

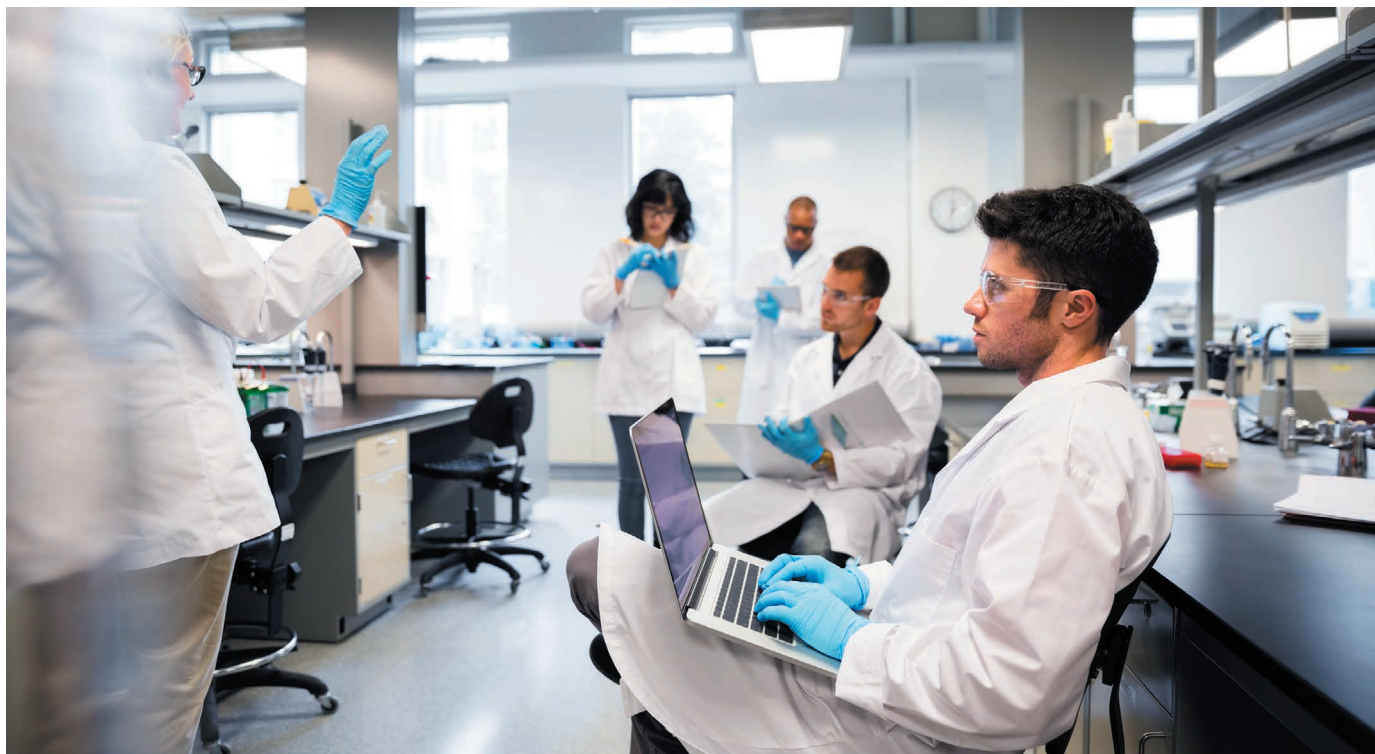
CAREERS

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Group discussions are one aspect of postdoc life that can be very different between large and small labs.

POSTDOCS

Big lab, small lab?

Choosing a lab of the right size is crucial for early-career development.

BY CHRIS WOOLSTON

While looking for a postdoctoral position, Michael Mitchell could have joined any number of small, intimate labs with a couple of colleagues and an ever-present lab leader. Instead, he decided to go big. In 2014, after earning a PhD in biomedical engineering, he accepted an offer from Robert Langer, also a biomedical engineer, at the Massachusetts Institute of Technology (MIT) in Cambridge. Mitchell shares the lab with some 40 other postdocs, a host of graduate students and a rotating cast of visiting researchers. The sheer scale of the enterprise becomes clear every summer, when the lab gathers for an annual party at Langer's beach house. "Bob has to rent three to four buses to get us down to the house," Mitchell says. "He

gets an entire ice-cream truck for dessert."

