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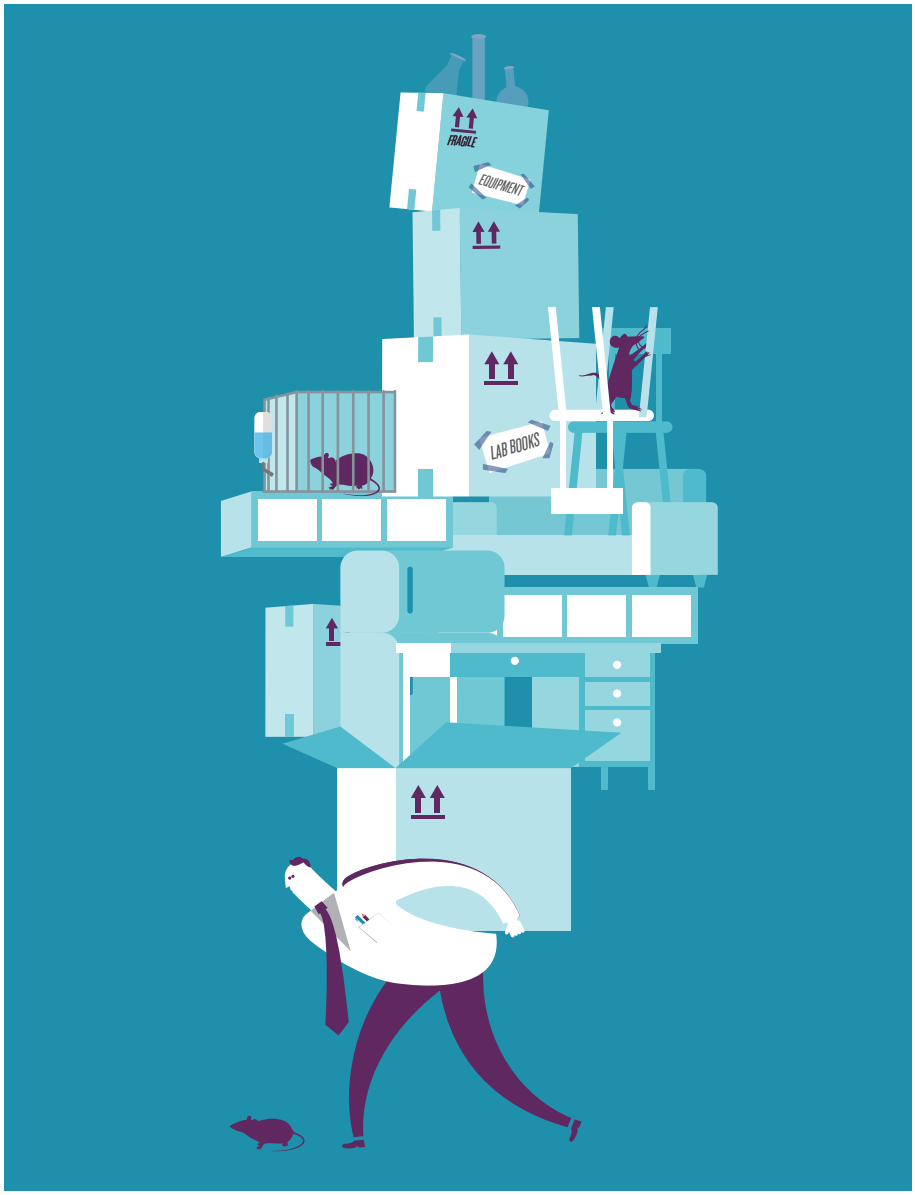

LAB TRANSITIONS

The bumpy road to relocation

Faced with a need to move lab, scientists should consider as early as possible how to effect a smooth transition.

BY PAUL SMAGLIK

Two years into his PhD programme in immunology, Sudarshan Anand learned that his adviser was leaving the Mayo Clinic in Rochester, Minnesota, for Johns Hopkins University in Baltimore, Maryland. So where did that leave Anand? If he stayed at Mayo, he would need to find another mentor and probably another PhD project. But if he followed his adviser to Baltimore, he would have to rebuild his support system. "It is easier to make friends in the first year of grad school," he says. "Joining a new programme in year three, you need to be more proactive and make friends outside of the lab."

