



MIGUEL MONCK

## WHEEL OF FORTUNE: UNCERTAIN PROSPECTS FOR POSTDOCS

*Nature's* first survey of this key segment of the scientific workforce uncovers anxiety and doubt about their professional pathway. **By Chris Woolston**

**A**s she considers her future, Meihui Wu is committed to staying in science. “I don’t want my skills to go to waste,” says Wu, a postdoctoral researcher in cancer immunology at the Singapore Eye Research Institute. She’s equally sure that she doesn’t want to take another postdoctoral position. She’s already on her second short-term contract as a postdoc, and wants to avoid

yet another period of ‘training’ with no end in sight. “I’ve seen friends who get stuck in multiple postdoc positions,” she says.

Wu now faces a question familiar to postdocs worldwide: what’s next? *Nature's* first survey of postdoctoral researchers, which drew responses from more than 7,600 respondents in 93 countries, included a series of questions about job prospects, a topic that has long

been a source of anxiety and uncertainty for researchers at this stage in their careers.

Highly trained and highly educated, postdoctoral researchers often struggle to turn their temporary positions into full-time, stable careers – a struggle that is now made even more daunting by the COVID-19 pandemic.

Although many despair about the dwindling number of academic positions, others find

optimism in a world that increasingly depends on scientific expertise. (Previous articles on the survey offered an overview of postdocs around the world, an examination of the many impacts of COVID-19 and a look at postdocs' quality of life; see 'Nature's postdoc survey'.)

Despite the many challenges, postdocs from all scientific fields have some reason to be hopeful, says Rachel Coulthard-Graf, career-development adviser at the European Molecular Biology Laboratory (EMBL) in

Heidelberg, Germany. "They have very strong job prospects," she says. "Academia has clearly become competitive, and they may worry about exploring other sectors that they don't know so well, but it's entirely doable", she says.

### Cloudy prospects

As a group, postdocs are worried about their futures. Little more than one-quarter (28%) of respondents had a positive view of their career prospects; twice as many (56%) had a

negative view, including 17% whose outlook was "extremely negative". Pessimism about job prospects was slightly higher for female respondents (58%) than for male respondents (53%). Coulthard-Graf notes that the majority of postdocs who seek out career services at EMBL are female, suggesting that many women are turning their worries into action.

Pessimism is especially common in astronomy and planetary science, where 27% had extremely negative career outlooks, as well as in ecology and evolution (23%). Biomedical researchers, who accounted for a slight majority of all respondents, also disclosed apprehension: more than half (55%) had a negative view of their job prospects, and just 28% felt optimistic. Eleven per cent of researchers in computer science and mathematics said they felt "extremely positive" about job prospects, the highest proportion of any field.

Most respondents feel that they picked a bad time to pursue science. Three-quarters said that their job prospects were worse than those of previous generations of scientists, with 37% saying they were "much worse" (see 'Academic ambitions'). Just 7% said their job outlook was somewhat better than earlier scientists', and just 1% felt their prospects were much better. Notably, 23% of respondents in Africa said their prospects were better than those of previous generations, a sign of growing optimism on that continent (see *Nature* 572, 143–145; 2019).

Many respondents have reasons for pessimism. Asked to list the biggest challenges to personal career progression, nearly two-thirds (64%) named a lack of funding in their field, almost half (45%) blamed a lack of jobs and 40% pointed to the impacts of the pandemic. One-quarter said that they are held back at least partly by their desire to stay in academia.

Postdocs who can't find permanent work often end up taking another postdoc position. As previously reported (see *Nature* 587, 505–508; 2020), more than 30% of respondents had already had at least two such placements, and a few reported completing up to six. Clearly, a stint that had originally been conceived as a 'training' period has instead become a holding pattern for many.

