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Leaving the lab: career development for developmental biologists

Let's face it: not all PhD students and postdocs will become lab heads. Every few years, the National Science Foundation surveys doctorate recipients in the USA about their career progression, and their latest published data (collected in 2006) show that only about one quarter of biomedical science PhDs held tenured or tenure-track positions (see Box 1). If graduate and postdoctoral training are merely apprenticeships for tenure-track jobs, these numbers suggest that there are too many people being trained for the number of research jobs that are available. But if trainee positions are more than a stepping stone to running a research lab, what value does a PhD in the life sciences have outside of the lab, and what types of job do the remaining three quarters of PhD graduates go on to have?

In July 2010, I asked the following questions on the Node: 'Should there be fewer postdoc and PhD positions? Or different kinds of [research] trainee positions, where some include training for scientific careers outside of the lab?'

The ensuing discussion suggested that the PhD degree and the postdoc system are not in need of reform, but that attitudes towards these positions should change. Greg Dressler, a professor at the University of Michigan, wrote in a comment on the Node post, 'I do think we need to get over the idea that nothing short of an academic career fulfills the ideal goal of our students and post-docs. Most of the folks I went to graduate school with are not in academia anymore, yet they have meaningful and successful careers.' In the same discussion, James Briscoe, a group leader at the MRC National Institute for Medical Research suggested that we need 'the acknowledgment and encouragement of a diversity of career routes and development paths'.

These are good suggestions. There are a number of jobs outside of research or academia that are suitable for PhD graduates. A research job in industry, for example, connects seamlessly to research experience gained during PhD and postdoctoral training. But not every PhD graduate wants to continue in a research career, academic or otherwise. What kind of non-research jobs are available and how do PhD graduates get these jobs? And how is scientific training useful to people in a non-research career? To answer these questions, I invited a number of people to write a post on the Node to explain how they moved away from a career in research after their PhD. These posts can be found on the Node (http://thenode.biologists.com/tag/altcareers) and are highlighted in Box 2, but it's worth discussing here the trends they raise collectively, and distilling some of the advice from those people who have left the life of the lab bench behind them.

'We need to get over the idea that nothing short of an academic career fulfills the ideal goal of our students and post-docs'

Why do some people search for a career outside of academic research? Although the competitive nature of tenure-track jobs can be a discouraging factor, many people who shared their stories on the Node did not think that carrying out their own research was the best way to express their broad interest in science. For Vivian Siegel, this realization came at the end of her postdoctoral training, when she was reluctant to accept a faculty position. Vivian visited a career counsellor, who asked her what she would do if money and people's opinions were not an issue. 'What surprised me was that I knew the answer to that question: I'd be a student for the rest of my life.' In search of a career to fulfil that wish, Vivian found an editorial position at *Cell*, and spent the next 12 years in publishing. She became chief editor for *Cell* and *Molecular Cell*, launched *Developmental Cell* and joined *PLoS* as its founding Executive Director, before eventually making her way back to academia as Director of the Center for Science Communication at Vanderbilt University. She still spends most of her time as an editor, and is Editor in Chief of *Disease Models & Mechanisms*. 'Being an editor is really very much like being a student,' Vivian wrote on the Node, 'you encounter lots of interesting and new science every day in a broad range of fields.'

Sarah Gibb also found a way to stay in touch with science without doing research. 'I liked finding out how things worked, not the politics that goes with establishing a career in academia.' While completing a PhD and postdoc at the University of Dundee, Sarah put a lot of effort into developing her skills outside of the lab. 'I started organising scientific meetings [and] did plenty of generic skills courses in time management, communication skills, presentation skills, the list goes on and on.' She also did freelance writing, public engagement work and a science policy internship – all during and right after her PhD. Her effort paid off, and Sarah now works as Science and Interpretation Officer at the Glasgow Science Centre. In this job, she develops exhibitions for the science centre, and talks to researchers to find ways

