

staff is tenured; this includes 97 per cent of full professors and 87 per cent of associate professors. If Australia were to shift away from tenure on any substantial basis there might be difficulties in recruiting staff.

Associated with the notion of hiring staff on contracts is that of a shift towards a free market. This would probably involve fixing academic salaries on the basis of a minimum rate but allowing an individual to negotiate a supplement on top of that. The supplement could be varied from year to year in relation to performance, responsibilities and market conditions. This is broadly the American system although a very high proportion of the more senior academic staff of American universities are tenured. It appears to be what Bond University is proposing.

### 5. Conclusion

In spite of the changing context in which individual scholars now interact with their institutions and the institutions with society, and in spite of the shift from a collegial towards a managerial operating mode, there has been little change in the formal conditions of academic employment. If anything, the conditions have become more, rather than less, rigid; for example, in the appointment and employment of tutors, in the prohibition by the State Grants legislation of paying above recommended salary levels. It would, therefore, be rash to predict change.

Nevertheless, the pressures for change

are there, and they are strong. Criticisms of the conditions of employment in institutions of higher education from political, official and business circles are strident. Although these criticisms are often grossly exaggerated, the institutions have not succeeded in mounting a convincing defence, largely because the criticisms have some validity and the institutions do not have in place sufficient processes of accountability.

Pressures for change also come from the bodies that advise governments on these matters. In particular, the Commonwealth Tertiary Education Commission, which is an expert body that should be seen as sympathetic to the aspirations of the institutions, is arguing for change, even if at a gentle rate.

From within the institutions themselves governing bodies, vice-chancellors and principals are increasingly concerned about accountability and flexibility and the need to improve management. Moreover, there are now many scholars who themselves favour change and a shift towards a more flexible, entrepreneurial style.

As we move into the 1990s, the vital question that we face, both as administrators and academics, is how to react to these pressures while preserving in our institutions their essential mission to conserve, transmit and extend knowledge. We can, of course, man the ramparts and pull up the drawbridge. But if we do this,

we shall, at worst, be starved out; at best, we shall become isolated — ineffectual and irrelevant. Some response in the directions that I have indicated is necessary. We should all be prepared to make it.

\*This paper was originally presented at the conference, "A New Order for Tertiary Education in Australia", held 9-12 July 1987 at Darling Downs Institute of Advanced Education.

### References

1. Commonwealth Tertiary Education Commission: *Report for 1985-87 Triennium*, Volume I, AGPS, Canberra, April 1984, Part I, paras 4.2-4.14; Volume II, AGPS, Canberra, September 1984. Part I, para. 2.32. *Report for 1988-90 Triennium*, Volume I, AGPS, Canberra, May 1987, Part I.
2. Commonwealth Tertiary Education Commission: *Review of Efficiency and Effectiveness in Higher Education*, AGPS, Canberra, 1986, (Chairman: Mr H.R. Hudson), Ch. 4, pp.141-148.
3. Australian Science and Technology Council: *Improving the Research Performance of Australia's Universities and Other Higher Education Institutions*, Commonwealth of Australia, February, 1987 (Chairman: Professor R.O. Slatyer), Ch. 4, pp. 25-31.
4. Commonwealth Tertiary Education Commission: *Review of Efficiency and Effectiveness in Higher Education*, AGPS, Canberra, 1986, Ch. 5.

## An early retirement option for Australian academics?

Staffing levels in universities in Australia, as well as in Europe and North America,<sup>1</sup> peaked in the mid-1970s after 20 years of unprecedented growth. Between 1956 and 1975 the number of universities in Australia increased from nine to 19, and there was almost fivefold growth in student enrolments and full-time academic posts. In contrast, enrolments rose by only 18 per cent between 1975 and 1985, while the number of academic staff increased by merely 5 per cent.<sup>2</sup> It seems reasonable to assume that the Australian university system will experience, at best, only modest expansion over the next decade.

