

ILLUSTRATION BY ANTONIO RODRIGUEZ

THE STATE OF SCIENCE SALARIES

Stagnating salaries, persistent pay divides and a competitive job market are dampening scientists' optimism. **By Chris Woolston**

Last month, Jucelaine Haas returned home to Brazil after spending a year as a visiting scientist at the Helmholtz Centre for Environmental Research in Leipzig, Germany. Now at the Federal University of Technology in Paraná, Haas says her tenure-track position offers some security but she has little opportunity for advancement. "I'm a university professor," she says. "It's such a nice title."

Haas laments that a lack of resources and opportunities in Brazil have made it difficult for her to collect the sorts of accomplishment that would make her competitive for faculty jobs in other countries. "When you look at my

CV, I don't have many qualifications. I've made the most of what I have," she says.

Haas's gloomy outlook is not unusual. Fewer than half of respondents to *Nature's* 2021 salary and satisfaction survey reported feeling positively about their career prospects, a clear sign of pessimism at a time of widespread funding shortages, intense competition for jobs and the disruptions of a global pandemic. By comparison, the proportion was nearly 60% in 2018, when the last survey took place.

The self-selected survey drew responses from more than 3,200 working scientists around the world. Slightly more than one-third came from North America. Roughly

one-quarter came from Europe, with another 14% coming from the United Kingdom and 10% from Asia. Almost two-fifths work in biomedical and clinical science, the most for any field. Close to two-thirds work in academia, 15% in industry, 9% in government and 5% at non-profit organizations. Respondents spanned the spectrum of job titles, including professors and lecturers (32%), postdoctoral researchers (22%) and staff scientists (19%). Almost 80% have a PhD. Female and male researchers responded in roughly equal numbers, but the choice of gender wasn't binary, and 2% of researchers identified as non-binary or preferred not to say.

Optimism about job prospects seems to be waning. Whereas 59% of researchers felt positively about their futures in 2018, just 47% felt that way this year. Exactly half of respondents said that their prospects were worse than those of previous generations, a number essentially unchanged from 2018.

For Haas, one downside of staying in Brazil is that academics there often have to take on many other duties beyond research and teaching. For instance, she once had to evaluate applications from students who were claiming financial hardships. In addition to all her other tasks and responsibilities, she found herself reviewing financial documents and interviewing students to make sure they were as poor as they claimed. “I don’t see how that’s related to my research,” she says.

Andie Hall, a research assistant at the Natural History Museum in London, is unsure about her long-term prospects. She’s been at the same institution for 17 years, enough time to establish a niche sequencing specimens including freshly collected bryozoans and 200-year-old lacewings. “My job is quite different from everyone else in the museum,” she says. “I’m part technician and part researcher. It’s interesting, but it’s also a challenge.”

If she ever did want to move on, she knows her options would be limited by the fact that she did not go further than a master’s degree. “I often see jobs – and even training courses – advertised that I know I could do, but they require a PhD,” she says. “If you’re a technician who’s at the bench solving problems, I don’t think that a PhD is necessarily as important as experience.”

A closer look at the results shows that career optimism isn’t evenly distributed. People who identified as male (49%) were

somewhat more likely than those who identified as female (45%) to have a positive view of their job prospects. Among the 10 countries with the most respondents, prospects seemed especially gloomy in Brazil, where only 33% felt positively. People were slightly more positive in Australia (37%) and Spain (38%). Optimism was more abundant in China (50%), the United States (52%) and India (57%). A biomedical postdoc in Australia shared her thoughts: “As a dedicated scientist with over 15 years experience, I am completely disillusioned about research. Many of my friends have left research and I am about to drop off as well. Not because of lack of skills or passion for research but rather because of the constant fighting to stay in the game (which is costing me my mental health).”

The sectors in which scientists are based strongly colour their views of the future. Respondents in industry (64%) are much more likely than those in academia (42%) to feel positively. A project manager in the United States wrote, “I am now an evangelist for all of my friends still in academia to get out and join biotech or any other professional industry.”

Respondents in the fields of health care and engineering were especially likely to see good things ahead, at 59% and 55%, respectively. By contrast, only 38% of those working in ecology and evolution and 40% of those in geology and environmental science feel positive. The pandemic probably contributed to both optimism and pessimism in different fields. A biomedical postdoc in the United States stated: “I’m hopeful that [the pandemic] will result in more funding opportunities in biomedical sciences, but I also think it has significantly slowed down any research that is not related to SARS-CoV-2.”

A positive outlook was more common in early- or mid-career researchers (49%) than in researchers in the later stages of their careers (39%). Predictably, optimism is also in greater supply in people in full-time permanent jobs (53%) than in those on full-time contracts (36%).

Fixed-term contracts are clouding the future of Edmond Sanganyado, an environmental chemist at Shantou University in China. “In China, there’s no pathway to a permanent job,” says Sanganyado, who is originally from Zimbabwe. “You have to keep renewing your contract every three years. It’s difficult for a foreigner to have long-term goals.”

