Kiaran Kirk has been Head of the School of Biochemistry and Molecular Biology, ANU since 1996, and was awarded the ASBMB Roche Medal in 2002. We asked him about his thoughts about the present state and future directions of biochemistry and molecular biology in Australia.

Fifty years ago, when the Society was founded, the best biochemistry departments had every expectation of hiring as academic staff the best researchers in the discipline. Research high-fliers, having completed a PhD and a postdoc or two, and wanting to establish their own research group, would typically look for a lectureship in a university department. Such departments had good infrastructure and resources; they were a natural choice for someone wanting to do cutting-edge research.

Times have changed. While there are general issues facing university departments in all disciplines, there are specific issues confronting biochemistry and molecular biology departments, with regard to research. There is an increasing perception that the best biochemistry and molecular biology research is conducted not by lecturing staff in university departments but, instead, by research-only staff in an increasing number of very well-resourced research institutes. This is reflected in trends in research funding. It is making it increasingly difficult for university departments to hire the best researchers as lecturing staff. And it poses a serious challenge to the notion that a good department is one in which the lecturing staff are high-quality researchers, who are actively engaged in high-quality research and whose teaching is influenced by and benefits from this.

The rise and rise of the research institutes

Much of the biochemistry and molecular biology research in Australia is medically-related. There are, in Australia, half a dozen large and well resourced medical research institutes that are outside the university system, as well as a number embedded within the universities. With the phasing-out over the last few years of medical research institute block funding (a system that saw the large research institutes funded through a separate mechanism to that by which medical research was funded in the universities), university lecturers seeking NHMRC support for research in this area now do so in open competition with 'research-only' staff in these large institutes, as well as an increasing number of smaller ones. The results, in terms of trends in the distribution of NHMRC research funding, are difficult to glean from available data. While figures available from the NHMRC do distinguish between 'Universities' and non-university 'Research Institutes,' they make no distinction within the university sector between departments and the increasing number of university-based research institutes. Nevertheless, one analysis of the allocation of NHMRC funds to different research sectors shows that over the period 2001 to 2003, NHMRC funding to research institutes increased from 27% to 34% of the total, whereas that to universities decreased from 54% to 51% (*NHMRC Performance Measurement Report 2000-2003*, Table J).

As yet there is not the same prevalence of research institutes carrying out non-medical biochemistry and molecular biology research. However this is changing. For example, the recently-established Australian Centre for Plant Functional Genomics in Adelaide is essentially a plant research institute which will, when fully operational, house over 100 research scientists. The Research School of Biological Sciences at the ANU has a concentration of research-only staff in the non-medical biological sciences who, within the last few years, have become eligible for ARC grant funding. Furthermore, an increasing number of universities are creating research institutes that operate outside the departmental or faculty structure and in which the staff do little if any undergraduate teaching (see, for example, the description of the establishment of 'The Institute for the Biotechnology of Infectious Diseases' at UTS, in *Australian Biochemist*, **36(1)**, 24).

Citation data

At least by some measures the transfer of research funding from traditional university departments to research institutes, and indeed the increasing perception that research institutes are now where the best research happens, is vindicated by the citation data. According to analyses carried out by Linda Butler at the ANU on behalf of the NHMRC, Australia's citation performance in the sub-field of Biochemistry and Cell Biology is below the world average. Taken as a whole, Australian research in biochemistry and cell biology tends to appear in relatively low impact journals. The NHMRC-funded group providing the most extreme exception to this trend is that of the research fellows based in the medical research institutes. The figures show this group to be publishing in very high impact journals, and, furthermore, to be achieving above the expected citation rate for these journals (*NHMRC-Supported Research: the Impact of Journal Publication Output 1996-2000*, Fig. 8)

In a similar analysis of the Biochemistry and Cell Biology sub-field carried out by Linda Butler for the ARC, the two ARC-funded groups publishing in the highest impact journals were those in the Special Research Centres and the full-time researchers in 'Other Research Institutes' (*ARC-supported research: the impact of journal publication output 1996-2000*, Fig. 31).

The significance of journal impact factors and citation rates as measures of research quality is certainly debatable; analysis of other outcomes, such as the successful training of research students at both the postgraduate and undergraduate levels, and even published output per dollar spent, may well tell a different story. Nevertheless impact factors and citation rates are clearly influential with grant committees, and research funding trends reflect this.

Should university lecturers be active in research?

The issue of whether and how students benefit from being taught by people who are good at, and are actively involved in, research is a complicated one. There are different issues for different groups of students. Students seeking a purely professional qualification may not gain the same benefit from exposure to research as students who are themselves intent on going on to carry out their own research. In many of the biochemistry and molecular biology curricula around the country, it is common that third year courses, and in some cases second year courses, reflect to a very significant extent the research interests of those teaching them. Lecturers use examples from their own research to illustrate general principles. From my own experience, the students respond extremely positively to this and it can be extremely influential in drawing in research students who might otherwise have done something else. Some universities offer the top undergraduates opportunities to participate in research projects in the third, second and even first years of their degrees; the benefits to these students are enormous.

At the Honours level, the stronger students are given the opportunity to carry out their own research projects. In many departments the students have the opportunity to carry out their research in research institutes; however the majority of Honours students work within university departments. Funding a 10-month Honours project in biochemistry and molecular biology is not cheap. Few, if any, university departments have the resources to fund projects fully from their own budgets, and the practice tends to be that students work on projects that form part of the work being funded by a particular grant. For staff without grants, Honours student supervision can be difficult, if not impossible.

How to maintain research in Biochemistry and Molecular Biology Departments?

University departments are adopting a range of strategies to ensure that they remain viable in research. Some departments are focusing their research efforts in one or a few particular areas, with the recruitment of academic staff and allocation of resources for equipment and infrastructure to be directed at having a critical mass in these areas. As well as helping to attract high quality lecturing staff, and fostering interaction and collaboration within a department, this approach can make a university department an attractive location for ARC or NHMRC Research Fellows working in that particular area. Having a narrow focus in the research expertise of staff does present challenges when it comes to presenting a well-rounded undergraduate curriculum. However these are surmountable, and it is not inappropriate for the curricula at different universities to differ in their focus.

Keeping teaching loads reasonably low is a crucial issue. As noted by Nick Hoogenraad in his comments on the results of a survey of Heads of Biochemistry and Molecular Biology Departments (*Australian Biochemist*, **36(1)**, 25), staff in strong research-oriented departments tend to do 30-50 lectures per year; any more than this (with all the associated practicals and tutorials) means maintaining a serious research program becomes extremely difficult.

One approach that can help limit teaching loads is for staff from research institutes to play a significant role in the undergraduate curriculum. There are sensitivities around this. An offer from a research high-flier to come and give a third year lecture on their research tends to be seen, rightly or wrongly, as an attempt to attract research students, and is not always well received. However people from research institutes making more substantial teaching contributions can bring benefits to all concerned, including a great deal of satisfaction to those giving the lectures.

A position in a research-active biochemistry and molecular biology department – combining research and teaching – has been, and continues to be, an extremely rewarding one. A university department is a different sort of environment from a research institute, not least because of the presence, and often involvement in research, of students at all levels. Nevertheless, ensuring that university departments continue to be places where top-quality research is done, and ensuring that future generations of research scientists are taught, and inspired, by people who are themselves active in research presents significant challenges for the future.