The majority of academics appointed during the period of expansion were recent graduates, and hence relatively young. With limited turnover in positions and few new jobs being created, the age distribution of Australian academics is shifting.<sup>3,4</sup> The Australian universities will carry into the 1990s a labour force that was recruited mainly in the 1960s and 1970s. The median age of tenured academics will probably soon exceed 50, and there will be more elderly academics than ever before. Almost all academics at senior lecturer or above hold tenure. They will be displaced prior to retirement at 65 only if tenure conditions are changed or incentives are offered for early retirement. The concern in the following commentary is with issues relating to whether early retirement options should be generally available to Australian academics.

### Consequences of the end to growth

In 1982, the most recent year for which detailed statistics have been published, 21 per cent of professors in Australian universities were under 45 years of age, as were 38 per cent of readers and associate professors, 58 per cent of senior lecturers, and 84 per cent of lecturers. In 1985 the turnover in tenured jobs through resignation, retirement, or death was less than 5 per cent. Unless many young graduates become academics, which could occur only if new jobs are created or there is a high turnover in currently tenured posts, the median age of tenured academics will increase cumulatively until the first decade of next century, when many reach the mandatory retirement age.

Academics recruited in the 1960s were the lucky generation. By entering an expanding system at a time when the supply-demand relationship is quite different from what it is now, they enjoyed rapid advancement. The career development of academics recruited in the 1970s has been adversely affected by the end to university growth. In an analysis covering four disciplines, Over and Lancaster<sup>5</sup> showed that only 48 per cent of men appointed as lecturers in 1975-1976 had advanced to a senior lectureship within seven years, in contrast to 68 per cent of the men appointed as lecturers in 1962-1964. The career asymptote for many among the recent cohort of academics will be a senior lectureship, since the number of chairs and readerships has increased only slightly over time and many existing appointments at these levels are held by academics who are still relatively young.

The end to university growth has meant that graduates who became academics in the 1960s have been advantaged over subsequently appointed academics not necessarily on the basis of qualifications, skill, and merit, but through labour market conditions. Overall, however, tenured academics have been favoured over the many recent graduates who cannot gain lectureships even though they have the credentials that would have virtually guaranteed such a job a decade or two earlier. The university system encourages intergenerational competition, but discourages, and even prohibits,

Ray Over

La Trobe University

evaluative comparison between individuals who differ in rank and status. Thus graduates from the same generation compete among themselves for entry to an academic career, but a person cannot gain appointment or promotion through displacement of a tenured academic.

**"The end to university growth has meant that graduates who became academics in the 1960s have been advantaged over subsequently appointed academics not necessarily on the basis of qualifications, skill and merit, but through labour market conditions."**

Under current conditions tenure is maintaining a labour force constituted of earlier cohorts of graduates. In addition, the large majority of academics are male. The sex ratio among academics in the late 1970s, when university expansion had ceased, was much that which would be expected in terms of the relative participation rates of men and women in postgraduate training a decade or so earlier.<sup>6</sup> In 1968, for example, women gained only 5 per cent of all PhD degrees, and 17 per cent of all Masters degrees, awarded by Australian universities, and they trained primarily in education, humanities, and the social and behavioural sciences, the disciplinary groupings in which women are found in largest numbers as academics. Whereas few women qualified when many positions were being filled, many women completed postgraduate qualifications in the 1980s, at a time when few academic jobs were available. Further, substantial numbers of women have qualified in fields where women traditionally were underrepresented. The sex ratio of academics would shift markedly if labour market conditions in the 1980s were as they had been in the 1960s. However, in a static system in which many academics (mostly men) are

tenured, recent graduates (many of whom are women) lack the opportunity to gain lectureships, or to experience rapid career development.<sup>7</sup> Ironically the last period of university expansion was fuelled by the increased participation of women in undergraduate training, and many of the men who were recruited in the early to mid 1970s, and now hold tenure, owe their jobs to this generation of women students.