Anand followed his instincts — and his mentor — to Maryland. By doing so, he kept a research project and adviser whom he liked, but he was delayed by about a semester owing to the need to retake coursework. He also had to recruit a new thesis committee. "The faculty didn't know me. I just dropped in and said, 'Hey, I would like you to be on my committee.' That was a little tricky." The experience helped Anand to prepare for two subsequent relocations: one to the University of California, San Diego, for a postdoc in 2007, and another in 2013 to take a tenure-track position at Oregon Health & Science University in Portland, where he still works today.

Science is a mobile enterprise, and researchers at any stage of their careers could suddenly face the prospect of packing up and moving to a different institution, nation or even continent. The process is rarely easy, even for those who don't have the headache of moving an entire laboratory. For graduate students, a move may mean repeating coursework. For postdocs, it could mean losing access to painstakingly collected data, animal models or reagents, or sacrificing time to create back-up animal models or cell cultures. Senior scientists might need to recruit and train a new lab team. All those factors have a role in a scientist's decision on whether to move and, if so, how.

For Anand, things worked out well: his team at Mayo was close to publishing a paper when the time came to move, which helped to give him firm scientific footing. "It did wonders for my confidence," Anand says. His remaining time at Johns Hopkins felt more like a postdoc, he says, because he had time to do experiments that weren't essential to his dissertation. He passed his qualifying exams with minimal stress and few regrets about his circuitous ▶

educational path. "You learn a lot about yourself by how you handle curveballs," he says.

But it isn't always such smooth sailing. Researchers who are faced with moving lab — whether to follow a mentor, because of a calamity or to snag a fellowship or research post — need to identify and maintain what they have already established before they consider recreating that situation in a new environment (see 'Five simple steps for a fluid transition').

A CAN OF WORMS

Developmental biologist Phil Newmark left his first postdoc at the University of Barcelona in Spain to continue his work at the Carnegie Institution for Science in Baltimore. Naturally, he took his research collection of planarian flatworms (*Schmidtea mediterranea*) with him. But within two years, his entire worm colony had died off as a result of sudden problems with the in-house water-purification system — right as the team was making some important technical breakthroughs.

These were not just any worms. The Spanish species differs from the North American one in that it reproduces asexually, has a smaller genome and isn't easily procured. "One cannot simply buy these animals from a supplier," Newmark says. "We could have lost years." Panicked, he and his postdoc adviser flew back to Spain to make a pilgrimage to the broken fountain from which he had gathered his first batch. They were relieved to find the same type of planarian still dwelling in the standing water.

The problem recurred a few years later — again as a result of abrupt changes in local water quality — when Newmark moved to the University of Illinois at Urbana–Champaign. This time, however, Newmark had a safety net of back-up worms, which gave him time to develop defined culture conditions, using ultrapure water as the starting point. That was fortuitous, because by then workers had repaired the fountain in Spain. It is no longer a habitat for planaria.

Biomolecular engineer W T. Godbey also had to adapt quickly to unforeseen disaster. In 2005, Hurricane Katrina destroyed his lab, forcing him to move temporarily from Tulane University in New Orleans, Louisiana, to Rice University in Houston, Texas. One of his graduate students, Xiujuan Zhang, decided to follow him — but she had to find him first. This was not an easy task in an age before ubiquitous mobile phones, and Tulane's e-mail server was down because of the flood. She eventually tracked him down through his mother.

> *"The first few weeks were the scariest because no one one knew where anyone was — home, on vacation, dead."*

"The first few weeks were the scariest part, because no one knew where anyone was — home, on vacation, dead," Godbey recalls. Once the flood waters had receded, he visited his lab at Tulane to see how much damage the hurricane had caused. His plasmid samples had been wrapped in garbage bags, boxed and shoved into a hot, mouldy freezer in a sweltering laboratory — yet fortunately, none had seriously degraded. Back at Rice, he and Zhang grew the DNA segments into a larger library, then sequenced the plasmids to ensure that none had been compromised. None had, but Godbey knows now that back-up supplies — and disaster planning — are essential.

