Australian Academy of Science

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19 December, 1997

The Committee Secretary
The Higher Education Review Committee
Location 728
GPO Box 9880
Canberra ACT 2601

Dear Sir/Madam,

In response to the West Committee's discussion document, the Council of the Australian Academy of Science wishes to submit the enclosed document to supplement the submission made in April 1997 and the verbal submissions made at the meeting in Sydney on 24 September by the President of the Academy, Sir Gustav Nossal, and the Secretary for Science Policy, Professor John White.

The matter of research, treated in the attached paper, is of the greatest importance for the future health of the Australian tertiary education system and Australia's economy as a whole. The Academy counsels the West Committee to address not only the 20 year perspective but also the linking from the present. The next few years will be very important and the question of diversity, also raised in the attached document, is a major concern. Strategies to produce it, while maintaining equity and opportunity, are needed.

Yours sincerely,

John White
Secretary, Science Policy

HIGHER EDUCATION AND RESEARCH IN AUSTRALIA

John.W.White,
Science Policy Secretary, Australian Academy of Science

The Context

1. Consistent with the Academy's written submission and the comments made to the Committee on 24 September 1997 by Sir Gustav Nossal and Professor John White, the Academy emphasises the importance of research as an integral and necessary part of the Australian Higher Education System. The Academy is glad to offer its assistance to the West Committee in developing further its recommendations on this matter as the opportunities and challenges for the next twenty years should be met now, at least in outline.

2. The Academy welcomes the West Committee's vision of wide access to postsecondary education for all in Australia who can benefit from it personally and for the national good. The unified national education system represents, already, a major investment in Australia's ability to enter the 21st century with a well educated population. It should not be weakened but must be diversified in its objectives. A weakness of the discussion paper is that it fails to point out the present high quality of the Australian higher educational system and to link this with the need for change so as to produce a greater variety of offerings to undergraduate and graduate students. The major challenge is to produce diversity, maintaining equity, opportunity and excellence at all levels and front a geographical point of view. In the Appendix, some ideas have been spelt out as an address to this problem(1). The next few years are very important and the Academy recommends that the West Committee specifically addresses measures which will enhance diversity.

3. The emphasis of the Test Committees discussion paper on teaching quality is also welcome. The students should have high quality teaching - the focus on their needs is good but the Committee's emphasis on the market reasons for this and the minimisation of cost to the public purse, though practical, appears to miss an important aspect. Certainly a university must teach well and the marvels of information technology now and to come will provide an unparalleled resource for individual learning. But the costs cannot be escaped by technology.

4. Education is that process of "leading forth" *("educere") a* student at leisure, to comprehension and intellectual excitement. It has a collective and social dimension related to students being together and with scholars obtaining an understanding It is a costly but irreplaceable aspect of the highest quality education at all levels(2) and is now in jeopardy, even at Australia's most prestigious universities because of the "efficiency gains" of recent

years. Its preservation is vital to a national strategy for excellence in Australian tertiary education. This is another reason why “massification” must be accompanied by a just policy of differentiation amongst institutions

Education and Research

5. Universities do most of Australia's basic research and without them the nation's infrastructure for innovation would be impoverished. There is urgent need for research policy development in the Higher Education sector. Perhaps nowhere else are the effects of the unified national system being felt so severely and the development so haphazard. It appears that, lacking policy directives from DEETYA and/or their Vice Chancellors (apart from a few), new universities have set themselves up on the traditional model. Rather than producing more diversity, geared to a wider range of entering student abilities, there has been a proliferation of academically oriented teaching and structures New departments, professors, associate professors, senior lecturers etc have appeared as well as the *nexus* with research that this orientation would traditionally imply. This narrowing of the diversity has been reinforced to some extent by the salary Harvard structure introduced in 1991 by the Industrial Relations Commission.

6. The West Committee has drawn attention to this and the related lack of attention to teaching merit rather than research merit as a criterion for promotion. But what else could these institutions have done and how strong is the **teaching-research** *nexus*? In traditional academic practice this nexus is strong. It is generally held that teaching in the later years of undergraduate courses should be informed by the recent research of the instructors and the research of others with which the teacher is familiar. A student who wants to understand and a teacher who manages to fulfil that expectation have one of the dignified roles in our society. This phenomenon occurs with scholars who know their subject, with classes where there is adequate matching of abilities and interest - (not necessarily classes of the greatest ability) where there is enough time between scholar and teacher to develop the rapport needed.

7. The availability of good research facilities is now an important element in the attractiveness of any university to new stab of international calibre. It is questionable, however, whether public funds can provide uniform opportunity to the whole of the unified national sector so as to realise generally this expectation. The Academy in its original submission to the Committee suggested that this point be investigated and our most recent submission(l) sketches one possible way to giving the excellent new academic recruits of the unified system equity in following their intellectual interests outside teaching. This way implies that tertiary education research should be funded in a pluralistic way, that there should be distributed centres of excellence and that there should be funds earmarked to promote mobility of not only students but academics to those centres for summer research programs and outside studies programs.