The push for an early retirement option for academics is likely to come from recent graduates (who can get jobs only if tenured academics are displaced), women (who can increase their representation and career prospects only by freeing up jobs), and mid-level academics (whose advancement is blocked by an earlier cohort of academics), while the pull may well come from older academics if economic incentives are sufficient. However, the case for introduction of an early retirement scheme will probably be argued not on the grounds of opportunity and equity, but on the basis that effectiveness and efficiency within universities will decline unless the anticipated shift in the age distribution of academics is avoided. Is it true, however, that academics become less productive as they age?

### Age and performance

In considering productivity in relation to age, it must be kept in mind that there is no single criterion in terms of which the standard of performance of an academic can be assessed validly. This conclusion reflects the diverse roles (for example, researcher, teacher, administrator, mentor, supervisor) that are recognized as legitimate for academics. Performance levels can be assessed by many indices — publication rate, citation rate, level of funding from external sources, success in postgraduate supervision, evaluation of teaching, awards, honours, peer ratings, and so on. Correlations between these measures probably differ between disciplines, since some roles are more normative (and hence legitimate) in disciplines where the focus is on fundamental research than in professionally oriented disciplines. Instead of being open to absolute definition, constructs such as performance, productivity, excellence, and equity are bound up with values and accepted practices.

However productivity is defined, the correlates of productivity in the Australian university context need to be identified before human resource interventions aimed at improving efficiency can be justified. Unless they have an empirical basis, interventions such as displacing older academics may be not only discriminatory but cost-ineffective. It would not be too difficult to establish through multivariate analysis the relative influence that a range of individual, in-

**“Almost nothing is known about what factors in the Australian university system lead some academics to be productive, and others not.”**

stitution, and system-wide variables have on different indices of performance. However, no such data currently are available. Almost nothing is known about what factors in the Australian university system lead some academics to be productive, and others not. What are the relationships between job satisfaction, commitment of time to different work roles, productivity, access to resources, career advancement, and role expectations? Do academics become less productive if they perceive little chance of promotion, or if they cannot get research funding? What factors affect motivation and morale? Do academics shift roles if satisfaction becomes limited in particular roles? How currently do the work roles of younger and older academics differ? Also, male and female academics? In view of the size and nature of the particular workforce, it is surprising that so little is known about how and why Australian academics function in ways that they do. The paucity of data on Australian academics must limit confidence in claims about the likely effectiveness of specific human resource interventions.

Although there has been only a single Australian study,<sup>8</sup> reference can be made to a general literature on the relationship between age and research achievement. Einstein claimed “. . . a person who has not made his great contribution to science by the age of thirty will never do so,”<sup>9</sup> while Hardy, the British mathematician, wrote “. . . mathematics, more than any other art or science, is a young man’s game . . . I do not know of any advance initiated by a man past fifty. If a man of mature age loses interest in and abandons mathematics, the loss is not likely to be very serious either for mathematics or for himself.”<sup>10</sup> The main statistical evidence in support of these claims has come from Lehman,<sup>11</sup> who analyzed citations in histories of science and similar sources in order to identify the ages at which individuals had made major discoveries and other outstanding contributions. Lehman concluded that creativity peaks at 26-30 in chemistry, 30-34 in botany, mathematics, and physics, 30-39 in genetics and psychology, and 35-39 in geology, medicine, and physiology. He advised the aging scientist to shift to administration, since achievement as an administrator peaked in a person’s 50s!

Lehman’s conclusion that creativity

declines with age is questionable, since his methodology is invalid. Lehman asked what proportion of outstanding contributions have come from scientists in different age groups, but he failed to recognize that, at least until recently, there were many more younger than older scientists at any point in time. Hence individuals had many more competitors for recognition later than earlier in their career. Lehman should have asked whether older scientists (of whom there have been few numerically) were proportionately as likely to make outstanding contributions as younger scientists (of whom there have been many numerically). In order to answer this question, Zuckerman<sup>12</sup> compared the ages at which American Nobel laureates in science completed their prize-winning research with the age profile of American scientists in general. The two distributions coincided. Thus, if outstanding contributions have come most often from young scientists, it is primarily because there have been more younger scientists.

