Brain drain: a more positive note*

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The first three essays in this series were by Australians who contributed to the "brain drain" by moving overseas and who, for reasons explained in their essays, are unlikely to return soon, if at all. Here I will strike a more positive note by explaining why, after six years in Oxford, I am planning to return to Australia. Thus, although I may be counted in the statistics for the brain drains from both Australia and the UK, the net drain (or gain) will be zero. What follows is my personal story, and does not necessarily have any relevance to others.

To start at the beginning, my childhood was spent in a small country town in Gippsland. When I was eight my family moved to Melbourne. After completing secondary school there I enrolled for a BSc degree at Monash University. In those days (1964–1967) Monash was a small and new university, with many young and enthusiastic academic staff, some of whom had contributed to Australia's "brain gain" by migrating from UK/Europe a few years earlier. I considered Melbourne University, but it seemed to have too much of a 19th century feel. That might not bother me now, since I am writing in Oxford, where the 19th century seems only yesterday. However, Monash appealed to me and turned out to be a good choice at the time. That was well before the period of cutbacks described in the first essay in this series.

At Monash I discovered that I had more interest in mathematics than physics or chemistry. Computer science was not an option then – the first professor (Chris Wallace) did not arrive until 1968. My interest in astronomy led to a vacation scholarship at Mt Stromlo Observatory, where I first learned something about computing on an IBM 1620 (an interesting machine, but that is another story). My computing skills proved useful when I returned to Monash, since I was able to perform some rudimentary computational group theory for Prof Janko's PhD students on a Ferranti Sirius computer. The results had to be written out by hand before Janko saw them, since he did not trust computers!

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*Appeared in *Australian Mathematical Society Gazette* **31**, 4 (Sept. 2004), 234–238.

After graduating from Monash I decided to continue my studies overseas. I do not regret that decision, as my career would otherwise have been quite different and probably much less interesting. Thanks to the excellent teaching at Monash, I did well enough on the GRE that Stanford offered me a place in their Computer Science PhD program. I had applied to Computer Science rather than Mathematics because at that time computer science was a new and exciting field, and one in which I could use my mathematical ability. In fact, the Computer Science Department at Stanford was founded by a mathematician (George Forsythe) and computer science students were able to take several mathematics courses in their first year.

At that time CSIRO offered "overseas studentships" that would pay Australian students to study overseas. Unfortunately, such studentships no longer exist, so it is more difficult for students nowadays. Thanks to CSIRO I was able to study full-time at Stanford and did not have to earn my living as a teaching assistant. Some of the Stanford professors who I particularly remember were Gene Golub and George Forsythe (my thesis advisors), George Pólya (then in his eighties, but ably assisted by Bob Tarjan who was in his twenties), Bob Floyd (whose take-home exam question inspired one of my first papers), and visitors such as Peter Henrici and Jim Wilkinson. Don Knuth arrived in Stanford in the same year (1968) that I did. Fortunately I become friendly with his secretary, Phyllis Winkler, who typed my thesis when she was not typing Don's books and papers. This was in the days before TeX, and a good mathematical typist was a precious commodity. (Following Wilkinson's excellent advice, my wife never admitted that she could type.)

I completed my PhD at Stanford rather too quickly – looking back, it might have been better to take advantage of the opportunities there for a few quarters longer. The reason for hurrying was that I had an offer of a lectureship in Computer Science at Monash. However, IBM's recruitment team was very persuasive, and paid for my wife and me to visit the IBM Research Center in Yorktown Heights, New York, to meet people there and see the beautiful location. Thus, at the last minute I decided to turn down the Monash offer and to take a postdoctoral position (officially "practical training" since it was done on a student visa) in the Mathematical Sciences Department at IBM Research. It was a good decision, for it enabled me to get some industrial experience, to meet some of the "East Coast" mathematics and computer science community (Goldstine, Rabin, Winograd, ...), and to revise my thesis and publish it as a book.

