

SCAR Fellowship Report 2006-2007

Victoria Metcalf

University of Canterbury, Christchurch, New Zealand

Institution visited

Northeastern University, Boston, MA, USA

Host scientist: Professor Bill Detrich

Dates

Apr-Jun 2007*

*Due to the fact I also received additional monies from two other Awards the actual dates I was overseas for was from Apr-Oct 2007.

Work towards scientific objectives of the fellowship: “Unique fat transport in Antarctic fish -evidence for cold adaptation, as a contribution to SCAR’s EBA programme”

In April 2007 I travelled to Boston using the monies awarded by the SCAR Fellowship to work in the laboratory of Prof. Bill Detrich for three months. My research aim there was to broaden the scope of my existing project on linkages between fat transport and cold adaptation in Antarctic notothenioid fish. Specifically, I aimed to create genetic resources in the form of a complementary DNA (cDNA) library from liver and a genomic DNA (gDNA) library from black cod. The goal in creation of these libraries would be to eventually look for albumin (fat transporter) expression and the albumin gene sequence in this non-Antarctic notothenioid species and make comparisons with Antarctic notothenioid species. In addition, I also wished to utilise notothenioid BAC libraries resident in Bill Detrich’s lab to screen for the albumin gene.

I successfully completed the construction of high quality cDNA and gDNA libraries not only from black cod but also as a bonus from the basal non Antarctic notothenioid, *Bovichtus variegatus*. Portions of these libraries were gifted to Bill Detrich and also to Chris Cheng, Illinois as a resource. I am currently seeking approval to import the remainder of these libraries back into New Zealand for screening. Not all science goes to plan however, and unfortunately we weren’t able to complete the BAC library work in Boston, largely due to time constraints as my initial attempt at cDNA library construction didn’t work and I had to repeat the entire process, leaving me too short of time for the BAC objective. However, we hope that there will either be an opportunity for me to return to complete the work or to send a student over in the nearish future. Regardless, I did learn a lot about BAC library construction and screening, so I still gained significant knowledge towards that particular objective and we all felt satisfied with what I had achieved research wise in Boston.

The opportunity to spend time with Prof. Detrich and his laboratory was personally very rewarding. Not only did I learn new techniques, but his group and I had many discussions on Antarctic fish and future joint research directions. In its entirety, my time spent

overseas has greatly benefited my career. I particularly enjoyed the graduate student contact in the various labs and my role in mentoring them during my visits. I gained a lot of intellectual stimulation from the many discussions of research ideas, as well as acquiring much knowledge, including new methods, from these leading experts. It was satisfying and a big career step to finalise some future joint projects, and strengthen existing collaborations.

Deliverables:

During the Fellowship term in Boston these were the deliverables that I aimed to achieve:

- 1) *N. angustata* cDNA and gDNA library construction. DONE
- 2) Creation of genomic resources (cDNA/gDNA libraries) that can be used for other studies. DONE
- 3) Attainment of skills for the applicant in use of BAC libraries and their screening. DONE (THEORY, NOT PRACTICAL)
- 4) BAC clones for notothenioid albumin identified and sequenced. NOT DONE

The project results will contribute directly to outputs in the form of publications in international peer-reviewed journals as well as presentations at national/international conferences (e.g. SCAR) and public talks. The project has resulted in strengthened collaboration.

Additional work conducted

I managed to attend an IPY symposium at the Smithsonian Institution in Washington DC. There I met with scientists to finalise plans for a joint venture for their NSF-funded project, with the student for that project beginning her PhD this year under my supervision here in Christchurch. At the symposium I was fortunate to be able to meet and network with many well-known US Antarctic scientists. I also visited my PhD examiner, the world's authority on albumin, in upstate NY for a weekend where we had a very useful time discussing the implications of my research and future directions.

Whilst in Boston, I worked on a joint funding proposal for the Foundation of Research Science and Technology as part of special International Polar Year funding opportunities with NIWA scientists Vonda Cummings and Simon Thrush. In August last year we learned that we were successful in this bid, with funding for the next 3 years for Antarctic research related to understanding climate change effects on polar marine invertebrate and vertebrate species.

I was privileged enough to be awarded two other awards to cover my international research last year, meaning that I was able to extend my time overseas to visit two sets of collaborators in Italy, who are all leading Antarctic fish scientists (di Prisco, Verdi, Pisano and Vacchi). In particular, my trip to Genova with Marino Vacchi and Eva Pisano was fruitful. We spent time finalizing results and deciding on remaining work for a reproductive paper that will be completed shortly, as well as discussing future joint research. Finally, I spent two months at the University of Illinois Urbana-Champaign with Chris Cheng and Art de Vries. There I learned more about BAC libraries and was taught new molecular techniques, conducted successful joint notothenioid and fish research with Chris, and immensely enjoyed the lengthy work discussions we had and the planning of exciting future joint research projects and upcoming publications.