**“... if outstanding contributions have come most often from younger scientists, it is primarily because there have been more younger scientists.”**

Several investigators<sup>13-17</sup> have measured the publication and citation rates of younger and older academics at one point in time (cross-sectional methodology) or followed a single cohort over time (longitudinal methodology). Although a curvilinear relationship between age and performance is found, a number of older academics achieve at higher standards than many younger academics. Further, a person’s current and future productivity are predicted not by their age, but by their past productivity. In general, academics with high output in late career were prolific in their early career, although there are many initially prolific academics whose output drops with age. Rarely do academics who demonstrated low output in their early career become prolific in late career.

Since most academics experience role changes during their career, research performance may be more directly related to career-status than to age. Priorities between research, teaching, and administration may shift over time. Within a research role the transition can be from knowledge generation (such as bench work) to knowledge synthesis (reviews, textbooks, etc.), management of research, or functioning as a supervisor and men-

tor. Role changes can occur for many different reasons, including obsolescence in knowledge and skills, loss in motivation (“Why should the aged eagle stretch its wings?”, T.S. Eliot, *Ash Wednesday*), and the rewards associated with different types of activity. Although there is a curvilinear relationship between age and research performance, some academics remain prolific as researchers throughout their career. Cole<sup>18</sup> has argued that the career paths of scientists reflect the manner in which the social system of science rations resources, facilities, and opportunities among individuals in accord with level of performance. In these terms successful scientists gain access to the human and physical resources that will facilitate achievement in the future, while unsuccessful scientists are forced into more marginal research roles in mid or late career.

### Early retirement issues

Thirteen of the 19 Australian universities (all but those in New South Wales, where superannuation is provided under a State scheme) have joined the Superannuation Scheme for Australian Universities (SSAU) since its establishment in 1983. The scheme allows retirement from age 55, but the percentage of averaged final salary received as a pension depends not just on years of service but age at retirement.<sup>19</sup> Table 1 shows the percentage of averaged final salary for academics who retire at 55, 60, and 65 after 15, 20, 25, 30, and 35 years of service. Assuming an averaged final salary of \$40,000, a person taking retirement at 55 after 25 years of service would receive an annual pension of \$9,600, in contrast to an annual pension of \$22,000 received on mandatory retirement at 65 after 35 years of service. It is clear from this example that SSAU offers financial disincentives for early retirement.

**Table 1**

Percentage of averaged final salary received under SSAU by academics retiring at 55, 60, or 65 after 15, 20, 25, 30, or 35 years of service

Age at retirement	Years of service				
	15	20	25	30	35
55	14	19	24	29	34
60	25	34	38	42	47
65	30	40	45	50	55

In its recent review of efficiency and effectiveness in Australian higher education, the Commonwealth Tertiary Education Commission (CTEC)<sup>20</sup> recommended

against provision of a supplemented early retirement option for academics, but proposed that a non-recurrent sum of \$40 million (over five years) be allocated so that staff levels can be decreased in areas of falling demand and increased in new fields. Under this proposal retirements would occur on the initiative of the university but with the agreement of the staff member, and superannuation benefits would be supplemented to a point midway between the person’s age at retirement and 65. The Australian Science and Technology Council<sup>21</sup> also supported introduction of an early retirement scheme that will increase flexibility in higher education institutions and provide opportunities for younger researchers. However, to date no funds have been provided specifically for early retirement.

In the CTEC report, concern was expressed about the financial implications of a generally available early retirement option. Costs would depend not only on the level of supplementary benefits (pension or lump sum) to be offered, but the number of academics electing to take early retirement and the policies institutions adopt on replacements. As a further issue, “. . . it would be foolish in the extreme to encourage highly experienced staff to leave the higher education system while they have a good deal to offer and there is a demand for their services.” There is no certainty with a voluntary scheme that the least productive academics, academics in some universities rather than others, academics in disciplines with skewed age distributions, or academics in fields with reducing enrolments will elect to take early retirement. In the early 1980s the United Kingdom universities offered early retirement incentives so that academic jobs would be reduced in number by one-sixth. Retirement was voluntary, and many of those electing to leave universities were academics with alternative career options. The intention of CTEC is that there be targeted displacement in Australian universities with the costs of the scheme being balanced by increased flexibility in human resources, and hence enhanced efficiency and effectiveness.