### Academic ambitions

Although the chances of landing an academic research position are becoming ever slimmer, particularly in light of the pandemic, nearly two-thirds (63%) of respondents hope to pursue a career in academia. One-quarter (26%) aren't sure of their plans. Men (68%) were more likely than women (59%) to aspire to academic careers. Natalie Sirisaengtaksin, a postdoctoral cancer researcher at the University of Texas Health Sciences Center in Houston, says that her thinking vacillates between pursuing a job in academia and looking elsewhere. "It's a really hard decision," she says. "It's difficult to give up on that dream. I

## 'It is difficult to see why anybody would embark on a career in academia'

Free-text comments in *Nature's* survey of postdoctoral researchers worldwide detailed the fear and apprehension that respondents feel concerning their career prospects. Comments have been lightly edited for length and clarity, and, where necessary, translated into English.

- The biggest problem that researchers face in my country is the enormous job uncertainty. My contract ends at the end of this year, and I don't know if I'm going to go unemployed or get another one that will allow me at least to work in science for another year. I'm always thinking about the possibility of having to abandon science. *Physicist, Spain.*
- Every year of postdoc work clearly makes me less and less attractive to employers outside of academia. *Chemist, Ireland.*
- Postdocs in India don't receive support from their mentors in terms of their careers. They never get recommendations on how to move ahead. *Biomedical researcher, India.*
- I wish it was less scary and isolating to do something I really love and that I am very good at. The lack of job prospects in academia is daunting. *Biomedical researcher, Canada.*
- Looking at career prospects objectively, it is difficult to see why anybody would really embark upon a career in academia. The entire system needs to change if we are to really see any improvement at the postdoc level. *Biomedical researcher, United Kingdom.*
- Universities are quick to close the doors to hiring full-time staff at absolutely any opportunity. But they remain happy to exploit many workers on terrible short-term

contracts. After dedicating a significant amount of your life to education and earning a PhD, you are rewarded with the prospects of short, fixed-term contracts with no guarantee of anything stable appearing.

*Psychologist, United States.*

- I feel postdocs are trapped in their positions and are not being given the tools they need to progress in their careers. Progress is not about hard work; it's about being lucky enough to be there for an important discovery or knowing the right person to get the next position. *Chemist, United States.*
- Career prospects have shrunk instead of expanded. I earn less in my third postdoc than in my first one even though I have much more experience. *Biomedical researcher, Canada.*
- China's massive investment in basic sciences allows postdoctoral fellows to have a positive view of their future career prospects if they are willing to return to work in China. There are abundant job opportunities in my home country, including postdoctorate or faculty positions. This makes me feel at ease, and I'm optimistic about the future. *Astronomer, South Korea.*
- The number of faculty positions is much smaller than the number of postdoctoral students, leading to fierce competition. Female postdocs who want to get a teaching position dare not give birth or take vacations. *Biomedical researcher, United States.*
- My lab has enough funding for the next two years, which is perfect for me to finish up and then search for a new job — maybe in academia, maybe in industry. I am open to both. I am optimistic that I will find a job in the future. *Biomedical researcher, United States.*

love mentoring students and thinking about big ideas.” However, she’s not sure she has the laboratory skills to be competitive, and she worries that running her own lab would take over her life. “If I got it, there’s a big question about whether I’d be happy,” she says.

Chrystal Starbird, a structural biologist at Yale School of Medicine in New Haven, Connecticut, has a much clearer vision for her future. “I’m applying for faculty positions,” she says. Starbird, who worked at the pharmaceutical company Pfizer before she started her PhD programme, says that universities encouraged her to apply for faculty positions immediately after she got her degree. She decided to complete a postdoc to build skills and establish credentials, but never lost sight of her ultimate goal of running her own university lab. “If I think an idea is worth pursuing, I want to be driving that idea forward,” she says.

Data on postdoctoral success rates in academia are sketchy, partly because postdocs are a poorly defined and undercounted group. According to a 2018 report, roughly 15% of postdocs in the United States could expect to go on to tenure-track faculty positions (S. C. McConnell *et al. eLife* 7, e40189; 2018).

