems and too little money. But she is most put off by the work itself — or, in her case, the lack of it. After four years in a PhD programme, she is getting ready to run her first experiment. “I know a lot of labs are like this,” she admits. “Academia is a very inefficient place to do research.” **C.W.**

which suggests that graduate students do not routinely go to great lengths to explore their career options. Both formal career training and helpful colleagues fell behind advisers and online research as sources of career guidance.

Chelsea Lowther, a PhD student in clinical genetics at the University of Toronto, Canada, has sought career advice from many sources. However, her decision to pursue academia is almost entirely her own. “My supervisor is great to talk to about career planning,” Lowther notes. “But she doesn’t tell us exactly what she thinks we should do. She doesn’t want to influence us.”

Lowther has good reason to believe that she is on the right path. Earlier this year, she won a three-year, Can\$105,000 (US\$80,600) grant from the Canadian Institutes of Health Research to study the genetics of schizophrenia and intellectual disabilities. “My adviser expects her graduate students to get their own funding,” she explains. “She thinks it will be good for our careers.”

Like Nwokonko, Lowther originally planned to go to medical school until the lure of research pulled her in another direction. Now in her third year of graduate school, she is approaching principal investigators at conferences to scope out potential postdoctoral opportunities. “I’m not concerned about finding a postdoc,” she insists. “That’s not where the bottleneck is. I would just love to think that I’ll only have to do one postdoc.”

Lowther maintains that she is not naive about

the difficulties of moving from a postdoctoral role to an elusive tenure-track position. “I don’t think I’ll be blindsided,” she says. “I’m aware of how bleak the prospects are. I try to stay confident and work as hard as I can. It will fall into place.”

AVOID THE CROWD

Some respondents disclosed that they already knew that a PhD was not for them before embarking on lower-level graduate qualifications. Dan Upsher was finishing a master’s degree in fisheries research at the University of Hull, UK, when he filled out the survey. At the time, he stated that he was interested in an industry career — and he has stayed on course. Instead of moving on to a PhD, Upsher has launched an aquatic-rehabilitation consultancy. “River rehabilitation is where my true passion lies,” he says. By his own estimate, the years of practical experience will be better for his career than a few more years of graduate school. Although he could always go back to university later on, for now, Upsher is glad to avoid the crowd. “Getting a PhD has become such a thing to do,” he remarks. “It’s a fad.”

Students who do move on to PhD

Instead of moving on to a PhD, Upsher has launched an aquatic-rehabilitation consultancy.

programmes often run into unexpected difficulties. Nearly half of survey respondents reported that they were surprised to discover how hard it is to get a grant, and a similar fraction revealed that finding a work-life balance is more challenging than expected. Forty per cent said that they were surprised to discover that many researchers with PhDs have already done multiple postdoctoral stints — an increasingly common scenario.

Still, those surprises were not enough to sour most students’ opinions of graduate school. Seventy per cent of respondents said that they are “satisfied” or “very satisfied” with their graduate-school experience, and only 3% reported being “very dissatisfied”.

Despite her own share of surprises, Bulanova still has her eyes on the academic path: one or two postdoctoral positions in Europe or the United States, followed by a tenure-track job. She accepts that it will not be easy. “In northern Europe, especially in Finland, there are cuts in funding and the positions are very limited,” she says. “Somehow I want to try.”

She has ideas that she wants to test, preferably in her own laboratory. Those ideas might not pan out exactly as she planned but, she admits, that is the beauty of science — and, for that matter, of careers in science. “If you already know all of the answers,” she says, “what’s the fun?” ■

Chris Woolston is a freelance writer in Billings, Montana.