The stance adopted by CTEC is that the age distribution of academics will right itself in time, and that productivity within the existing workforce can be maintained if universities make wider use of review and evaluation processes. In calculating the cost-benefits of an early retirement option, a factor to consider is that fewer than 10 per cent of Australian academics are 60 or more but almost 60 per cent are between 40 and 55. If the option were to be available only for some few years, the number of jobs available through turnover would increase in the short-term but there would be a lull for several years

after the scheme came to an end. The major problem with a continuing scheme is the large number of academics now aged 40 to 55 who would become eligible for early retirement during the 1990s.

**“If a generally available early retirement option is to be developed . . . attention needs to be given not only to questions of finance but to the attitudes of academics towards early retirement.”**

If a generally available early retirement option is to be developed (which seems unlikely), attention needs to be given not only to questions of finance but to the attitudes of academics towards early retirement. Over and Cumming<sup>10</sup> recently surveyed academics at senior lecturer level and above in non-professional disciplines at La Trobe, Melbourne, and Monash universities. Most of the academics in this sample expressed high job satisfaction, and few contemplated taking early retirement under current SSAU benefits. The respondents estimated they would need on average 81 per cent of their academic salary if retiring at 55, 73 per cent at 60, and 67 per cent at 65 in order to be able to maintain an acceptable standard of living. It seems reasonable to assume that most academics in non-professional disciplines who currently hold tenure will retain appointments in universities until age 65 in the absence of a scheme that provides substantial financial benefits for early retirement. Under present conditions there probably is higher turnover among academics in professional than non-professional disciplines, and the attitudes of these two groups of academics towards early retirement might be quite different.

Although some Australian universities currently make *ex gratia* payments on an individual basis to academics who elect to retire before 65, only one Australian university has provided a generally available early retirement option.<sup>23</sup> For a brief period the University of Adelaide offered a lump sum payment of 30 per cent of foregone salary, in addition to the person’s accrued superannuation entitlements, to any academic between 55 and 64 who agreed to retire. This offer was taken up by 18 per cent of all academics aged 55 to 59, and by 75 per cent of those between 60 and 64.

The benefits currently available under SSAU provide no incentive for tenured academics, particularly those who have not worked in other settings and who have limited alternative career prospects, to

retire prior to the age of 65. These benefits would need to be supplemented substantially before many academics will seriously consider early retirement. The costs of such a scheme would depend on factors such as the level of supplementation, the number of participants, and salary savings on replacement appointments. Not only is there little likelihood that a generally available early retirement option with attractive incentives will be introduced, but there are valid objections, apart from cost, to such a scheme. At the same time targeted early retirement programmes may have beneficial consequences. Changing the composition of the workforce through interventions other than early retirement also needs to be considered.

### Some possible interventions

It seems inequitable that graduates of one generation (most of whom are men) are heavily overrepresented in universities relative to recent graduates (many of whom are women). An early retirement scheme that encourages many older academics to retire would correct this inequity. However, the present age distribution of academics is an historical accident, and a state of affairs that will not recur. Personnel in universities will change with time, and there is likely to be complete correction of the present imbalances by the year 2010 without any of the costs an early retirement scheme would entail. If the concern is with equity, support would be given not to a continuing scheme but to a scheme limited to the 1990s. One problem with a short-term programme is that when it ceases there can be a gap of years before many further retirements occur; turnover is increased in one period at the expense of another period. Further, a balanced workforce may not be achieved if retirement is on a voluntary basis or if there is an insufficient pool of appropriately qualified replacement staff. Because of the many uncertainties as to whether imbalance will be redressed through a voluntary scheme open to all academics beyond a given age, a substantial data base is needed prior to implementation. Perhaps a stronger case can be made for the introduction over the next few years of targeted early retirement programmes aimed, for example, at producing greater turnover of jobs in disciplines with specific age structures or in disciplines where currently there are few women in academic posts. The composition of the replacement pool would again be an important consideration.

