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A gender divide is still evident in science salaries.

SALARIES

Reality check

A feeling that good performance is not adequately rewarded is pervading the research world.

BY CHRIS WOOLSTON

Although the United States and Europe are slowly rebounding from the recent recession, it is a precarious time to be a scientist. Government funding is flat or flagging in many nations, and that, along with other concerns, has many scientists worried about their futures.

Nature's biennial salary and job-satisfaction survey, which this year drew responses from 5,757 readers around the world, found plenty of success stories, and nearly two-thirds of the 3,328 who responded to the question say that they are happy with their current jobs. But the survey also uncovered widespread unhappiness about earnings, career options and future prospects. And although the dissatisfaction spanned the globe, it seemed to reach particular heights in Europe, a continent that is struggling to find a place for research in the budget.

The respondents — a self-selected group who in many cases used the survey as an opportunity to vent frustrations — have strong feelings about the financial state of science. Just under half say that the main challenge they face is competition for funding. And one-third of respondents say that they are dissatisfied with their pay. Many seemingly have reason for disappointment. Almost 30% of the 3,292 full-time researchers who replied report an income of less than US$30,000 a year. This group includes not only postdoctoral researchers and staff scientists, but also assistant professors and even full professors. Just 13% report an annual income in excess of $110,000, and only 6% make more than $150,000, a salary that would seem relatively pedestrian in many professional fields.

Geography matters. Overall, almost one-quarter of the 1,300 respondents in Europe report earning less than $30,000, compared with just 6% of the 948 in North America. And European salaries don't seem to be growing: less ▶

INEQUALITY IN SCIENCE
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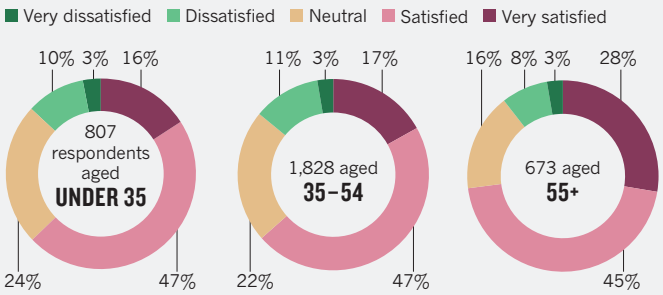
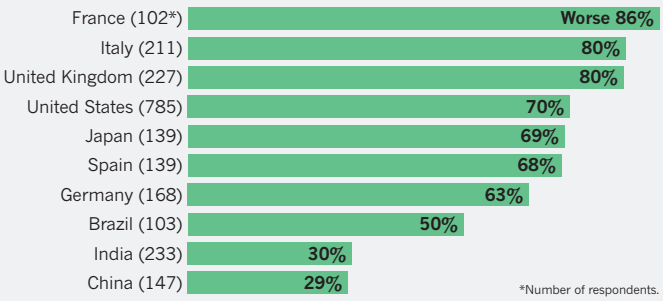
Protocols and prospects

Scientists who took *Nature*'s 2016 salary survey are more pleased with their work than they are with their pay cheques. When asked what they sacrificed for a life in science, they are more likely to list income than work–life balance. Overall, they seem happy with that choice: nearly two-thirds expressed satisfaction in their jobs.

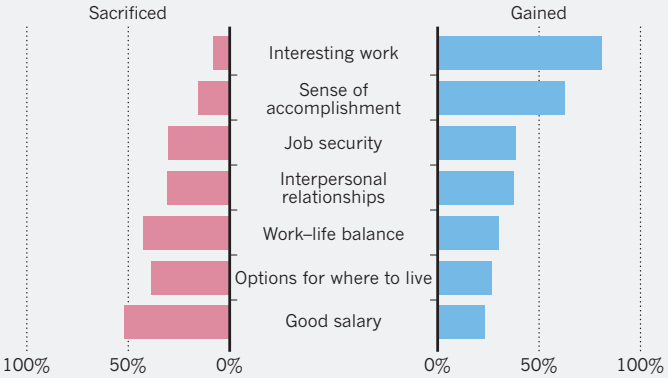
Q How satisfied are you in your current job?