Of all the factors that potential postdocs must consider when choosing a position, lab size should be near the top of their list: it can shape a junior researcher's career. Scientists say that small labs may be isolating, but that members tend to have great access to the lab leader. Conversely, whereas trainees in larger labs may have less time face-to-face with their mentor, some data suggest that they have more chances to collaborate and publish.

Those considering a postdoc position should think carefully about what would suit them. "It's quite a personal choice," says Kerstin Kinkelin, the training and career-development project manager at the Francis Crick Institute in London. "There's no general rule about which is better or worse, but people need to think about which lab size works for them personally."

A large lab was the right choice for Mitchell. "I knew Bob's lab would have the resources to allow me to pursue the range of research ideas that I'm interested in," he says. "But I was also looking for an excellent mentor. I would have worked for Bob even if I was the only one there."

PUBLISHING PARADOX

The size of a lab may affect the quantity and types of paper a postdoc publishes. Mitchell notes that postdocs on a large team might have a chance to make small contributions to the many projects run by other members of the lab. This could lead to a slew of undesirable middle-author papers. "In a large lab, you want to be very focused on your own research project," Mitchell says. "It's more important to get first-author publications that you can take ownership for. Ultimately you're going to be ►

► judged on your independent work.”

Lab size can also affect the likelihood of a postdoc publishing high-profile papers, says Christopher Liu, a former biochemist who studies strategic management at the University of Toronto in Canada. In an unpublished study of 91 biology labs at MIT, Liu found that larger labs tend to publish more articles in top-tier journals. Specifically, adding one person to an average-sized lab of 11 members increases the impact score of publications by 1.5%. In other words, Liu says, postdocs could increase their chances of getting published in journals such as *Nature*, *Science* or *Cell* by joining a large lab.

The data also suggest an important caveat: adding a postdoc to an average-sized lab reduces the number of publications per person. That means that postdocs who join a large lab could risk slightly decreasing the quantity, although not necessarily the quality, of papers published by lab members — themselves included. “Large labs hit more home runs,” says Liu, “but they also get fewer at-bats.” In a similar vein, a 2015 study of UK biology labs found that publications per person decrease as lab size increases (I. Cook *et al. PeerJ* 3, e989; 2015).

VALUABLE MENTORSHIP

Liu sees an obvious explanation for the relative lack of efficiency in large labs. Every postdoc who decides to join the team automatically dilutes the amount of time that the principal investigator (PI) can spend with each lab member. He adds that even though postdocs tend to be more independent than graduate students, time with a PI is still a valuable commodity.

Even the best postdocs need at least occasional guidance from their lab leader, agrees Ann Miller, a molecular biologist at the University of Michigan in Ann Arbor. “In a smaller lab, you’re going to get more attention from your PI,” she says. “And that PI is going to have a more vested interest in your success.”

Miller runs a lab with just one postdoc and a couple of graduate students. Even with such a small group, she takes mentorship seriously — she won the 2017 Exceptional Mentor of the Year award from the university’s Office of Graduate and Postdoctoral Studies. Because she doesn’t have a large team, she ensures that each new member will fit. She’s particularly selective about postdocs and hired her first in 2013, two years after she started her lab. “In a small lab, each postdoc is chosen very carefully to fit with the science and the lab culture,” she says. “I interviewed several other people but I was looking for just the right person.”

That first postdoc, Tomohito Higashi, accepted a faculty job at the Fukushima Medical University in Japan this year. He says that more time with Miller significantly helped his career. “I had research discussions and casual conversations with her almost every day.”

David Smith, a molecular evolutionary biologist who shares a single postdoc with another



Ann Miller (centre) carefully selects postdocs to ensure that they are a good fit in her small lab.

lab at the University of Western Ontario in London, Canada, would caution any prospective postdoc about the possible downsides of joining a large group. “I know faculty members who did their postdocs in labs that were so large that the PI wouldn’t even write reference letters,” he says. Such labs can sometimes breed a culture in which postdocs battle one another for resources, for the attention of the PI and for authorship on papers. “A lot of people don’t thrive in that environment. It depends how well they can handle the competition, the drive and the tempo.”