Rory Duncan, based in Edinburgh and director of talent and skills at UK Research and Innovation, the leading funder of UK research, says the numbers are stacked against researchers who want permanent academic jobs in his part of the world. “We support roughly 40,000 postdocs in our universities, and there aren’t that many faculty positions available,” he says. “We are trying to help develop really talented people with broad, high-level skills that are sought after in the research and innovation ecosystem. Some will work in academia, but most will go on to work in some other sector.”

Coulthard-Graf estimates that roughly 30% of postdocs at EMBL secure faculty positions, a rate that almost certainly exceeds global averages. She says that about twice that number would list academia as their preferred destination, which means that a significant proportion of postdocs will have to turn to plan B.

University hiring freezes and layoffs during the pandemic have further dimmed the prospects of those hoping to land in academia (see ‘It is difficult to see why anybody would embark on a career in academia’), although the full impact is still unclear. An analysis of academic job postings in October 2020 suggested that faculty openings in the United States had dropped by 70% compared with the same period in 2019 (see [go.nature.com/3pvjnkj](https://go.nature.com/3pvjnkj)).

## Looking for guidance

With such uncertain prospects, many postdocs could benefit from career advice, but help isn’t always nearby. When asked to identify their sources of guidance, more respondents gave credit to other postdocs (70%) than to their supervisors (67%). Postdocs are so

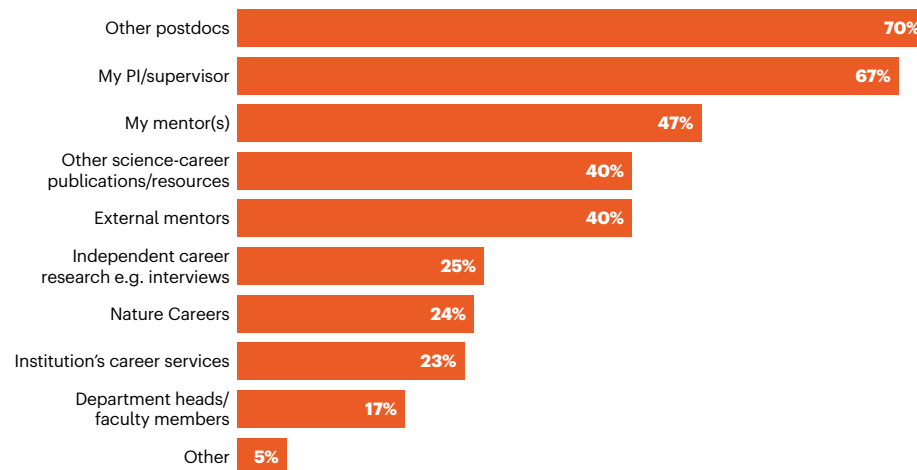
## ACADEMIC AMBITIONS

Despite hiring freezes and layoffs at universities around the world, most respondents aspire to a career in academia. And although they turn to peers and principal investigators (PIs) for career advice, they still have a negative view of their prospects. A large majority feel that previous generations of postdocs had it better.

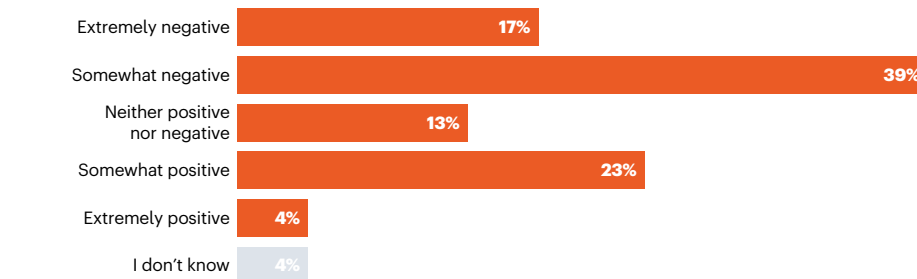
### Do you hope to pursue a career in academia?