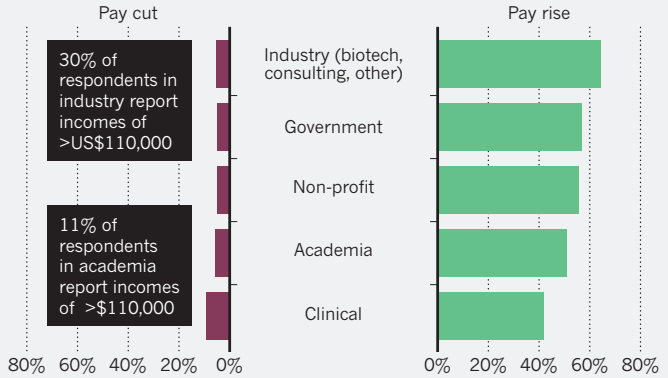
Q Do you see your job prospects as better or worse than for past generations of scientists?



Q What have you given up or gained by choosing a career in science?



Q Did you get a pay rise or cut in the last year?



than 40% of European respondents report a pay rise in the past 12 months, the lowest proportion of any continent. In comparison, nearly two-thirds of researchers in Asia and North America have enjoyed pay rises.

CONTINENTAL DRIFT

Europeans do not seem to have a very rosy view of the road ahead (see page 471). Slightly less than half feel fairly or very positive about their job prospects, compared with 58% of North Americans and 65% of Asians. Optimism is quite high in Africa, however, where 72% say that their prospects are good.

European pessimism is a common theme in respondents' comments. "There is no future in a research career in Italy," writes Luciana D'Apice, a molecular biologist at the Institute of Protein Biochemistry in Naples. D'Apice, whose earnings sit at the lower end of the spectrum, says that Italy is falling behind other nations in Europe in terms of scientific support. "Even though research is always a topic in politicians' speeches, it means nothing to them," she says. She spent a year at the relatively well-funded Pasteur Institute in Paris, and is discouraged by the comparatively tiny budgets and meagre equipment at Italian labs. "I'm convinced that we Italians could contribute to science given the right conditions," she says. One of her duties is to guide and advise master's and PhD students, and she says that they are voting with their feet. "I've seen many motivated and brilliant young people leave research to look for something less impossible to achieve." She is considering moving to teaching or writing herself, even though she loves her work.

D'Apice isn't the only one complaining about the level of support for research in Italy. In a letter to *Nature* published in February, Giorgio Parisi, a theoretical physicist at the University of Rome, wrote that Italy "seriously neglects its research base" (G. Parisi *Nature* **530,** 33; 2016). In the letter, he notes that the government plans to spend about €92 million (US$100 million) on research in 2016, about one-tenth of what France spends.

> ***"You could tick all of the right boxes and still not get a permanent position."***

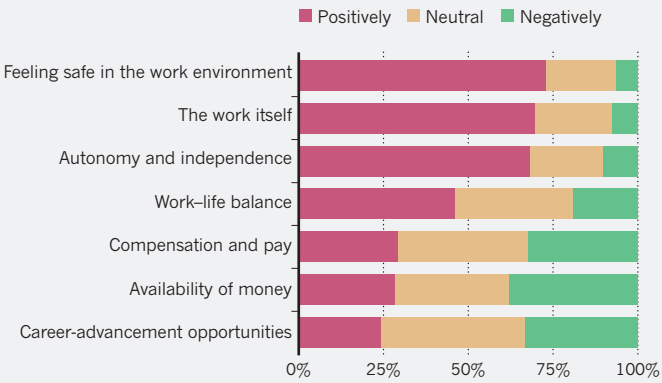
Frustrations run high in other parts of the continent, too. "The situation is ridiculous in Europe right now," writes Alexander Merle, a postdoc at the Max Planck Institute for Physics in Munich, Germany. He says that he might have to leave science in the next year or two if he can't find a job with more security. The search is discouraging — he feels that the plum jobs don't always go to candidates with the best qualifications and experience. "You could tick all of the right boxes and still not get a permanent position," he says. "Performance does not translate to success."

Merle has noticed that European fellowships are getting harder to win. He won a coveted Marie Skłodowska-Curie Actions fellowship in 2012, but a recent application for another fellowship fell short. With many fighting for too few positions, he says it's easy for quality ideas and people to miss out. "There are four or five people on a committee, and if just one person has a negative comment, it kills your chances no matter how good your proposal." Merle would not encourage students to pursue a research career. "Scientists are quite depressed at the situation here in Europe."