What SCAR funds were allocated?

10000USD was awarded to the fellow.

How were the SCAR funds spent?

10,000USD was awarded. I have presented amounts below in NZD &/or USD.

Expense	Original budget ¹	Total amount spent	Amount covered by SCAR
Around the world airfares	c.2,400NZD for the Boston leg	4,874NZD*	1,813NZD
Consumables	7,500USD/10,800NZD	3,535NZD ^b	3,535NZD
Living costs-rent ¹		7,344.44NZD	7,344.44NZD
Food, travel and day-to-day costs ¹	c.10,000USD/14,200NZD	10,572NZD	2,307.56NZD
Total	c. 27,400NZD	26,325.44NZD	15,000NZD/10,000USD provided by SCAR
	10,000USD/15,000NZD^a actual allocated by SCAR		The deficit was paid for with my other Award monies.

¹At the time I presented the budget in my application 1USD = 1.42NZD. The values in this column are based on this exchange rate.

*Rest of airfare covered by my existing funds/other Award monies

^aThe 10,000USD converted to 15,000NZD when it was deposited in the UC Foundation bank account

^bLess than budgeted because did not use BAC library filter set

¹ My original budget allowed for a per diem of USD100 including accommodation. Finding a suitable furnished apartment in Boston proved to be nearly twice what I had originally budgeted, and so it was good that I had additional monies from my grant as well as other awards to help cover the cost of my living in Boston. In addition, originally I budgeted for 70 days in Boston. However, my collaborator and I decided longer was better for a greater chance of completion. I was in Boston for 88 days, which increased overall trip expenses.

Please note that I also obtained two other Awards for my international travel in 2007, which allowed me to extend my planned work. I have provided a budget breakdown here based only on the time spent in Boston, and presented the breakdown generally as if the ZONTA Science Award was the only Award. If requested, I will happily provide a budget breakdown for the entire six months overseas with all the award monies combined. I just thought it was simpler to present the budget this way. I can also provide further detail on any specific section if needed. I had some money (c.3500NZD) within my grant towards this trip as well.

Future work plans

I need to complete the genetic screening to understand the loss of the albumin protein in notothenioid fish. This will involve Southern blots and also BAC library screening either in Boston or in Illinois. This will allow me to answer whether the albumin gene is present or not. As loss appears to be more widespread amongst fish than previously thought research will need to be done to discover which fish species have the albumin gene and which don't. I have been invited onto the Royal Society of New Zealand Antarctic Science Committee to help steer the direction of Antarctic Science in New Zealand. I have a number of public talks coming up and am also an invited speaker this year at international and national conferences. I have just secured a tenured academic lecturer appointment in Animal Genetics beginning in June at Lincoln University, Canterbury, New Zealand. In that role, I will be well poised to continue Antarctic research and contribute to the Antarctic science community. Thank you to SCAR for helping me achieve this career goal.

Publications

There will be publications forthcoming from this research period. I will notify the Committee when they eventuate.

Talks given

Speaker, Invited. Victoria J. Metcalf. A youthful perspective on Antarctic marine research. Antarctica: 50 Years on The Ice: Just the Tip of the Iceberg, Antarctica New Zealand Annual Antarctic conference, hosted by RSNZ, Wellington 2-6 July, 2007: pp 39.

Speaker, Invited. Victoria J. Metcalf, 2007. Fishy tales from Antarctica. 34th Professor Harry Messel International Science School 2007. The Science Foundation for Physics within the University of Sydney, Sydney, Australia. 1-14 July 2007: book chapter 7.

Speaker, Invited. Victoria J. Metcalf, 2007. Extreme living in Antarctica. 34th Professor Harry Messel International Science School 2007. The Science Foundation for Physics within the University of Sydney, Sydney, Australia. 1-14 July 2007: book chapter 8.

Invited speaker at Agriculture and Life Sciences Division, Lincoln University, Canterbury. Current research and future directions, Jan 2008.

Invited speaker at Scott Base, Antarctica. Warm fish, fish food and other tales, Dec 2007.

Invited speaker at School of Biological Sciences, University of Canterbury, Christchurch. From Genes to Ecosystems: Integrative Physiology in the Antarctic, Oct 2007.

Upcoming talks

Victoria J Metcalf. Fatty Acid Transport In Notothenioid Fish - Evidence For Cold Adaptation? SCAR, St Petersburg, Russia, July 2008.

