

Great Expectations

Lessons at the Interface of Academia and Industry

Our series continues in which younger scientists provide their views on professional and personal development, and the world at large. Samantha Lien discusses academia and biotechnology, and tells of her overseas experiences.

I am currently working as a post-doc at Genentech Inc., based in South San Francisco. My coming here was the result of a series of happy incidents following my PhD at the Department of Biochemistry at the University of Adelaide, in collaboration with the Cooperative Research Centre (CRC) for Tissue Growth and Repair, and a post-doc at the Department of Biochemistry in Uppsala, Sweden. As with my PhD, a post-doc at Genentech has meant that I have the chance to be a part of the biotechnological scene, yet also do good basic research. I feel like I've stumbled on the best of both worlds. Post-docs at Genentech are protected from that bone of contention - publish versus patent issues - by working on projects which are not directly related to company products. Indeed, the company aims to be comparable to an academic institution in terms of publications, so researchers are actively encouraged to publish in high impact journals. This is a good investment for the discovery of potential therapeutics, and shows that when people talk about industrial R&D, there really can be more than just a 'D'.

My feeling as I walk down the corridors is that I am in a very exciting, directed, but very nearly academic environment. Nearly every day there are seminars and journal clubs given by the post-docs, staff scientists and visiting speakers and the quality is universally high. In contrast to many academic institutions however, the resources and services available are stunning (to me). Along with the resources however, comes a much greater expectation that you will produce results - quickly. It's a lot more high-pressure than my experiences of Swedish or Australian institutions, but the pressure is made reasonable by the fact that it's now so simple just to do science. Finally, it's gratifying that post-docs at Genentech are regarded as regular employees and

therefore receive most of the benefits (such as superannuation, a health care plan and membership in the stock purchase plan) that an independent researcher would receive. This is a stark contrast to my experiences as an academic post-doc, which I will describe later.

But to begin at the beginning, while studying for my PhD under the supervision of Professor John Wallace and Mr Geoff Francis, I had the opportunity to work at the interface of academia and industry. John's group was a member of the Cooperative Research Centre for Tissue Growth and Repair, while Geoff was the Biotechnology Reagents Manager of GroPep Ltd, the biotechnology company that became the commercial arm of the CRC. Our CRC was interested in the use of insulin-like growth factors and related molecules as potential therapeutics. My task was to investigate the substrate specificity of α -lytic protease (a serine protease) and a library of its mutants. The goal was to see whether the use of one of these proteases and its preferred substrate could improve the production process and increase the final yields of our growth factors. We tackled the problem of determining substrate specificity by using substrate phage display (see Footnote below), a technique which was developed at Genentech. My project, while academic in nature, had direct applications in the production processes employed by GroPep. This kind of training was perfect for me, since I've always been motivated by the idea of using science to benefit humanity and I love the pressures and practicality of biotechnological research. Moreover, working in the university towards goals that would benefit GroPep allowed me to see the inner workings of a biotechnology company while also giving me first-hand experience of the value of academic research.

The CRC gave me good training in other respects too. Unlike other PhD students



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who belonged solely to the academic environment, we CRC students were expected to give three-monthly update presentations, as well as an annual major seminar (which was assessed) and annual poster presentations. Add to this John's lab group meetings and an annual Biochemistry department research update, and I was getting a very strong grounding in giving speeches. Other advantages of being a student in our CRC were the opportunities to take part in various short training sessions (such as patent writing, or how to give a good presentation) and the chance to take a 3 month sabbatical from our PhD projects in order to work as a GroPep employee.

During my sabbatical (which I undertook in Geoff's laboratory) I demonstrated that an α -lytic protease cleavage system was 600-fold more efficient than GroPep's previous system, which coincidentally had been developed at Genentech. Our new system had made us both more independent and more commercially competitive. Unfortunately for me, GroPep decided not to pursue a patent but here was still some delay before I received approval to publish this work. The publish versus patent issue is perhaps the biggest stumbling block of pursuing an industrial project as a student. I nevertheless believe that the chance to work in cooperation with industry is a great one and that the advantages of experiencing both academia and industry outweigh the disadvantages of a possible short-term embargo.

I was pretty sure that I wanted to pursue a career in biotechnology, but the biotech community in Australia didn't seem established enough for me to commit to a company immediately after my completing

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my doctorate. Besides, as many PhD students would attest, there's a lot of pressure to gain some overseas experience in order to improve one's professional status in Australia. I also thought that since I had never tried a totally academic position, that perhaps I should experience it before making any final decisions about my future career. Finally, I was curious about life in different countries – is Australia truly the nicest place in the world to live? (Yes, I still think so.) What would it be like to live in Europe, with other countries just a hop, skip and a jump away? As a side benefit to answering these questions, I hoped that during the time I spent overseas I would see our Australian companies grow and begin to develop more of our home-grown ideas instead of letting them be taken overseas.

Happily, during my PhD I had been offered a post-doctoral position in the laboratory of Professor Bengt Mannervik in the Department of Biochemistry at Uppsala University, in Sweden. This was the direct result of a talk that I gave at an ASBMB conference (thank you ASBMB!). The chances that the ASBMB give to students to talk at their conferences are commendable, since they not only provide good exposure (and hopefully feedback), but also because they provide another good training-ground for giving presentations. It seems to me that the ability to present science well is becoming more and more important. During my travels I have been saddened to notice the lack of international recognition of Australian universities and researchers. I've spoken with people who are considering moving abroad to study or to work, but who would not consider coming to Australia, partially due to the distances involved, but also due to the fact that they don't recognise the names of many of our scientists and universities. To increase our international exposure it's not only important to submit high-quality work to high impact journals, but to attend international conferences and give high-quality presentations.