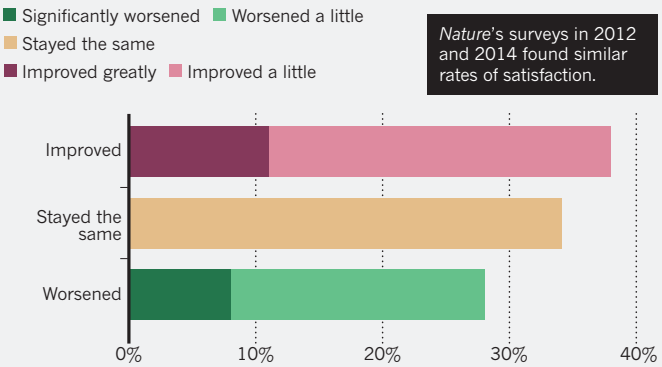
The common perception that European fellowships are drying up is not entirely supported by the numbers, says Lucia Caudet, spokesperson for the European Commission. She notes that the commission plans to offer Curie fellowships to 65,000 researchers between 2014 and 2020, up from 50,000 in the previous 7 years.

Still, Europeans feel that their job prospects pale by comparison with those of past generations. More than 80% of researchers in the United Kingdom, France and Italy say that prospects have worsened (see 'Protocols

Q How do the following affect your job satisfaction?

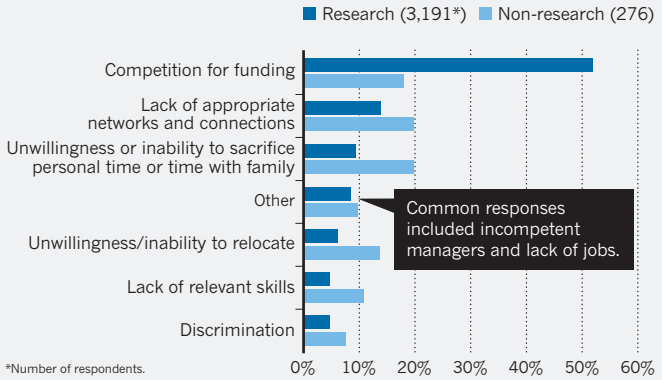


Q In the past year, would you say your level of satisfaction has:



Nature's surveys in 2012 and 2014 found similar rates of satisfaction.

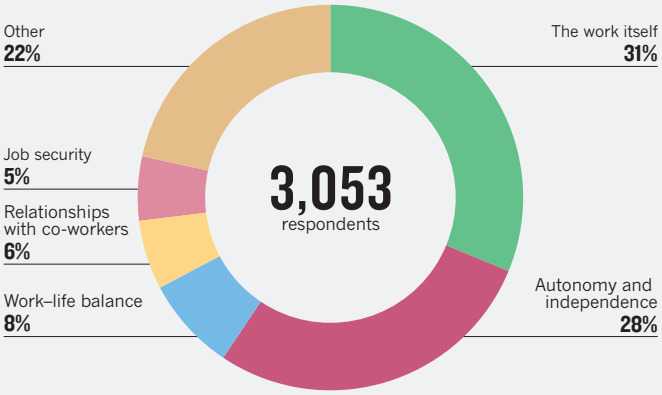
Q What is the biggest challenge for your career progression?



Common responses included incompetent managers and lack of jobs.

*Number of respondents.

Q What single factor most contributes to your satisfaction?



and prospects'), and about 70% in the United States and Japan share that view. But in China and India, optimism abounds: about seven of every ten respondents in each of those countries say that their prospects are better than those of scientists in the past.

Yet second thoughts about science seem to be commonplace across the world. About two in every ten respondents would not recommend research as a career path. That includes Birgit Rommel, a geneticist at the University of Bremen in Germany. She says she feels lucky to have a permanent job in academia, but wouldn't encourage others to follow in her footsteps. Jobs are too scarce, she says, and the system isn't geared to encourage success. "Germany has a stupid rule that you can work for only 12 years in academia without a permanent job, which kicks a lot of people out of the system," she says. "Many people who wanted to do research end up as salespeople at some company."

That 12-year window is mandated by a German law that says researchers can't be on temporary contracts for more than six years before earning a PhD or more than six years afterwards. Acknowledging that many researchers fail to find permanent work within that time, the German Bundestag passed a law in January 2016 requiring universities to provide more training for and support for early-career scientists, especially in the first two years after earning a PhD.

