the Board said that in view of the attitude of the two Commissions and the Board’s desire to effect an appropriate rationalization of tertiary education facilities in Armidale, it invited the Council to reconsider the question of the most desirable form of association between the University and the College.

As a consequence of such letters, merger discussions are once more under way within universities at Armidale, Newcastle and Wollongong. (Merger debates are not confined to N.S.W., in Queensland a possible amalgamation of Townsville C.A.E. and the James Cook University has been considered.)

The arguments and issues discussed by academics which are outlined above were raised during a particular national economic climate when there were expectations of expanding numbers of tertiary students. Since then, the economic climate has changed considerably and so have predictions of future tertiary student numbers. Student expectations and demands for courses are also changing. If these new conditions are incorporated by academics in their appreciation of the current situation their views of the arguments and issues on merger could well differ from those recounted here.

REFERENCES

1. These Institutions were: the Armidale Teachers College — now Armidale College of Advanced Education (C.A.E.); the University of New England (U.N.E.); the Newcastle Teachers College — now Newcastle C.A.E.; the University of Newcastle; the Wollongong Teachers’ College — now Wollongong Institute of Education.


5. L. N. Short, Development of teacher education, 18th June, 1971, Newcastle University documents.


11. G. H. Duncan (Principal of Newcastle Teachers’ College), Submission to the Senate, the Committee of the University of Newcastle appointed to consider a proposal to incorporate Newcastle Teachers’ College within the University, 9th February 1972. The University of Newcastle documents.


17. Wollongong University. College, Department of Geography statement in the Wollongong University College Secretary, 26th October, 1973.


THE PRODUCTIVITY OF UNIVERSITY RESEARCH

The value of university research funds tends to be taken for granted by those who pursue it. Researchers readily accept the view which has twice been advanced in Reports of the Universities Commission, namely that:

Research is an essential activity of a university... the extension of knowledge is at the very heart of university work; indeed learning can only be experienced at the higher levels if the minds of students are stretched at its frontiers. Accordingly there is little need to justify the role that research plays in universities or the allocation of funds for research.

The Commission’s complicity was in fact short-lived. In the August 1975 federal budget, the Government proposed cuts in research expenditure. A change of Government has not changed the economic climate in which universities have to justify their needs for funds for research as for all other purposes.

Indeed if the traditional reliance paid to research and researchers in universities is to survive, more attention may have to be paid than ever before to the productivity of university research.

Australians universities are very dependent on Government for research funds. The Universities Commission has produced figures which show that of the total research expenditure of $285.5m in 1973 by universities other than the Australian National University, 77% came from Government sources. The OECD Examiners found the level of Australian university research funding low and offered the following advice as a basis for improvement:

Since the normal way of financing universities’ recurrent expenditure allows just a relatively small part for research work, ways have to be found by which the awarding situation might be improved. To ask for more money is certainly the easiest way, but it will have success only when the Government as well as the Parliament are convinced that:

(a) that the money is needed for purposes worthy of additional taxation;
(b) that every other way to achieve greater efficiency in using available funds and means has been tried.

The OECD Examiners’ advice thus seems to suggest that analysis of both inputs and outputs of university research ought to form the basis of submissions to Government.

Input/Output Measures

The development of measures of research input on a national scale has been relatively recent in Australia.

The Department of Science is continuing the work on it. These are (1) additions to knowledge and Science on a national inventory of resources devoted to R & D as part of Project SCORE. The new inventory covered the year 1969/1969 and another has been prepared for 1973/1974. Research inputs are more amenable to measurement than outputs but there are difficulties. How, for example, is the cost of unsuccessful research to be allocated? Should it be charged to the final cost of a successful research effort, regardless of whether the previous research was carried out by the same people, or in another department, or in another university? and regardless of whether the research which made any contribution to the successful project? Research sponsors have been known to be disappointed, not to say suspicious to the point of litigation, when work they have funded has proved unproductive while work done under other auspices on the same problems has proved successful. Measurement of the totality of research inputs must therefore be recognized as at least difficult.

While efforts like Project SCORE are important in contributing overall information on research inputs, there have been suggestions other than those of the OECD Examiners that efficiency of management of research resources lies with the researchers themselves. An Australian professor has recently observed that “the academic staff are the key people in determining the productivity in research. They are subject to a number of constraints and must optimise within those constraints.” The authors can offer no certain prescription for optimisation of scarce research resources. They can only observe that optimisation of time and effort is likely to be difficult in many Australian university departments where researchers combine heavy teaching loads with research commitments and where there is a high degree of uncertainty about future funding. Perhaps optimisation is rather to be sought in the choice of projects and in allocation of funds to competing projects. Implicit in this suggestion is of course the assumption that there are valid measures of research output which can be applied to individuals and to projects.

Whether the outputs of university research can be measured in relation to the achievements or outputs often claimed or at least assumed to result from them. These are (1) additions to knowledge, (2) improvements in university teaching, and (3) improvements in the life of the community generally.
Additions to Knowledge

Universities are not modest in their aims of adding to knowledge. Nobody has expressed the aim of science in universities as "to seek eternally for fundamental explanations, to keep working at it as long as men are able to understand fully and deeply the processes of nature." Obviously in this context the university researcher need not be confined to the thought that his work are not immediately applicable. Moreover in the face of P Navy's eloquent warnings it is far too advanced to measure additions to knowledge by universities may well seem crude.

Freeman has reviewed methods based on counts of scientific papers resulting from research. While such methods hold the appeal of simplicity to statistical analysis, they have grave deficiencies. There is the overall danger of equating quantity with quality. Some subjects are likely to lend themselves to more papers than others. Publication will be restricted to those achievements which are socially most valuable. Some institutions will exert more pressure on researchers to publish and so a large number of the greatest number of articles from the smallest piece of research may result. For such reasons Freeman concluded that "great caution is necessary in applying these measures."