The widespread negativity uncovered by the survey is a bit surprising for people with so much to offer, says Jim Vigoreaux, a biologist and vice-provost for faculty affairs at the University of Vermont in Burlington. Vigoreaux co-authored an article in June that offers advice for scientists seeking faculty positions at research-intensive institutions (J. O. Vigoreaux and M. J. Leibowitz *BMC Proc.* 15, 4; 2021). He acknowledges that faculty positions are in short supply and that the odds of success are low for any particular application.

But he also notes that people with scientific skills have a growing number of options both inside and outside academia. Complex issues such as sustainability, social justice and health care will require a vast and committed research workforce, he says. “There are big challenges ahead of us, really interesting questions in so many areas of science and technology. I don’t quite get all of this pessimism.”

Vigoreaux encourages researchers on the job market to take a wide view of the possibilities in science, whether in academia or beyond. But that doesn’t mean they should take a scatter-gun approach to applying for jobs. “The prevailing mentality is to throw everything at the wall and see what sticks,” he says. “I encourage people to refrain from doing that. They should be more selective. And when they identify an opportunity, they should go full steam ahead.”

Respondents had their reasons for doubt. When asked to identify the biggest barriers to career progression, more than one-third cited competition for funding as one their top concerns, and 31% noted an overall lack of funding. Funding shortfalls were a particularly common complaint in Spain (44%), Australia (53%) and Brazil (64%). Overall, 9% of respondents said they were held back by a lack of skills. When asked to specify their shortcomings, those respondents were especially concerned about a lack of ‘hard’ skills, such as proficiency in specific experimental techniques and computational know-how.

Pay disparities

The survey found stark pay disparities driven by factors such as field of study, job type and geography. Overall, about one-third of respondents reported making at least US\$80,000 a year, including 7% who make \$150,000 or more. That’s up from 2018, when 23% reported making more than \$80,000 and 5% reported making more than \$150,000. At the other end of the spectrum, 19% reported earning less than \$30,000 in the 2021 survey, including 9% who make less than \$15,000.

High salaries proved to be more common in industry than academia. Seventeen per cent of respondents in industry reported making more than \$150,000 each year, but only 5% of academics reached those heights. A bioinformatician in the United States says she makes “around 50% of what I was offered for industry positions during my job search. It would be nice if academia could be more competitive with industry, but I love what I do and where I live so I can’t really complain.”

Unsurprisingly, salaries vary by country. More than half of US respondents reported making at least \$80,000. But that mark was reached by only 19% in the United Kingdom, 6% in China and a mere 3% in Brazil. Haas says that as a full professor in Brazil, she makes less than most PhD students elsewhere. Overall,

NATURE'S SALARY AND JOB SURVEY

A series of four articles gives a snapshot of the state of science at a pivotal time.

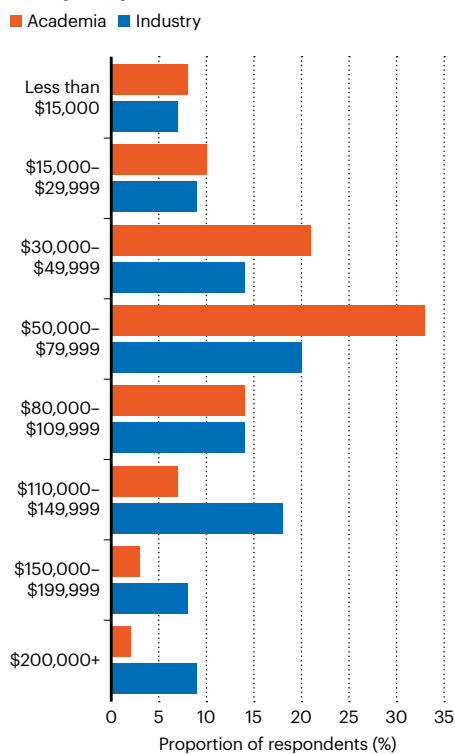
This article is the second of four linked to Nature’s global salary and job satisfaction survey. Further articles are scheduled for the following weeks, exploring job satisfaction, diversity and inclusion and other aspects of scientific life.

The salary survey runs every three years and last took place in 2018. It was created together with Shift Learning, a market-research company in London, and 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/3eqcpgk9.

SALARIES AND PROSPECTS

Scientific salaries vary widely, with higher wages generally found in industry. A slim majority of scientists are satisfied with their salaries, but they are less certain about their futures.

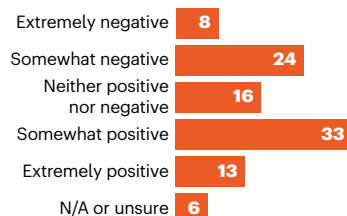
Salary comparison (US\$)



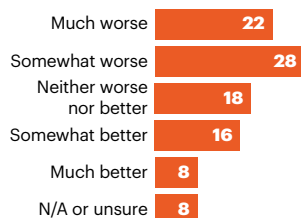
How satisfied are you with your salary/compensation?