Victoria J Metcalf. Polar 'Canaries'- Understanding adaptive processes using Antarctic marine animals. Association of Women in Sciences conference, Christchurch, New Zealand, July 2008.

Victoria J Metcalf. Antarctic 'canary' research and journeys to Antarctica, Rotary Club of Avonhead, Christchurch, May 2008.

Victoria J Metcalf. Antarctic 'canary' research and journeys to Antarctica, ZONTA Club of Christchurch of Avonhead, Christchurch, June 2008.

Selection of images from my time away in 2007:

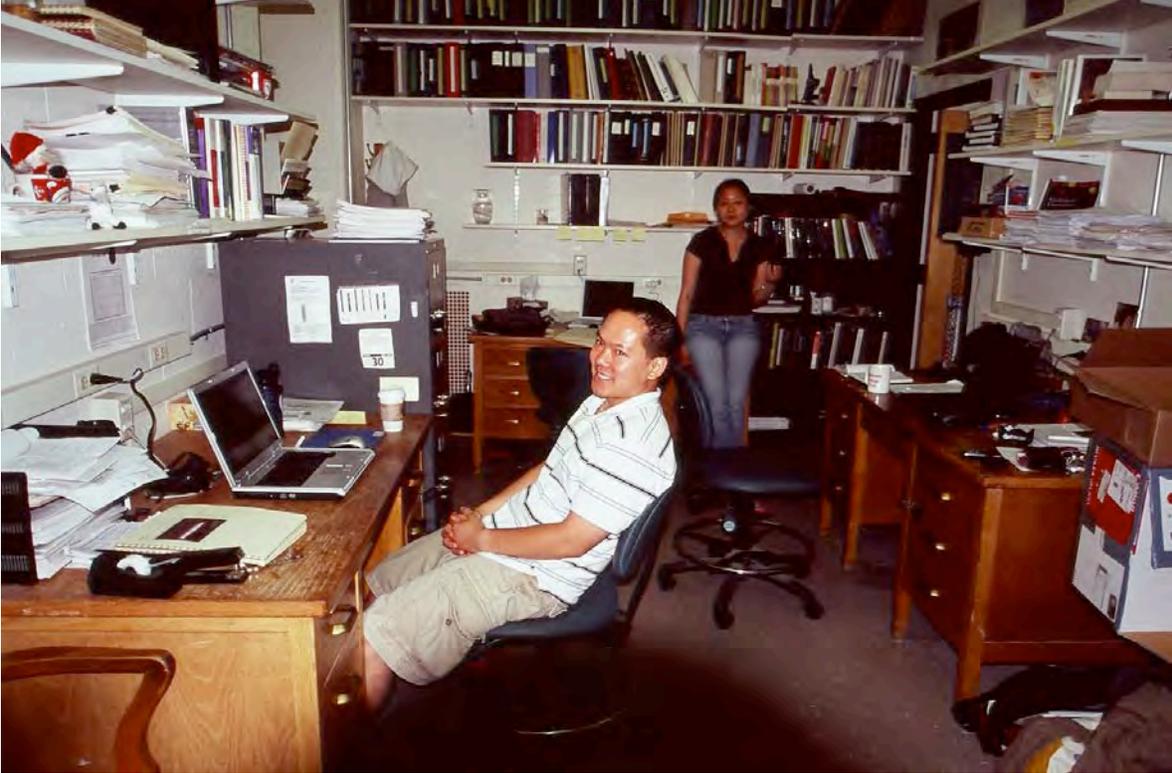
The Detrich lab at Northeastern University in Boston: Bill Detrich, Jon Wong (PhD student), Sandra Parker (lab manager), Joyce Lau (MSc student)



Joyce, Sandra and Jon with their model organism, zebrafish, in the lab at NU



Jon & Joyce in the office at NU. My desk (& home!) for 3 months is to the right.



The outside of my super cute brownstone apartment in Boston in the South End



Whilst in Boston I got to attend an International Polar Year Symposium held by the Smithsonian Institution in Washington DC. There I got to also spend time with my collaborators from the Smithsonian and finalise plans for our joint project. I now am the primary supervisor of a student working at University of Canterbury on this project.



I spent Memorial weekend in the US with my PhD examiner, Ted Peters Jr in Cooperstown NY. We had a great time catching up aside from watching the Memorial Day Parade. He is the world's expert on albumin and we had very useful discussions on my present and future work.



My around the world ticket allowed me to travel to Europe after my time in Boston. Whilst in Italy, I got to spend a few days with one of my Italian collaborators Marino Vacchi and his wife Eva Pisano, discussing work (results of joint work for a paper as well as future projects), whilst he showed me the sights near his home city of Genova.

Eva Pisano, me and Marino Vacchi in Genova