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Access the full survey data at:
go.nature.com/2caxuti

On the survey, Rommel pegs her salary in the $50,000–79,000 range. After more than 20 years in science, she says that she feels undervalued. "It took me about ten years of fighting and change of a boss to climb one step up the salary ladder," she says. "No matter how much the salary is, this is not very satisfactory, even less so in the light of all that political debate about supporting women."

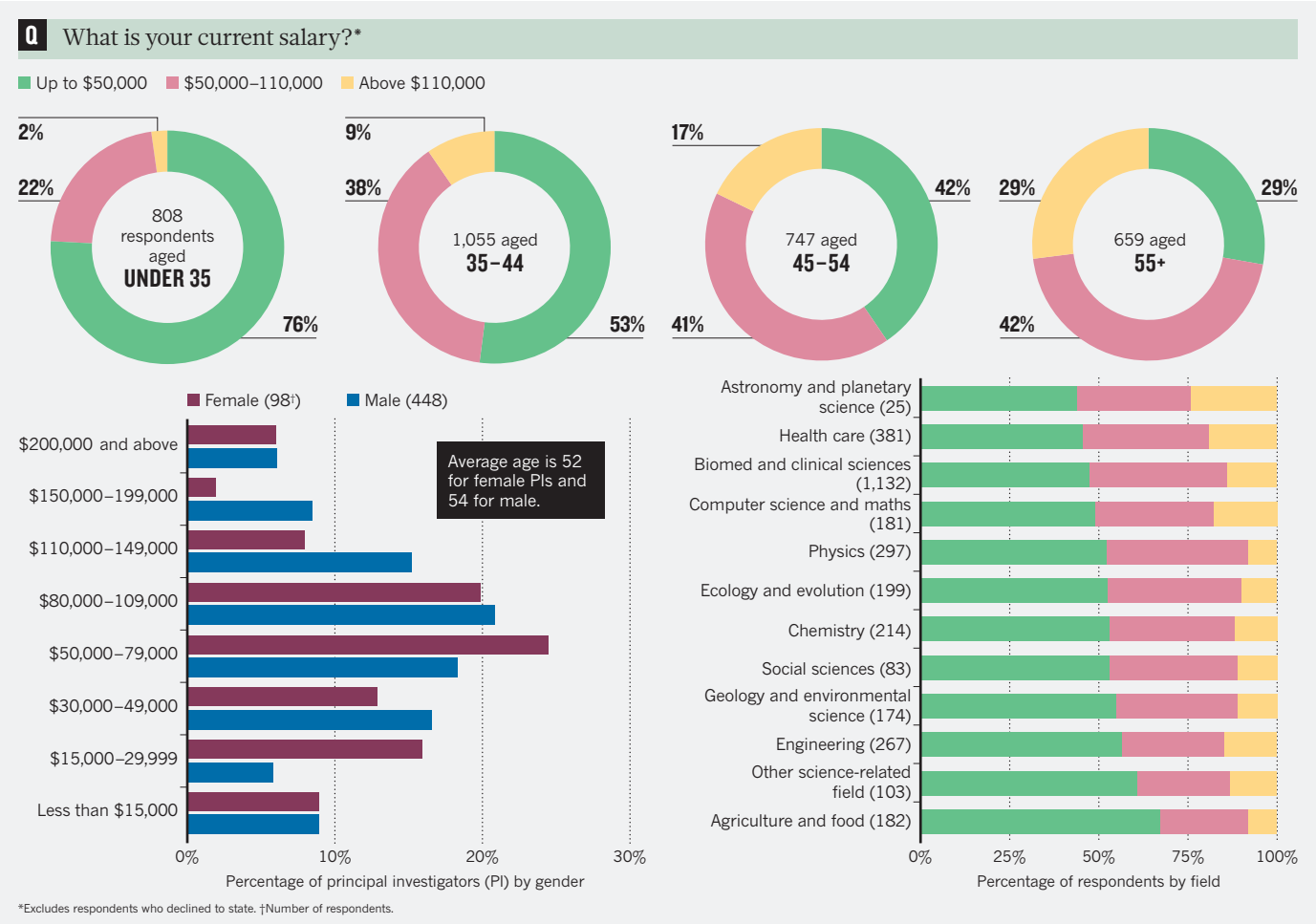
On the other side of the globe, physicist Sergei Slussarenko has come to the same conclusion. He, too, would not recommend a science career to people who ask. He is a postdoc working on quantum optics at Griffith University in Brisbane, Australia, and is satisfied with his salary, especially compared with any wage he could hope to get in his home country of Ukraine. "Science is better supported in Australia than in Europe," he says. "It's a small country with a lot of money. I'm pretty happy with myself." However, he adds, people who work in professional occupations outside science are virtually certain to earn more than he does.