Early retirement is advocated typically not on the basis of equity, but on the grounds that academics decline in their productivity and efficiency as they age. If such deterioration were inevitable and universal, there would be a strong case for

**“... there is no guarantee that only the least effective academics will retire if a voluntary early retirement scheme is introduced with age as the sole criterion of eligibility for retirement.”**

mandatory retirement at, say, 55 or 60 rather than 65. Further, this policy would apply on a continuing basis rather than as a short-term measure. As noted earlier, there is not a substantial data base on the relationship between age and level of performance in the legitimate roles of academics. In the absence of such data, it is discriminatory to use age rather than standard of performance as the basis for displacement of tenured academics, even if adequate retirement benefits are provided. Further, there is no guarantee that only the least effective academics will retire if a voluntary early retirement scheme is introduced with age as the sole criterion of eligibility for retirement. If valid performance indicators can be developed, it would seem sensible to shift the focus from older academics to the least effective and productive academics, whatever their age. Incidentally the savings over time are greater if an inefficient younger academic rather than an inefficient older academic can be induced to trade tenure for cash. A major problem with a displacement scheme targeted towards the least productive academics rather than merely older academics is the stigma associated with being labelled inefficient. The alternative open to universities is to focus not on displacement, but on staff evaluation and development, particularly with the aim of improving the standard of performance of inefficient academics. This latter strategy underlies recommendations in the recent CTEC report on efficiency and effectiveness in Australian higher education.

From the CTEC report,<sup>24</sup> it seems most likely that supplemented early retirement will be available to Australian academics within specific targeted programmes rather than as a general condition of employment. The objective will be to enhance flexibility in human resources by decreasing staffing levels in some areas on an accelerated level so that replacement staff can be deployed in other areas. Age is to be used as a criterion, with retirement occurring at the initiative of the university but with the consent of the academic. This degree of labelling, together with limited financial incentives, may render the scheme unattractive.

Staffing flexibility can be increased by

means other than early retirement.<sup>25</sup> The recent level of reliance on limited-term appointments has been justified on this basis. In the past Australian universities have not encouraged fractional appointment, particularly in tenured posts. However, in a recent survey<sup>26</sup> of academics at senior lecturer level and above in non-professional disciplines 56 per cent of respondents expressed moderate or strong interest in moving from a full-time to a fractional tenured appointment (typically half-time, commencing at an age between 55 and 60). At the same time, when asked what commitments they preferred in a fractional appointment, the majority of respondents wanted to drop teaching and administration and concentrate on postgraduate supervision and research! Universities may wish to encourage many tenured academics to move to fractional appointments, but on terms and conditions that meet the needs and interests of the institution as well as the individual. The possibility of a fractional appointment might be attractive to many younger academics, and not just older academics. Australian universities make much less use of adjunct appointments than universities in North America, although development of this form of employment may have many advantages including flexible adjustment of the time committed to different work contexts. Mid-career transitions involving movement from employment in a university to another setting have typically been seen as the exclusive responsibility of the individual. However, consideration should be given to targeted programmes that facilitate such transition.