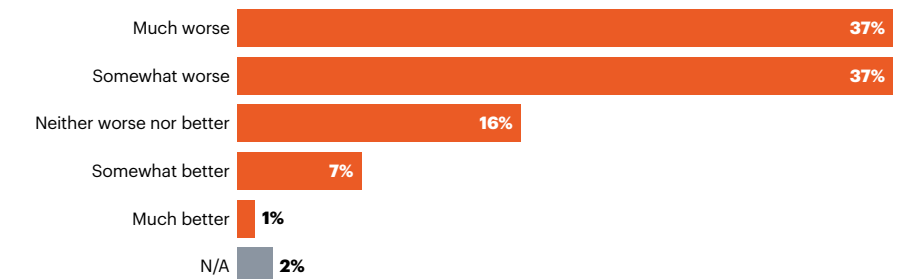
### Which sources do you use to seek career advice?



### How do you feel about your job prospects?



### Do you see your job prospects as better or worse than those of previous postdoc generations?



valuable to the scientific enterprise that some supervisors might be reluctant to help them progress in their careers, Duncan says. “It’s in the interest of supervisors to keep the best people they have as long as they can,” he says. “There is some deep soul-searching required to ensure that the person who is in the transitional role receives the type of development that they ought to be receiving.”

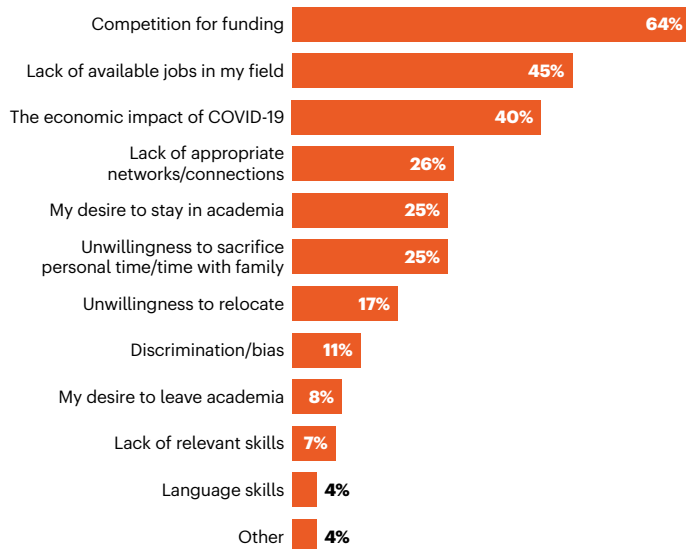
Career development and guidance are top priorities at EMBL, Coulthard-Graf says. She

notes that the institute now has two career advisers who provide training and advice to its 500 or so PhD students and postdocs. When she encounters postdocs who are intent on an academic career, she suggests specific steps that will increase their chances of success. “I try to never actively discourage it,” she says. And when postdocs say that they might be open to other possibilities, she has much to offer. “We discuss alternatives,” she says. “They haven’t always been exposed to other options.”

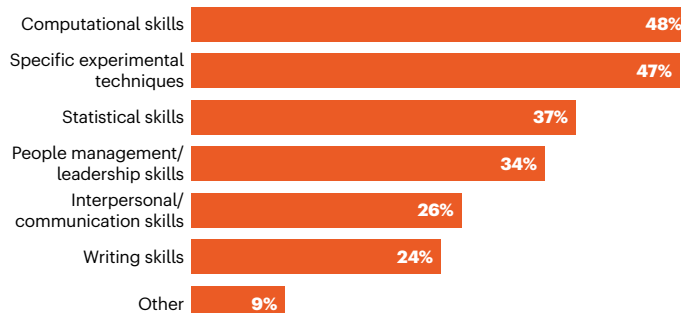
## WHAT'S NEXT?

Postdoctoral researchers who responded to *Nature's* survey voiced widespread concern about their career progression. Many felt that they lack skills to compete — especially in the current job climate. With all that they've been through, less than half would recommend a science career to their younger selves.

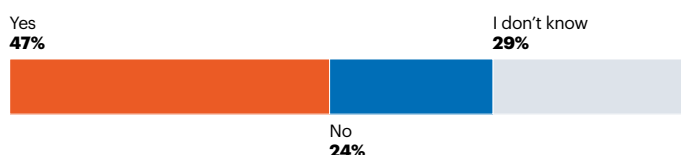
### What do you think is the biggest challenge for your personal career progression?