Box 1. Links to relevant information

- NSF Scientists and Engineers Statistical Data System (SESTAT), containing data of their Survey of Doctorate Recipients (http://www.nsf.gov/statistics/sestat/)
- FASEB's analysis of NSF's Survey of Doctorate Recipients (http://www.faseb.org/Policy-and-Government-Affairs/Data-Compilations/Education-and-Employment-of-Scientists.aspx)
- Discussion about trainee numbers on the Node (http://thenode.biologists.com/too-many-postdocs/)
- All non-research career stories on the Node (http://thenode.biologists.com/tag/altcareers)

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to interpret their work for the public. Although the position didn't explicitly require a PhD degree, Sarah might not have had her job without it. 'A big part of their decision to offer me the position was based on the fact that I had done a PhD. I had experience of doing research and lots of reading…They also felt I had the confidence and experience to go and speak to top academics in all manner of fields.'

What kind of non-research jobs are available and how do PhD graduates get these jobs?

Other employers may prefer PhD graduates, too: Michael Belliveau completed his degree for the sole purpose of continuing in a law career. 'From discussions with patent attorneys, I learned that completion of a PhD was nearly an essential requirement, so I delayed law school and instead pursued my doctorate degree.' After his PhD, Michael found a job as Technology Specialist at patent law firm Clark & Elbing. In this position, he used his scientific training to evaluate patents, while the law firm assisted with his education towards a law degree. Michael is now a partner in the firm: 'Now, I rely more upon knowledge of the law than my knowledge of science, although the latter certainly remains important. The one aspect of my scientific training that has continuously served me well is the ability to critically analyze a collection of facts. The ability to do so is critical to the success of scientists and patent attorneys alike.'

As Michael Belliveau's story shows, some career changes require additional degrees. Michael Szego became interested in clinical ethics after attending a career seminar during his PhD degree in molecular genetics, but knew he needed to undertake further education to be able to find a job as an ethicist. 'To address my knowledge gap, I enrolled in a Bioethics Masters program at the University of Toronto. I was fortunate enough to get a scholarship and worked hard over the 2 year degree to immerse myself into the field of bioethics.' He is now a fellow in clinical and organization ethics at the University of Toronto Joint Centre for Bioethics, where he is learning ethics 'on the job' through rotations at ethics programs of healthcare institutions.

Michael Szego started out his graduate career with the intention of becoming a research scientist. 'While I enjoyed the scientific process, I had a nagging feeling that a scientific career was not the perfect fit for me. Accordingly, I tried to keep an open mind and got involved in extracurricular activities.' For Michael, one of his extracurricular activities – a visit to a career seminar – introduced him to his current career in ethics. For others, the extracurricular work may one day turn into a career of its own. This was the case for Sobia Hamid, who left research after her PhD in genetics, and founded a company based on a tool to visualize the monetary impact of charitable donations. Although it's not at all related to her graduate research, Sobia's career has relied on skills she gained and opportunities she took during her PhD. Like Michael Szego and Sarah Gibb, Sobia explored extracurricular activities and joined the Cambridge University Entrepreneurs Society (CUE). 'At CUE, I learnt about what was required to develop successful businesses, and met fellow students interested in entrepreneurship. I also worked for a while for a biotech, identifying collaborative opportunities with research labs around the world.'

Box 2. Non-research career posts on the Node

- How fate determined my career as a science journalist, by Claire Ainsworth (http://thenode.biologists.com/how-fate-determined-my-career-as-a-science-journalist/)
- My transition to patent law, by Michael Belliveau (http://thenode.biologists.com/my-transition-to-patent-law/)
- From the bench to the science centre, by Sarah Gibb (http://thenode.biologists.com/from-the-bench-to-the-science-centre/)
- Keeping an open mind: a scientist's quest for positive change, by Sobia Hamid (http://thenode.biologists.com/keeping-an-open-mind/)
- Educational game designer: where biology, games and technology meet, by Nicole Husain (http://thenode.biologists.com/educational-game-designer/)
- A career as editor – Vivian Siegel (http://thenode.biologists.com/a-career-as-editor/)
- My journey from bench scientist to clinical ethicist, by Michael Szego (http://thenode.biologists.com/my-journey-from-bench-scientist-to-clinical-ethicist/)
- A career in publishing: a developing story, by Jane Alfred (http://thenode.biologists.com/a-career-in-publishing-a-developing-story/)
- Keep up and blog on – my route to the Node, by Eva Amsen (http://thenode.biologists.com/keep-up-and-blog-on/)