8. The quality and the contribution to both national prestige and prosperity of the higher educational research system cannot be doubted although there appears to be some falling off in recent years(3). A follow up study to Bourke and Butler (Australian Academy of Science and ARC 1997) is in progress. For basic research it is likely that Australia is neither distributing resources in an optimum way(4) nor maintaining international collaborations in the same proportion to its total effort as in the past. In science, another factor may be the present unattractiveness of an academic career to young people The public appreciation, the security of tenure and the remuneration are low relative to ten years ago and this seems likely to persist. Scholarship is a vocation, a life's work and the future differentiation of the system should recognise this whatever the quantum of public finance set for basic research support.

9. For applied research and engineering the opportunities for collaborative work with industry need encouragement. Individuals in the universities and industry have a prime responsibility for this and schemes such as the Cooperative Research Centre (CRC) program, the SPIRT scheme of the ARC and the START scheme of DIST should be strengthened. Present indications are that despite major research student participation and onflow to industry, the CRC scheme is likely to be attenuated An essential policy to be developed concerns enhancement of pluralism of access in funding so as to avoid "bandwagon" effects and the myopic stultification of the most creative people by strategic planning. In this respect the National priority settings and foresighting advocated by the West review discussion document are misguided and reminiscent of failed eastern European dirigisme, The ARC has made a move in the right direction with its Key Centres programs.

Strategies for Excellence and Equity

10. Here we examine the process of higher education research and the filtering of opportunity that occurs *in* it. The effects of technology will be great in some areas, such as electronic library access for scholars, though here again there will be new costs to cope with the access itself, the problems of evanescence and the continued preservation and electronic reading of current materials. In the sciences communication with distant collaborators will be efficient and remote experimentation may become feasible in some areas We believe, however, that key methods of the present system of post graduate training will persist. These methods are the PhD and postdoctoral processes for research training.

11. A vital part of the tertiary education process is teaching those gifted people who have the aptitude and the talent "how to discover". As with undergraduate teaching at the higher levels this is again a process requiring close contact - almost an apprenticeship between those who know how and those who wish to learn, The process is not generic and in the best

universities of Australia and the world, examples of best practice still occur despite the pressures of performance indicators and middle management on academics and students alike "to perform". In science there is a "filtering stage"- the honours year - where young people who are keen on their subject have the chance to solve a problem which is solvable in about nine months. Many of them succeed in this brilliantly, some do not and leave.

12. The subsequent PhD degree course should be an “induction” into research practice with a much more open problem than that offered at Honours level. Success here illustrates that the candidate can fully and largely independently solve a worthwhile problem. In the Anglo-Saxon system as opposed to the European continental system, the PhD has been regarded as training. The long periods taken by students in German, French and other continental universities should be rejected here. Nor is the American system, which again takes long periods of time for the research degree, appropriate. Its length is related to the amount of course work that students are expected to do but still this is not necessary in the Australian context.

13. Those selected for postdoctoral fellowships should have had excellent "convergent" training at the PhD level. Some will be brought in from overseas and Australia will benefit from them. Some of these will wish to stay and what better migrants could we have? But what of the process itself. In the best practice excellent graduates will be faced with a new type of problem. They are given real research freedom in the postdoctoral life. They have two or at the most three years to show that they not only have the excellent "convergent" skills inculcated in a project but also to show "divergent" qualities of creativity.

National and International Collaboration

14. In Europe, Japan and America the costly infrastructure of research in centres of excellence has become progressively available to the wider side of the community through major national and international research facility programs. Evidently this is a cost effective way of providing excellent facilities for research on a competitive basis. At the most costly end of the research infrastructure spectrum telescopes, synchrotron radiation sources and intense neutron sources many of which are now operated and financed internationally as research facilities. It is likely that in the next twenty years there will be further developments of this kind. In the biological and other sciences, as for library access work at major international facilities (though by no means is convenient as University based research) has some advantages particularly for younger research workers

- The competitive aspect that only those projects are funded which pass peer review is a valuable test of the quality of research particularly when the peer review competition is an international one.

- Simply through working for a while in another research institutional the scientific perspective of visitors to the facility is broadened and new scientific networks are created as joint collaborations develop.

- The host country, of the facility benefits not only through the cash payments for each establishment and use (where applicable) but also frown an inflow of scientific talent which even if it is temporary, may help to refresh and reorient national scientific perspectives.

- The above points apply also to national research facilities although whenever possible these should be of a quality to attract international competition for their use.

Conclusions

This brief sketch is mainly related to the ways in which research in the physical sciences may develop in Australia and needs to be supplemented and discussed in the wider context of Australian tertiary education research policy. The linkage between a basic research system of high quality, applied research and engineering and industrial development is a key policy issue no less than the maintenance of high academic culture through the University research system in all of the domains of scholarship.