### Which skills do you feel you're lacking in?



### Would you recommend a career in scientific research to your younger self?



Coulthard-Graf has found that many postdocs are driven above all by curiosity, and so can be drawn to other career paths — such as industry, journal editing and government regulatory affairs — when these are pointed out to them. “People who leave the academic track find ways to satisfy that curiosity,” she says. “I wish they would view these goals equally.”

Amar Parvate turned a two-year postdoc in virology at the La Jolla Institute for Immunology in California into a springboard for his new

job. Since August, he's been a microscopist and biochemist at the Pacific Northwest National Laboratory (PNNL), a US government research lab in Richland, Washington. Unlike many of his peers, Parvate never really longed for academia. “The odds would have been stacked against me,” he says.

### Alternative paths

Parvate had already applied for virology jobs at a few biotech and pharmaceutical companies without success when the position at the PNNL opened up. “It was more chance than thought,” he says. A national research laboratory wasn't part of his long-term plans, but it turned out to be a great fit. He is one of just a few researchers who have access to a top-of-the-range cryo-electron microscope. “It's one of the most amazing pieces of equipment you can get your hands on,” he says. Eventually, he plans to become a ‘super user’ in charge of all applications of the microscope, from sample preparation to data analysis. For him, it's a high-tech path to job security. “I plan to be here for quite a while,” he says.

Brian Groendyke was a postdoc in medicinal chemistry at Harvard University in Cambridge, Massachusetts, when he took the survey. A couple of months later, he received an offer from a biotech company in nearby Boston, and he is now about to start a career in industry. “The job opportunities are good here, and I won't have to relocate.”

Like many other scientists, he went into his postdoc with a vision of running his own university lab some day, but gradually warmed to the idea of focusing on science without worrying about teaching or other academic obligations. He says that his postdoc left him

well prepared for his career path. “I've gained a lot of skills that I would not have had coming straight out of graduate school.”

Not everyone feels that they have the right tools to move forwards. Asked to list their weak areas, 48% pointed to computational skills, 47% wished they were better at specific experimental techniques and 37% lamented their lack of proficiency with statistics (see ‘What's next?’).

Still, postdocs would often be surprised to find where their skills could take them if they keep an open mind, says Coulthard-Graf. “A lot of postdocs haven't really looked beyond research,” she says. “What's on their radar is academia or pharmaceuticals and biotech.” Many possibilities exist, she says, and postdocs sometimes have to look past long-standing stigmas against non-research careers to consider potentially rewarding, high-paying jobs. “There are a lot of sales positions related to pharma, biotech or medical devices,” she says. “If you even mention that, a lot of postdocs will automatically say, ‘Oh, no, that's not for me’ — without even considering it.”

After much thought, Wu plans to stay where she is. She says that she never really saw herself running her own lab, and her few applications for industry jobs led nowhere. Now she hopes to stay in her current lab as a staff scientist. “My supervisor needs someone to help support her lab,” she says. “I could be here for a long time.”

Wu wants to encourage other postdocs to keep their heads up even if employment prospects look bleak in the short term. “Don't be too negative if things aren't going well,” she says. “The world needs us.”

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## NATURE'S POSTDOC SURVEY

A series of four articles gives a snapshot of the working lives of postdocs in academia.

In September, *Nature* reported survey results about how COVID-19 has affected postdocs and their views of the future. The second article in the series offers an overview of their circumstances worldwide. The third explores postdocs' quality of life, including mental health and experiences of discrimination and harassment. The final article examines respondents' sense of their career prospects, a crucial issue for postdocs as they look ahead. The survey, created together with Shift Learning, a market-research company in London, was advertised on nature.com, in Springer Nature digital products and through e-mail campaigns. It was offered in English, Mandarin Chinese, Spanish, French and Portuguese. The full survey data sets are available at [go.nature.com/3tmckuq](https://go.nature.com/3tmckuq).