COUNTRY CONUNDRUMS

Even the most careful plans can be thrown out of whack when complications arise, especially for senior scientists. Molecular biologist Josh Brickman began a relocation in 2011 from the University of Edinburgh, UK, to the University of Copenhagen, where he had accepted a group-leader post at the then-newly created Danish Stem Cell Center. He had to transport multiple types of animal, recreate several mouse lines, resettle half-a-dozen lab staff and, for a time, supervise labs in two countries to fulfil dual grant commitments. "It was an experience," he says.

Different animal-housing conventions at the two facilities intensified the stress inherent in moving more than 100 frogs and 6 lines of transgenic mice. The Edinburgh facility had housed the mice in open-topped cages, which risked exposing them to pathogens. The animal facility in Copenhagen, by contrast, had closed cages that were considered pathogen-free — which meant that the relocated mice could not be placed directly into them. Instead, the animals were mated, and their embryos were removed and transferred to surrogate mothers that had been raised in the Copenhagen pathogen-free lab. "It took much longer than we had expected," Brickman says. "And we had problems doing mouse experiments during the process."

Transporting the embryonic-stem-cell lines — which according to Brickman's estimates

SMOOTH MOVES

Five simple steps for a fluid transition

There is no one-size-fits-all approach to moving lab, but those who have successfully navigated the ordeal can offer useful advice.

- **Create back-up plans for resources.** Phil Newmark's planaria worms survived a move from Barcelona, Spain, to Baltimore, Maryland — until a change in the lab's water-purification system killed the lot. Now a developmental biologist at the University of Illinois at Urbana–Champaign, Newmark confirmed for himself that when moving it is crucial to consider resources — in his case, both his live specimens and water quality at his new site. "After our die-off, I made a big effort to make multiple clonal lines and establish long-term colonies," he says.
- **Make sure that your new lab is ready.** Construction delays at biomolecular engineer Josh Brickman's new lab at the University of Copenhagen meant that his equipment — including animal models — had to be housed in temporary facilities. That created an extra step in an already complicated move from the University of Edinburgh, UK. "If I were faced with doing it again, I would certainly move only once I knew the facility was finished," says Brickman.
- **Keep lab staff in the loop**. Everyone should be informed as early as possible that you are considering a move, no matter your career stage. Talking openly about plans and considering how they might affect lab members and the lab's work is important for a smooth transition, whether or not the group is going, too. "They may have situations you're not aware of," says W T. Godbey, an engineer at Tulane University in New Orleans, Louisiana. He had to move his lab temporarily to Rice University in Houston, Texas, after Hurricane Katrina in 2005.
- **Don't dismiss your gut feelings**. Sudarshan Anand, a biologist at the Oregon Health & Science University in Portland, followed his adviser from the Mayo Clinic in Rochester, Minnesota, to Johns Hopkins University in Baltimore. Although he acknowledges that some people rely on rational processes, such as cost–benefit analysis, to decide whether to relocate, that did not work for him. "Sometimes it's better to go with your instincts," Anand says. He also recommends that early-career researchers avoid over-emphasising professional gains when mulling over a move. "You need to evaluate your personal situation," he says. In his latest move, he had to consider his wife's employment prospects as well.
- **Line up a point person**. Brickman says that having a local coordinator on board to handle logistical details is invaluable. "We had an amazing administrator who was on the phone with my students and postdocs when their apartments fell through, or when we had any problems with animals," he says. "That saved our bacon many times." P.S.

represented more than 100 person-years of work — also proved cumbersome. First, he had to ensure that every line was duplicated in Edinburgh. Then he and his lab members arranged for the cell lines and reagents to be stored properly in liquid nitrogen and packed carefully into supercooled containers. The group loaded a truck with the cell lines and reagents and then flew to Copenhagen to meet it and ensure that the biological material was still stable.

Complicating matters further, the MRC Centre for Regenerative Medicine at the University of Edinburgh, where Brickman's lab was based, was moving to a new building at the time that the stem-cell centre in Copenhagen was under construction. When he learned that the opening in Copenhagen would be delayed, Brickman felt it best to move the bulk of his lab to temporary facilities in Denmark rather than to the new building in Scotland — even though he would later have to transfer again to the permanent lab.