Footnotes

(1) Paper submitted to the West Committee on 24 September 1997 by J.W.White. (Appendix I)

(2) Paradoxically this is most true not only for the best students but also for those in the lowest quartiles of the tertiary entrance cohort. I have recently been told of the situation at one of the newer unified national system universities where it has affirmed that no-one in the elementary maths class could be expected to benefit for sitting in a traditional lecture with two hundred others. That university taught in classes of thirty to meet this difficulty, the cost being subsidised by the income from offshore dependencies of the university.

(3) See for example the study by Bourke and Butler 1995 by the Academies and ARC. Summary Appendix II

(4) A recent paper by Professor Michael Barber (also submitted to the West Committee) for example, points out that through DEETYA the available funds in the unified national system might be better counted as not simply the ca $M650pa in direct grants via ARC, and the research quantum allocation but an additional $B1.1 through the one third salary component of academics.

APPENDIX I

The Meaning of Diversity

Equity, Opportunity and Excellence

J.W.White

Equity

1. As a result of the unified national system of education, Australia now has 39 universities and 40% of the cohort of students who leave secondary education, entering the tertiary level. A simplistic view of this might be that it is too costly or not cost-effective. This is surely not so as an investment in the education of such a large fraction of the population must be valuable

2. Suggestions from many quarters for improvement of the distribution of the education dollar have spoken of "diversity". In some way, this 39 university system, plus the TAFE system, must become more diverse in its goals and methods, while satisfying; the desirable, wide geographical distribution of tertiary education.

3 A just, starting point is to support the idea of equity in access to tertiary education. This would suppose that it is an acknowledged truth that all of those who can benefit from tertiary education should be able to enter the system without highly differential financial or other costs. The aspect of equity must also apply *to* disadvantaged groups in the population.

Opportunity

4. The aspect of "opportunity" is concerned with the nature of the courses taught, the range of challenge that can be presented in any one institution - in a word, how far a student can expect to progress with the facilities and courses provided in any particular institution. This is a matter of money, whether from government, from fees or a combination both. It seems impossible financially for all of the 39 tertiary institutions to offer, for example, the same level of research facilities. Thus many submissions to the West Committee suggest a policy of concentrating infrastructure. This is one way to provide '`opportunity" if coupled to measures to provide “equity” at the post graduate stage.

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Such a policy would involve strong incentives to all tertiary institutions to provide teaching at the best levels, possibly with some endogenous restriction of curricula in smaller organisations. These restrictions might be for reasons of expected student demand, staff resources or local interest and research specialisation.

But these well taught students should have the possibility to go further into scholarship and research subject to the quality of their performance as undergraduates. A new cost to them and to the system arises in the move to institutions for postgraduate courses. This should be met, at least partially, by redistribution of the current higher education budget so as to meet the equity criterion One offset is biller use of concentrated infrastructure such as libraries and costly equipment.

There is a related point for the staff of smaller tertiary institutions. In the present "market" these universities will have recruited excellent graduates as university lecturers etc. and it is inevitable and desirable that many of these graduates will wish to continue scholarly work: and research. Some provision for this must certainly be made at their home institutions through internal competition for the home institution's funds. Beyond this, as at many smaller colleges in the United States, access to unique facilities at bigger universities, at major national and international facilities should be facilitated for academic staff.

In Europe and increasingly in the United States, such access has opened up unexpected opportunities in the physical and biological sciences for sustaining the intellectual life of academics at smaller universities.

Erce11ence

5. Australians acknowledged high standard in education and all of its contingent benefits could result frown such a combination of policies. To summarise,

- A way is provided for a challenge to excellence for all university staff and university entrants in the wide spectrum of Australian tertiary institutions.

- At the same time, a concentration of resources is provided for excellent students to enter postgraduate studies under the best conditions, wherever they are first taught.

- The equity criterion is met as each is allowed achieve at the level of his or her own capabilities and

- the national good is achieved by an economy which also provides diversity and excellence

Secondary Education

6 The above sketch of tertiary policy needs to be complemented by action at the secondary level to remedy the malaise which threatens the quality of teaching in secondary schools. This will also cost money.

In science since some 70% of teachers have not been trained in subjects like mathematics, physics and chemistry which they are obliged to teach. This trend of non-expert teachers having to teach well beyond the limits of their training, must be reversed.

The Academy has recommended that "HECS fee waiver scholarships" be available for those who are willing to make a commitment of up to five years teaching in schools. If implemented, this scheme, like the old Teachers College Scholarship scheme will have to be acceptable to State Education Departments and integrated with their recruiting profile. Reform here is urgent so as to give the oncoming generation of students the necessary "feel" for "harder" subjects.

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[Return to Top] [Return to Index]