In 1972, after 18 months at Yorktown Heights, I decided that it was time to return to Australia. Bob Anderssen and Mike Osborne persuaded me to take up a Research Fellowship in the Computer Centre at the Australian National University. In those days the ANU made it easy for new staff from overseas by offering adequate removal expenses and excellent temporary housing.

My intention was to stay at ANU for three years, but as it turned out I stayed for 26 years. In that period my position (and office) changed many times. In 1978, when the Computer Centre was abolished in an administrative shuffle, I moved to the small Computer Science Department in the Faculties (then SGS, the part of ANU that did undergraduate teaching) to become the Foundation Professor of Computer Science.

In 1983–1985 I was on secondment to Neil Trudinger's "Centre of Excellence", the *Centre for Mathematical Analysis.* That was great while it lasted, but eventually the money ran out. The government at the time apparently thought that such a Centre could become self-supporting; sadly that was not the case. Not wanting to revert to the role of Head of an undergraduate teaching department, and seeing the writing on the wall, I moved to the IAS (the other part of ANU) as its first Professor of Computer Sciences. This was initially in the Department of Engineering Physics under Prof Kaneff (a pioneer of solar energy who was ahead of his time), and then in a separate Deparment, called the Computer Sciences Laboratory to distinguish it from the undergraduate teaching Computer Science Department.

I was never a member of the IAS Mathematics Department, but I came close. Kurt Mahlher encouraged me to write some multiple-precision software in order to compute interesting transcendental numbers such as $\exp(\pi\sqrt{163}) \approx 262537412640768743.99999999999925$. For a while I occupied the office that had previously belonged to Bernhard Neumann and then John Coates, before John contributed to the brain drain by moving overseas and the IAS Mathematics Department moved to the other side of campus. My period under the influence of the ghosts of former occupants lasted only a few years: after another reorganisation I also moved to the other side of the campus, to the new Research School of Information Science and Engineering. This might have caused an identity crisis – was I a mathematician, computer scientist, or engineer? However, such distinctions did not bother me. It can be useful to have different hats for different occasions.

The first time that I contemplated joining the brain drain was in the late eighties, when John Dawkins, the Minister for Education at the time, was embarking on his "reforms" of the Australian higher education system.

Funding became tight and Universities started to be run more by accountants and politicians than by academics. However, for personal reasons (two children at school, elderly relatives, etc) it was difficult to move. It was only in 1997, after the children had left home, that an unexpected phone call inviting me to apply for a chair in Oxford made me realise that the time for a move was ripe.

Early in 1998 I took up the chair of Computing Science at the University of Oxford. Even though the move was unexpectedly difficult and it took some time for my wife and me to settle into our new life in Oxford, we now enjoy living in the UK, and especially enjoy the opportunity to explore Europe. Some pleasant things that I noticed when I arrived in Oxford were the better ratio of support staff to academic staff, and the lack of pressure to perform "stunts" to get publicity and obtain funding.

Academically, Oxford is a stimulating place. The undergraduate students are excellent. There are distinguished colleagues in the department, both in the Programming Research Group, where my chair is officially located, and in the Numerical Analysis group (sometimes I wear an NA hat, since my thesis and some early publications were in that area). There are often interesting visitors passing through and giving seminars. The Computing Laboratory (Oxford's name for its Computer Science Department) is close to Physics, where there is a strong group working in quantum computing (a subject that I am intererested in, if only because I do not believe in the "hype" associated with it), and to the Mathematical Institute, where I have interests in common with number theorists such as Roger Heath-Brown and Bryan Birch. Thus, why would I want to leave Oxford? There are of course a few practical problems related to living in Oxford, such as high house prices (comparable to Sydney; but fortunately we were able to buy a house when we first arrived), and the climate (but it is not really that bad – a hot Canberra summer can be much worse than a wet Oxford winter). The complicated and devolved University and College system at Oxford makes it very difficult to change anything, so the undergraduate courses are often out of date, and the examination system is arcane, but perhaps these minor flaws add to Oxford's charm.