The problem, Slussarenko says, is the lack of job security. He hopes to stay at Griffith, but that can happen only if a grant gets approved. "My future depends on someone else," he says. Over the years, he has seen many people leave science for something more stable and predictable. "They get a job offer for something completely different," he says. "They think about it for two or three minutes and say 'bye-bye' to science."

SALARY SACRIFICES

Despite widespread misgivings, 61% of all respondents say they would recommend a research career. But the commitment comes with a cost, they say. More than half have sacrificed a good salary for the sake of science, some 42% have sacrificed work–life balance, and close to one-third say that their relationships have suffered. The flip side is that more than 80% say that their work is interesting, and 62% feel sense of accomplishment.

Barbara Kramer, a chemist at Truman State University in Kirksville, Missouri, has experienced the give-and-take of science. She would recommend science as a career, and often gives that advice to students in real life. "I love what I do," she says. "I try not to think about the sacrifices I've made." But some of the trade-offs are obvious. "We're in a tiny town in the middle of nowhere, and we aren't compensated particularly well. We've had fights to increase salaries." As the mother of twin four-year-old boys, she



sympathizes with the respondents who say that doing science throws off their work–life balance. "I have no time for family stuff," she says. "I feel guilty about the time that I spend at work."

Scientists of both sexes make sacrifices, but responses to the survey suggest that women are getting less in return. More than twice as many men as women reported earning more than $110,000 a year (15% of men versus 7% of women). Men are over-represented in the most senior, highest-paid positions in science, so it's not surprising that most of the top earners are men. But the trend continues even at the top of the career ladder. Among full professors and principal investigators, 28% of men but only 16% of women reported earning more than $110,000.

The results seem to underscore the ongoing gender gap in science, but they must be interpreted with caution, says Wendy Williams, a human-development researcher at Cornell University in Ithaca, New York. She says that self-reported surveys may not accurately capture gender differences in salary. "Men may overstate their earnings," she says. "And women who feel overworked may under-report their earnings because they feel under-appreciated."

With those caveats in mind, *Nature*'s survey is hardly the first to suggest a gender gap in science salaries. In the 2013 *Survey of Doctorate Recipients* by the US National Science Foundation (NSF), men with full-time jobs in the biological sciences reported a median salary of $100,000, whereas women reported $84,000. In the physical sciences, men reported a median salary of $110,000 and women reported $90,000. That survey is also self-reported, although it is sent out to a representative population rather than being self-selected.

"Men may overstate their earnings. And women who feel overworked may under-report their earnings."

The reasons behind the apparent disparities are unclear. In a 2014 paper, Williams and her colleagues noted that salaries in the sciences are generally negotiable, and women may simply ask for less than men (S. J. Ceci *et al. Psychol. Sci. Public Interest* **15,** 75–141; 2014). Williams also points to a large body of data suggesting that women give up some income in exchange for working hours that leave some time for family. She speculates that a survey of male scientists who happened to be primary caregivers would show that they, too, pay a price.

Amid all the financial hardship and sacrifice, science also has its share of success stories. Donald Phinney, a stem-cell biologist at the Scripps Research Institute in Jupiter, Florida, reported an income at the high end of the scale. He would recommend science as a career because the "rewards outweigh the sacrifices".

Still, he says, he has his own tales of woe and struggle. Relatively speaking, he says, he made less in his trainee days than graduate students and postdocs generally make today. And as a principal investigator, he knows what it's like to fight for funding. "I had a time when things were looking bleak," he says. "We put our heads down and started writing grants. There aren't a lot of dead ends in science. You can always take a new direction."

Like many respondents, Phinney thinks that scientists in general and junior researchers in particular are grossly underpaid, especially given their level of dedication.

But he points out that the chance to practise science is one of the most intellectually rewarding around. "Young scientists have to be very careful not to let optimism wither on the vine because they are frustrated with funding," he says. "You're still doing science, It's discovery, and there's so much to learn." ■

Chris Woolston *is a freelance writer in Billings, Montana.*