SURVIVE AND THRIVE

Many postdocs rise above the challenge of life in a large lab. Mitchell is one example. Early next year, he will move to a new job as an assistant professor at the University of Pennsylvania in Philadelphia. He has also earned recognition for his work, winning a 2016 Burroughs Wellcome Fund Career Award at the Scientific Interface, a US\$500,000 prize given to researchers combining biology and engineering.

Mitchell says that he owes much of his success to the size of the Langer team. “If I read about an exciting technique and want to do it but don’t know how, I can knock on a door down the hall and find someone who does,” he says. “We can have coffee, talk about an idea — and we’re doing an experiment that night in the lab.” He adds that one high-profile paper on which he was first author — about using polymer nanoparticles to enhance the effects of immunotherapeutics on tumour cells (M. J. Mitchell *et al. Nature Commun.* 8, 14179; 2017) — was sparked by a conversation over coffee with a colleague.

Mitchell says that the lab doesn’t breed cut-throat competition, partly because Langer emphasizes teamwork and carefully evaluates applicants to make sure they can fit with the

rest of the lab. “It’s like a faculty interview,” Mitchell says. “The potential postdoc comes in for two days, meets with other scientists and postdocs, and gives an hour-long seminar. Bob gets a lot of feedback from people throughout the lab.” And unlike some leaders of large labs, Langer makes himself available to his students and staff. “Bob is notorious for responding to questions from postdocs or graduate students over e-mail within minutes,” Mitchell says.

Alessandra Breschi, a geneticist and bioinformatician who just completed a postdoc in the large lab of Roderic Guigó Serra at the Centre for Genomic Regulation in Barcelona, Spain, says that working in a lab with some 30 other people forced her to be more independent. “You have to learn to find information on your own,” she says. Breschi spoke to *Nature* shortly before starting her new postdoctoral position in the lab of Michael Snyder at Stanford University in California, where there are already around 40 postdocs. She hopes that her large-lab experience will serve her well.

Likewise, Amelie Baud, a neurobehavioural postdoc at the European Bioinformatics Institute in Hinxton, UK, has found success in the rapidly growing lab of Oliver Stegle. When she first joined the lab in 2013, she shared it with just two other people: a PhD student and a master’s student. “Joining a tiny group is potentially risky,” she says. “I like the idea of an average-sized group that has a critical mass at lab meetings. You can get feedback on presentations and organize journal clubs.”

The Stegle lab now includes eight postdocs, along with several graduate students and visiting scientists. “It’s a large lab even for this area of study,” Baud says. “As the lab grew, I never noticed a change in atmosphere. The lab is dynamic, and there’s a lot going on, but I haven’t heard about competition in the group, and I don’t think it exists.” As the lab

expanded, Baud thrived. In 2014, she won a £250,000 (US\$332,000) four-year Sir Henry Wellcome postdoctoral fellowship.

Liu's analysis of MIT labs suggests that top-tier postdocs tend to excel no matter the lab size. In that sample, postdocs who had won fellowships — a marker for excellence — didn't hamper efficiency when they joined a lab. The data, according to Liu, suggest that outstanding postdocs don't necessarily need to worry about staying productive in a large lab. But for postdocs who aren't superstars, large labs have clear dangers. "If you feel that you would benefit from more attention from the PI, maybe you should consider a smaller lab," he says.

REAL-WORLD TRAINING

In addition to more interaction with the PI, smaller labs might also provide realistic training for a career in academia, Miller says. "Some of my friends who come out of large, highly funded labs were used to having a lot of technical support and money for anything," she says. "When you start your own lab, it can be a bit of a shocker."

Smith has seen similar consequences in Canada. "Students and scientists who have been in big labs their whole careers can have a skewed view of academics," he says. "Reality isn't massive research teams and *Nature* papers and million-dollar grants."