'One aspect of my scientific training that has continuously served me well is the ability to critically analyze a collection of facts'

Even if you have your heart set on a research career, it might be a good idea to take on some additional activities away from the bench. You never know how the experience might one day turn out to have been more than just a hobby – just ask Nicole Husain. Nicole joined a science outreach organisation during her PhD and enjoyed doing school visits and trying to explain her research in *Drosophila* eye development to five-year-olds. 'It never occurred to me that there might be a way to combine my interest in communicating science with my academic background – mostly because I never looked beyond the path of becoming a PI.' Near the end of her degree, Nicole lost her motivation for research, but thanks to her experience in outreach she found a job at Spongelab Interactive – a company that develops educational online games about science. 'They were looking for a graduate student to help write grants and contribute to their games about biology. It sounded too perfect and strange to be true. It was the first CV I ever sent out that included my scholarships and publications as well as my video gaming experience.' Nicole's job is a perfect combination of her hobbies, outreach experience and scientific education. 'A PhD in developmental and cell biology really is essential in understanding the science I'm trying to communicate and the research, analytical and problem-solving skills from grad school are essential [for] working in an industry where you're leading the way with new research and technology innovations.'

Like Nicole, science journalist Claire Ainsworth also originally intended to pursue a research career. During her PhD, in which she studied fate determination of cells in the fly renal system, she took a science communication course run by the Wellcome Trust for students on their Prize Fellowships. 'One of the course tutors, Peter Evans, a science radio journalist for BBC Radio 4, encouraged me to try my hand at student radio. Before long, I was a writer

and presenter for *The Frontier*, a science magazine show on Oxygen 107.9FM, the UK's first student station with a full FM radio licence.' This turned out to be a career-defining event. 'I have no idea how many listeners *The Frontier* team had, but producing a live half-hour show every week, whilst also studying for our degrees, was both hugely stressful and immensely fun. It planted the idea that this might be something I could do in future.' Claire landed an internship at *New Scientist*, and has worked as editor and reporter both there and at *Nature* before starting a freelance writing career and running her own science communication skills company, SciConnect. 'There are days of doubt, of course. Every now and then I fish a sozzled fruit fly out of my Rioja, dry its bright wings and feel a pang of nostalgia for the lab...At times like these I remind myself that science is not just about making discoveries, but also holding science to account and making sure those discoveries reach beyond the lab.'

As an academic researcher, you are in the minority – most of your trainees will follow another path

Advice for graduate students and postdocs

If you are a PhD student or postdoc who is considering a non-research career, have a look at the posts on the Node for advice and inspiration. You'll notice some trends in the tips they offer.

- Keep an open mind – you may start your PhD with the intention of becoming an academic scientist, but that may change.
- Do more than just research and explore extracurricular activities, such as journal clubs, student clubs and student government, outreach organisations, career seminars, skills courses, writing contests, or teaching.
- Talk to as many people as possible about your career plans, people who have the kind of jobs you might be interested in, career counsellors and also your supervisor.
- Once you know where your interests lie, focus on expanding your skill set – either through practice, courses, available internships or an additional degree if necessary.

A final note to supervisors

If you are mentoring graduate students and postdocs, keep in mind that not all of them will end up with a career like yours. As an academic researcher, you are in the minority – most of your trainees will follow another path. You may not want them to move on from the research they are doing now, but if they let you know they have other career plans, please support their decision. They might become editors or patent attorneys, hone their talents in writing or business, or inspire young people through science outreach and educaton, but the time they spend in your lab is vital to their future.