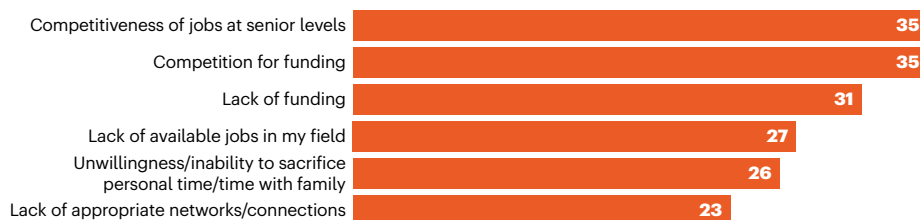
How do you feel about your future job prospects?



Do you feel that your prospects are better or worse than past generations?



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



27% of respondents whose job involves mainly teaching reported earning less than \$15,000. Notably, 7% of full professors also reported making less than \$15,000 a year, a troubling situation for accomplished academics. A full biomedical professor in Argentina lamented that she pockets about \$300–400 per month after a series of cutbacks at her institution. “Science in Argentina has been awful for many years,” she wrote. “It keeps getting worse.”

As with previous *Nature* surveys, male and female researchers generally reported similar earnings, especially at the early stages of their careers. However, there is a gender gap in high earners in senior positions. Among those who identified as late-career scientists, 40% of male researchers and 36% of female researchers reported earning at least \$110,000. This trend echoes that found in the 2018 survey, with 33% for men and 23% for women.

Salaries seem to be stagnating. Just 38% of respondents reported receiving a salary increase in the past year, down from 51% who reported a boost in 2018. Nine per cent

reported a decrease in salary. When asked to identify the reason for the salary cut, 40% blamed cutbacks at their institutions. This particular complaint was almost twice as common in academia (44%) as in industry (23%).

Even though relatively few respondents reported rises compared with previous surveys, just over half said they were happy with their overall levels of compensation. That’s up from 43% in 2018. Levels of satisfaction were especially high (62%) in respondents working in industry. For those in academia, fewer than half were satisfied.

Very low lows

Many scientists have reason for complaint. A full-time staff scientist physicist in Russia noted that his yearly salary is less than \$5,000. “There is regional discrimination in Russia,” he wrote. “A scientist’s salary in Moscow is about the same as in Europe.” He says that salaries in the Republic of Dagestan, where he lives, are particularly low, with his as a prime example.

High salaries don’t always translate to

contentment. A project manager at a US biotech firm indicated that she’s “neither satisfied nor dissatisfied” with her salary of more than \$200,000. She pointed out some issues at her company that transcend salary, including “a lack of long-term institutional goals, turnover of personnel, poor decision-making process and top-down communication”.

Sometimes, a change of scenery can significantly improve a scientist’s financial situation. Physicist Ana Rakonjac says that she struggled with relatively low salaries during more than five years of postdoctoral work in the United Kingdom, but things started to look up when she took an industry job as a senior research scientist at Atomionics, an atomic physics start-up in Singapore. “The salary was much higher, which relieved a lot of personal stress,” she says. “Postdoc salaries are OK, but it was a difficult situation for saving money. I never felt great financial security. If something went wrong, I’d have to rely on my parents.”

Postdoctoral training doesn’t always pay well in the short term, but it can be a worthwhile investment in the future, especially for those who wish to remain in academia, says Joyce Main, a higher-education researcher at Purdue University in West Lafayette, Indiana. Main co-authored a paper earlier this year that used a National Science Foundation database to track career outcomes for US postdocs in the social sciences and science, technology, engineering and medicine (STEM) fields (J. Wang and J. B. Main *Stud. Grad. Postdoc. Educ.* 12, 384–402; 2021). The study found that completing a postdoc in either a social-science or a STEM field increased the odds of landing a tenure-track faculty position seven to nine years after finishing the PhD. “In terms of developing your research programme, a postdoc can be helpful because it gives you an opportunity to focus on research and publishing papers,” she says.

Vigoreaux says that scientists who aren’t focused in their job search are less likely to get the salaries they deserve. “The crux of the problem is that they’re just jumping at the first thing that’s given them because they feel insecure,” he says. “They don’t come prepared with skills to negotiate a good starting salary.” He explains that job-seekers who are focused in their quest will have clearer expectations of what they can expect to earn.

Overall, the survey highlighted the wide diversity of scientific lives. The obvious struggles of many stand in contrast to the success of others. A social scientist in the United States who makes more than \$110,000 working in government summed up her perspective. “I am content and optimistic about my own career, but [I’m] very aware that I am lucky in comparison to the majority of PhDs in my field.”

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