Miller completed her postdoc in a small lab at the University of Wisconsin–Madison. Without a technician or other postdocs, she had to learn every detail about managing a lab, from writing animal-care protocols to mixing reagents. Because of this, she didn't stumble when it was time to start her own lab. "I

was ready to go," she says. She also didn't have to compete with other postdocs to give talks at meetings, review papers

or join key projects. "All of these things are good for your career development and visibility in the field," she says.

Looking ahead, Miller says that she would eventually like to have two or three postdocs and several graduate students — a lab that falls between the extremes of size. "That's kind of reaching my capacity for being fully invested," she says.

Postdocs can find success in labs of any size, says Kinkelin. They need only to decide if they want to stand out in a small group or find their own space in a larger one. Either way can work — especially if postdocs are aware of the potential trade-offs ahead of time. "People have to think about what they want to get out of it." ■

Chris Woolston is a freelance writer in Billings, Montana.

COLUMN

United we stand

Postdoc advocacy is key, say **Antoine de Morrée, Forrest Collman, Catherine Gordon and Megan Klabunde**.

When we were elected in 2011 to head Stanford University's postdoctoral association in California, we had big plans to improve social networks and training for postdocs. But we soon learnt of a more pressing issue. Living costs in the San Francisco Bay area had risen dramatically (the monthly rent for a room in a shared apartment had increased by around 7% over the previous year, to more than US\$1,600) and our postdoc community wanted help — specifically, with commuting expenses, which were so high that they negated any savings in rent for living farther away from campus. Commuting postdocs, earning around \$3,500 a month, were spending up to \$200 each month for train passes or \$30 for monthly campus parking permits, plus as much as \$1 per litre of petrol.

We took this issue to faculty members and administrators. Our work led to a pilot transportation-benefit programme in 2014, followed by a full rollout in 2016 for Stanford's 2,100 postdocs. Our lesson: advocacy works.

GET DATA

Although we quickly learnt that living costs were an issue, it took longer to understand how to address the problem. For instance, it was obvious that train-commuting postdocs would benefit from support, but would postdocs who did not currently commute, or who commuted by car? We formed a committee to investigate, and found that rent consumed more than 60% of the take-home pay for postdocs who lived within 30 minutes of campus. If they lived 15 miles away, their rent dropped by one-third — a huge incentive to commute.

With these data in hand, we met with key administrators responsible for postdoctoral affairs. We examined peer institutions and found that several offered commuter benefits to their postdocs. We also learnt that, as an employer, Stanford could buy discounted yearly train passes for all 1,800 postdocs living off-campus for less than the combined expenditure of only those who commuted by train.

STAND TOGETHER

Our data suggested that implementing commuter benefits was the right thing for Stanford to do. But we would need to persuade the university of this. First, we organized an anonymous survey (49% response rate) and analysed the data with the help of a statistician. We



learnt that one-sixth of postdocs commuted by car but would use the train if it was free. Next, we circulated a petition that invited postdocs to support the introduction of commuter benefits. We distributed this after the university had settled its annual budgets and consulted experts from Stanford's business school to refine our marketing. The petition revealed strong support for our efforts — 70% of postdocs signed.

Our momentum rekindled a movement among Stanford administrators to secure commuter benefits for postdocs and graduate students to help reduce the demand for limited graduate-student housing.

When we presented our findings to the provost advisory committee on postdoctoral affairs, the members unanimously supported our proposal to extend existing staff travel benefits to postdocs. The provost authorized a pilot programme through which the university purchased train passes for all postdocs living off-campus and sold them at cost (\$180 per year). Train-pass sales rose from 30% of eligible postdocs purchasing a pass in 2014 to 50% in mid-2016. When it emerged that the cost of passes was still prohibitive for many postdocs, the provost made the programme free. By the end of 2016, more than 70% of eligible postdocs had collected their train pass and could afford to live farther away from campus.

Postdocs are grateful for the new policy, and we are delighted that university faculty members and administrators were willing to discuss and implement solutions. Our grass-roots advocacy helped us to turn words into action. ■

Antoine de Morrée, Forrest Collman, Catherine Gordon and Megan Klabunde are former postdoctoral researchers at Stanford University in California.