Time abroad

My post-doc in Sweden gave me the opportunity to try out a fully academic lifestyle and to learn from one of the fathers of glutathione transferase research. I can't begin to express what a great educational



Local traffic near the Ice Hotel in Sweden

experience this was, and not just in a scientific sense. During the year or so that I was in Sweden I learnt a lot about the glutathione transferase field, which was totally new for me, and also expanded my knowledge of enzyme kinetics. On a more personal note, I gained a lot from the experience of heading off alone to a different country, learning a new language by the sink-or-swim method and the daily struggles of opening a bank account, finding housing and learning the social etiquette of a new culture. It gave me a much greater appreciation of how good the quality of life is in Australia and how many everyday things we can take for granted. Having everyone you know and all your familiar surrounds located half the globe away definitely forces you to grow and develop in ways that you wouldn't do if you stayed at home. For those who haven't done it, I can highly recommend the experience.

Besides, if I hadn't done all these things, I would never have had the chance to experience some of the wonders of Sweden – such as Icelandic pony-riding through snowstorms, being transfixed by the beauty of the Northern Lights or staying overnight at the Ice Hotel. As its name suggests, this hotel is built entirely from snow and ice each winter, creating a giant (but beautiful) igloo. The insulation provided by the packed snow walls is remarkable, so that while temperatures can reach a chilly -40°C outside, it's a constant warm and balmy -5°C inside. Travelling to the hotel from Kiruna airport is like stepping into a winter

wonderland, complete with huskies, sleds pulled by reindeer and glittering ice sculptures scattered through and around the hotel. Luckily for those needing revival from the subzero temperatures (definitely me), the hotel is also famous for its well-stocked ice bar, where even the glasses are carved out of ice. The house speciality is Scotch *in the rocks*.

My time in Sweden was also valuable because it gave me more of an appreciation of the precariousness of the academic scientific career structure – not just in Australia but in the rest of the world. As a post-doc in Sweden I fell into a gaping black hole— I was not accorded with student status, so could not be considered for university-assisted housing or other aid, yet I was also not recognised as an employee, so was not eligible for government-assisted housing, medical benefits or the like. A seemingly straightforward task such as finding a place where I could afford to live was a concern which took many months



World-class Halloween costumes: scientists in San Francisco relax at least one night each year.

to be resolved. I found myself disillusioned by the low pay which was justified by the fact that I was theoretically still being trained, but which was not balanced by the availability of the support networks normally available to students. With these kinds of disincentives, and the increasing probability of being trapped in the post-

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doctoral cycle, it seems unlikely to me that academic research will continue attracting the best and the brightest.

My decision to leave Sweden came with the offer of another post-doctoral position, this time in the laboratory of Dr Henry Lowman, at Genentech. Coincidentally, this opportunity also arose from my PhD work. When John, Geoff and I were considering possible thesis examiners, we came up with Henry's name. Henry seemed like a good choice as an examiner since my work had in many cases paralleled work done at Genentech by him or his colleagues. I remember, however, being uncertain of how my work would stand up to Henry's scrutiny. Thankfully Geoff had some good advice when I expressed this concern. Basically, he told me that if you want to be a world-class scientist, you need to be measured by world-class standards. Definitely words to remember, even if they were a little nerve-wracking at the time.

I'm really glad now that I took Geoff's advice. I'm also glad that I took the plunge and applied to give a talk at the ASBMB conference where I met Bengt. Trying to reach world-class standards as a scientist has opened a lot of doors for me. It's given me the opportunity to travel, to meet interesting people and to learn and grow, both as a scientist and as a person. My goal now is to continue reaching for those world-class standards, in the hope that the experiences that come from it will enable me to bring back some exciting new ideas to the Australian scientific community.

Prospects for the future

I still feel that I would like to return to Australia, since I haven't yet found a place with a lifestyle as enjoyable, but I am daunted by the poor prospects for scientists in our society. It seems to me that one of the keys to turning those prospects around is by educating the general public more on the role of scientists and the fact that science can be used to change so many peoples' lives for the better. When I was in Sweden, I was impressed by the example put forward by one of the PhD students in the lab (Ann Gustafsson), who applied for a government grant to visit schools and teach children about science. She and a friend travelled to different regions of Sweden and performed simple yet exciting

scientific experiments to show that science can be fun and interesting.

I would really like to see more opportunities, or more scientists take the opportunity, to take part in discussions about science, in language and forums that are accessible to the general public. Why is it that scientists are still portrayed in the film and TV industries as antisocial beings who are up to no good by messing with nature and creating monsters? The exception to this seems to be forensic pathologists who are clearly on the side of law and order, but in general they do not perform innovative research. I wish that more members of the general public could see the biological sciences in the way that I do – as being a great force for improving people's lives, as being very human and as being very much *for* the people. This cannot happen without the demystification of science. Due to distance constraints, I haven't had the opportunity to participate in the ScienceNOW! program which aims to bring scientists together with the media and the public to enhance the profile of Australian science, but I applaud the concept. I hope that the message will soon reach enough people that they will start questioning our government's policies of consistently reducing funding for the foundation of any great scientific breakthrough – basic research.

Addendum:

After I finished writing this article I read that the Australian Labor Party had unveiled their plan to establish Australia as the Knowledge Nation. I'm glad to see this shift in policy and hope that in the future Australia will be the place that more scientists call home.

Footnote:

This technique uses a library of linker peptides displayed between a bait molecule and one of the coat proteins on filamentous phage. Phage are captured on a solid phase by a ligand (or antibody) to the bait molecule and after protease treatment, phage bearing protease-susceptible linker peptide sequences are released into the supernatant. These protease-susceptible phage can be propagated and used in further rounds of selection in order to isolate labile substrate sequences.