Another difficulty in measuring a piece of research as an addition to knowledge is the fact that its significance may not be recognized for many years. There is no evidence that between 1910 and 1920, contemporaries of Einstein had any real evidence of the great improvements in the material standard of living such as new uses for natural resources, new manufacturing processes providing wider ranges of goods, medical discoveries improving the health of the community.

New technologies are often introduced which are not immediately applicable. For such reasons Freeman concluded that "great caution is necessary in applying these measures."

Diffusion of Findings

Unfortunately research capable of saving our environment is probably not being applied in industry or as any other type of university research. The OECD Examiners noted that contacts between industry, universities and research institutions are sporadic and often confined to personal relationships. They also commented that "we feel that students of universities and industry, several references were made to barriers of a cultural or psychological nature between the academic world and the world of industry."

These views are supported by other evidence, notably a survey commissioned by the Federal Government in 1972 which reported that there is little contact between universities and industry outside of Australia. Industry does not appreciate the needs of universities, and university staff do not appreciate the needs of industry.

If the OECD Examiners were not in agreement on an issue it was that of measuring the results of research. Even so the voluminous literature on diffusion of innovations few studies have focused on university research. The few include two British studies on both of which revealed misunderstandings between universities and industry. The 1969 study at University College found researchers interested in developing and maintaining contacts with industry.

The other source comes by way of the Confederation of British Industry in 1970 commented on "differences in outlook" and "differences in time scale and objectives of universities and industry."

J. T. Allen also sounds a warning note in his report of a recent study of technological transfer in the Republic of Ireland. The report concludes that most small countries have attempted to aid the technological development of their industry through matching grants or loans and research institutes. What evidence there is on the effectiveness of such efforts indicates that this strategy has generally failed. The universities and research institutes may develop a very high degree of technological competence, but this is seldom successfully utilized by industry. If measures of direct industrial application are applied as measures of the productivity of university research one must have some very poor scores to explain. Remember, for example, that Langrish and his colleagues in the recent report found that out of the 59 important innovative ideas from sources outside the firms, only 10 had come from universities in any form.

There are therefore serious limitations in attempts to quantify outcomes of university research as additions to knowledge, improvements in teaching and so on. It should not be said that such benefits do not exist or that they cannot be demonstrated. Universities
provide consulting services to the community through direct arrangements with academics. Some universities, such as the University of New South Wales through Unisearch Limited and the University of Newcastle through TUNRA, have set up special units to communicate with industry and to organize contract research and consultancies.

There remain, however, many problem areas in the diffusion of the results of university research and of the knowledge and skills of members of universities. There may be problems in contract research when the funding body wishes the results to remain confidential and seeks to impose limitations on publication. Opinions differ on whether universities ought to patent inventions developed with public funds. In the use of research students on problem-solving projects conflicts of objectives can arise between universities and the organizations with the problems. There is also imperfect knowledge within university departments of research activities in other departments. Whether such knowledge is shared seems often to depend on coincidence and personal contacts, or even on requests from students for permission to work on projects in other departments. The productivity of any university's research might be improved by the creation of a data base of ongoing projects and available expertise. So might the quality of the consultancy services provided.

There are also peculiarly Australian problems in making university research more productive. The OECD examiners suggested that:

It may reasonably be assumed that enterprises controlled from abroad concentrate their development work mainly on adapting foreign products and processes to local conditions, whereas the low level of resources devoted to development work in independent Australian firms suggests that in many cases their development effort is not sufficient to exploit fully and rapidly the results of fundamental and applied research. 10

In these circumstances opportunities for Australian academics to become entrepreneurs and set up their own companies to take high technology into the community are likely to be severely limited. By contrast in the United States Roberts identified in 1966 in the Boston area 105 companies which were spinoffs from Massachusetts Institute of Technology laboratories and 51 which were spin-offs from MIT academic departments. In considerations of increasing the productivity of university research, however, there is the more serious general problem of the inadequacy of our knowledge of the processes by which diffusion of innovations takes place. Simple linear models of relationships between basic research and applied research and development have been discarded. Schon has pointed out how complex diffusion models must be if they are to cope with the "dynamically conservative plenum into which information moves." 11 Burns has questioned beliefs about technology transfer based on assumptions that transmission of information from academic research to industry will lead to commercial exploitation and eventual use. Burns also rejects the notion of technology as an assemblage of pieces of information which can be extracted or expelled from one sector of organized creativity and transposed to another to produce different outputs. 12 Burns has suggested as "a simple, clarifying notion" that "the mechanism of technological transfer is one of agents, not agencies; of the movement of people among establishments, rather than the routing of information through communication systems." 13

Conclusion

Acceptance of this notion implies that in order to improve the productivity of their research universities might have to be much more open to the community generally and much more flexible in their tolerance of movements of staff and students in and out of academic environments. In the present economic and political climate universities may find their best form of defence lies in more strenuous efforts to demonstrate what their research contributes to knowledge, to teaching and to the community. What they are defending can be narrowly viewed as their share of public funds. On the other hand, it may be the essence of universities which is at stake — at least for those of us who subscribe to Nathan Pusey's belief that:

A university was, and is, first of all an association of scholars. It is their essential function not to produce goods or perform practical services, but simply to keep a life of mind vigorous and functioning among us. Though it is a cardinal article in this basic faith that from this kind of activity, provisionally, other kinds of goods now associated with the university are apt to flow, the first justification for it is not this, but simply that mental activity of this sort becomes our full humanity. 14

2. Australia, Universities Commission, Sixth Report, May 1973, Table 4.1, p. 239.
7. Ibid. p. 31.
23. Ibid., p. 12.