Managing lab members in two sites also proved challenging. Brickman had landed a collaborative UK grant before he left, so he hired a new postdoc to work at his Edinburgh lab and continued to manage three lab members who remained there. He could not directly supervise his new recruits much of the time, and so missed out on day-to-day knowledge of how his Edinburgh lab functioned; he commuted between Scotland and Denmark weekly for three months but worked mainly in Denmark over the next two years. The protracted move, he says, may have delayed the publication of papers — an unfortunate result for his junior co-authors, although he says that the papers were eventually accepted into high-impact journals.

Despite all the snags, much went right, Brickman says. He credits administrative support in both Edinburgh and Copenhagen for the smooth relocation of his lab group. "All of my people were able to move both work and personal lives," he says. "None of them ended up homeless, despite moving to a new country where they didn't speak the language and in a city where it is almost impossible to find rental apartments." In the end, clearing the many logistical hurdles proved worthwhile, he says, because the new stem-cell centre's strengths outweigh the hassles that he underwent to join it.

There is no way around it — moving lab, whether within a university or to another country, is gruelling, stressful and likely to include disaster or catastrophe. Ultimately, however, no one can plan for everything, and adaptability is perhaps the most useful resource. "I am much more unflappable now," says Godbey. "The more extreme the situation, the more flexible you need to be." ■

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TURNING POINT
Daniel Carder

Daniel Carder, director of the Center for Alternative Fuels, Engines and Emissions at West Virginia University (WVU) in Morgantown, was on a team whose work led to Volkswagen's admission that some of its diesel vehicles contained software able to sidestep emissions tests.

WEST VIRGINIA UNIV.

What does the centre do?
We have done vehicle-emissions testing and technology development for 25 years. We designed the first mobile diesel-fuel measurement systems, which use detectable carbon emissions to determine consumption. In addition to fundamental research, we produce open data on how new automotive technologies, such as clean diesel, prove in practice. We also try to make them more efficient.

Can you describe your research?
I have bachelor's and master's degrees in mechanical engineering from WVU, and will complete my PhD this year. I am involved with the measurement and control of emission particulates related to diesel-fuel usage. My thesis work led to the adoption of US federal standards for particulate emissions in underground mine extraction. That technology controls highway and off-highway emissions.

Did you expect to find any problems?
Quite the contrary. In 2013, we received US$69,000 from the International Council on Clean Transportation to test the diesel emissions of two Volkswagen models. We expected to show that clean diesel fuel was doing a good job. We had seen successful demonstrations of the same type of technology in the bus and tractor markets and wanted to translate them for passenger-vehicle manufacturers.

What were your first experimental results?
We believed that these systems would reduce emissions from 1,000 parts per million of particulates to 10–20 p.p.m. When we saw initial data for the Volkswagen vehicles, the first thing we did was scrutinize our work. Did we make a mistake with calibration? We double- and triple-checked our data and procedures. After several quality-control exercises, we were assured that our findings were valid. But it wasn't in our contract to find out why.

Were the data made public?
Yes. Marc Besch, also a graduate student, presented the discrepancies in 2014 at a workshop in San Diego, California, attended by people from the US Environmental Protection Agency, petroleum companies and engine manufacturers. Before we left the conference, we were contacted by Volkswagen asking about our techniques and data-collection methods. It seemed like a normal fact-finding mission.

When did you realize that this was a big story?
I was in the lab on 18 September when the news broke. My hands were filthy from working on diesel engines. My phone was ringing continuously, but I didn't recognize the numbers — reporters were calling. We were blindsided.

Can you describe the media attention?
Constant. I am the poster boy for why everyone should have media training. It's been trial by fire.

How has the discovery affected your work?
You never know when routine research could have a major impact. And it has provided a good way to talk to our students about the quality and custody of data. It is satisfying and rewarding to be recognized for work behind the scenes.

Do you have any concerns about the fallout?
We are the data collectors who will develop and refine new technologies. One concern is the perception that our objectivity could be compromised. We have strived to get industry to work with academia on emissions-control technology and policy issues because we believe that researchers cannot sit in ivory towers.

What should the public know about your work?
As support for earmark funding has waned for centres such as ours with a mission that benefits the nation, we have shown that they have merit. It's difficult to keep ventures like this afloat without congressional support. ■

INTERVIEW BY VIRGINIA GEWIN

This interview has been edited for length and clarity.