The UK, while not the same as Australia, has many ties to Australia, and living in the UK I feel much more "at home" than I would in USA. On the other hand, North American universities are, in my experience, more welcoming to newcomers. In the UK, and especially at Oxbridge, class distinctions still persist, and foreigners find it difficult to make friends amongst the natives. Thus, I understand why the first three authors of essays in this series decided to move to USA rather than UK, although I made a different choice, and I am not tempted to try the USA at present.

The University of Oxford is theoretically independent of government control, but in practice it is dependent on government funding, just like all major Australian universities. Thus, Oxford has to put up with various bureaucratic inconveniences imposed from above. A particularly irksome one is the Research Assessment Exercise (RAE), which rates the research done in departments and indirectly determines their level of funding. This is widely seen as divisive, biased against interdisciplinary or novel research, discouraging scholarship and teaching as they compete for time with research, and encouraging department heads to worry more about the ever-changing rules of the RAE than about encouraging genuine research. Certainly the RAE is time-consuming, expensive, and has capricious outcomes. Unfortunately, Australia has the habit of adopting fashions from overseas even as they are being recognised as failures where they originated. Thus, there are moves to introduce something like the RAE in Australia. I hope that this does not happen, because at present the lack of an RAE is one of Australia's advantages over the UK.

Although living happily in the UK, I feel some bond with the country of my birth, and would like to contribute to it by, for example, training some of the younger generation of Australian computer scientists and mathematicians. Also, of course, as one grows older it is best to live close to one's children. Thus, whenever someone suggested applying for a Federation Fellowship, as happened several times after I moved to Oxford, I would reply "yes, it's a good idea, but not just yet, as I would like to stay a few more years in Oxford". However, by 2003, I realised that it was "now or never". I would soon be too old and would either have to stay in Oxford until retiring age, or return to a less attractive position in Australia. Thus, I applied for a Federation Fellowship, and was lucky enough to be offered one. Once the formalities are completed (at the time of writing the formal contract remains to be signed), I expect to return to Australia for at least five years.

The Federation Fellowship will give me the opportunity to make a contribution to Australia by training graduate students and building up a research group that will, hopefully, continue to flourish after I retire. Of course, I also hope to do some research, insofar as someone of my age is capable of it. Failing that, I shall follow Hardy's advice and write some books. Returning to Australia for a Federation Fellowship is a much more attractive proposition than returning to a position as a Head of Department or other administrative position.

What can we conclude from this personal history? In my case, the Federation Fellowship scheme will (most likely) succeed in its aim of bringing Australians back home. However, for a younger person, such as the author of the previous essay in this series, applying for a Federation Fellowship might not be so attractive. There is the question of what happens at the end of the five-year Fellowship. It is not yet clear what ex-Federation Fellows will do – we may hope that the majority of them will stay in Australia, but quite likely many of them will start contributing to the brain drain. Another concern is that so few Federation Fellowships have been awarded to mathematicians, statisticians, or computer scientists. I do not know the reasons for this. However, I hope that my success will encourage others to apply in the future.

One problem with the Federation Fellowship scheme is that, by the time someone is well enough known and has a good enough track record to be offered such an attractive Fellowship, he (or, in rare cases, she) will be old enough to have established strong ties to his/her present location, e.g. a spouse who can not easily change jobs, children at high school, etc. To bring back early- and mid-career academics it is necessary to improve overall working conditions in Australian Universities, and to improve morale in academic departments. This is not the place, and I am not the best person, to say how to achieve such aims, but a good start might be to take a hard look at the "reforms" of the past two decades and decide which of them were ultimately harmful and should be reversed, if possible.

To conclude, I will continue to advise good Australian students and postdocs to go overseas for a few years, but remind them not to stay there too long, lest they find it impossible to return and regret that in their old age. Those in positions of influence in the Australian higher education system should aim to make it as attractive as possible for academics to return to Australia. This means help with relocation, housing, child care, the "two body problem", travel funds, and generally improving conditions and morale in our universities. The aim should be to make our intellectual "trade balance" positive in the long run. Inevitably some talented Australians will settle overseas and never return, but at least an equal number of talented immigrants should be attracted to take their place. Otherwise, Australia's intellectual capital will decline, and we will all be the poorer for it.