Although the focus in the present discussion has been on older academics, it must be remembered that the present bulge in the academic staff profile in Australian universities is not at the upper age ranges. In 1985 about 55 per cent of academics were between 35 and 49, in contrast to 27 per cent between 50 and 64 (including 12 per cent age 50-54, 10 per cent 55-59, and 5 per cent 60-64).<sup>27</sup> By 1995 those academics who were between 55 and 64 in 1985 (15 per cent of the total) will have retired, but the academics who were aged 40 to 54 in 1985 (50 per cent of the total) will be 50 to 64. It may be much more cost-effective to target interventions over the next few years not at older academics (since they are relatively few in number and will soon reach the mandatory age for retirement), but at academics now aged 40 to 54. Members of this latter group were recruited and promoted under favourable labour market conditions, they are over-represented relative to other cohorts of graduates, and they now are many years from the mandatory age for retirement. Many will have spent most of their working career within

universities, and the large majority hold tenure. If interventions are to be targeted towards this group, the challenge becomes one of identifying and providing mid-career change options that are attractive to academics who have probably contemplated spending all their working life in universities. Attention should perhaps be directed more to this issue than to the question of early retirement by older academics. Incidentally, the age distribution of academics in Australian universities and advanced colleges are similar.<sup>27</sup>

### References

1. C.V. Kidd, 'New academic positions: The outlook in Europe and North America', in *Science* 1981, 212, 293-298.
2. Commonwealth Tertiary Education Commission, *Review of Efficiency and Effectiveness in Higher Education*, Australian Government Publishing Service, Canberra, 1986.
3. R. Over, 'Age distribution of Australian academics', in *Vestes*, 1981, 24, 15-17.
4. G. Santow and M. Bracher, 'A demographic profile of the Australian National University', Australian National University, Canberra, 1983.
5. R. Over and S. Lancaster, 'The early

career patterns of men and women in Australian universities, in *Australian Journal of Education*, 1984, 28, 309-318.

6. R. Over, 'Women academics in Australian universities', in *Australian Journal of Education*, 1981, 25, 166-176.
7. R. Over and B. McKenzie, 'Career prospects for women in Australian universities', in *Journal of Tertiary Educational Administration*, 1985, 7, 61-71.
8. R. Over, 'Is age a good predictor of research productivity?', in *Australian Journal of Psychology*, 1982, 17, 129-139.
9. Quoted in C.W. Adams, 'The age at which scientists do their best work, in *Isis*, 1945, 36, 166-169.
10. G.H. Hardy, *A Mathematician's Apology*, Cambridge University Press, Cambridge, 1948, p.12.
11. H.C. Lehman, *Age and Achievement*, Princeton University Press, Princeton, 1953.
12. H. Zuckerman, *Scientific Elite*, Free Press, New York, 1977.
13. A.E. Bayer and J.E. Dutton, 'Career age and research-professional activities of academic scientists, in *Journal of Higher Education*, 1977, 48, 259-282.
14. S. Cole, 'Age and scientific performance', in *American Journal of Sociology*, 1982, 11, 511-520.
15. R. Over, 'Does research productivity decline with age?', in *Higher Education*, 1981, 11, 511-520.
16. R.M. Soldofsky, 'Age and productivity of university faculties: A case study', in

*Economics of Education Review*, 1984, 3, 289-298.

17. K.L. Horner, J.P. Rushton, and P.A. Vernon, 'Relation between aging and research productivity of academic psychologists', in *Psychology and Aging*, 1986, 1, 319-324.
18. J. Cole, op. cit.
19. Superannuation Scheme for Australian Universities, 'Summary of provisions, January 1986'.
20. Commonwealth Tertiary Education Commission, op. cit., pp. 181-182.
21. Australian Science and Technology Council, *Improving the Research Performance of Australia's Universities and Other Higher Education Institutions*, Australian Government Publishing Services, Canberra, 1987.
22. R. Over and G. Cumming, 'Attitudes of Australian academics to early retirement', manuscript in preparation.
23. Australian Vice-Chancellors' Committee and the Federation of Australian University Staff Associations, 'A national early retirement scheme for university staff' (unpublished document).
24. Commonwealth Tertiary Education Commission, op. cit., pp. 181-182.
25. D.D. Palmer and C.V. Patton, 'Mid-career change options in academe: Experience and possibilities', in *Journal of Higher Education*, 1981, 52, 378-398.
26. Over and Cumming, op. cit.
27. Commonwealth Tertiary Education Commission, op. cit., p. 160.