How research came to dominate higher education and what ought to be done about it*

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For the past ten years I have been deeply involved in what has come to be called 'research policy', an area of the social sciences which is concerned with the best ways to structure, support, fund and evaluate the human activity called research. Unusually for an academic, I have been involved in research policy as an actor rather than as an analyst — as a member, then chairman, of my country's principal research grants body, as full-time chairman of the much larger research council that replaced it, as a member of the science council that advises our Prime Minister on such matters, and for a few years as a sort of pro-vice-chancellor for research of my university, itself the most distinguished research institute in the country.

These ten years have been turbulent ones for our university and research system, as they have been in the United Kingdom and indeed in most advanced countries. The turbulence has come from a fundamental tension in the universities about the role of research and its funding, and more generally about the role of universities in modern society. It is about this tension that I wish to speak.

I need to offer a second autobiographical note. I am by training a historian and political scientist. That means that in coming to problems of public policy I tend to set things in a long time-scale — for any important matter in contemporary Britain or Australia a century seems to me to be a minimum — and I am sensitive to questions of interest, power and conflict. They abound in research policy!

Research and the development of the university system

Let me begin by offering you a three-period model of the development of the modern university. It is a model, and a broad-gauge one, intended to help shape our perceptions of where we are, where we have come from, and where we are going.

The first of the three periods, much the longest, begins before the Second World War, as early as the 10th century if you want to start with the University of Bologna. It ends, depending on the country, some time after the Second World War. For our purposes the two most important characteristics of universities in this period were that they were small both in number and in size, and that they were not deeply involved in research.

Period II begins when the national government decides that the expansion of higher education is a major national purpose and starts funnelling public funds into higher education for the building of new institutions and for the support of the students who are to attend them. It ends when that period of strong growth comes to an end. In both Britain and Australia Period II began in the late 1950s, and ended for most purposes in the mid 1970s. What characterised Period II was that the number and size of universities grew dramatically, and that research became an essential element both of the work of the university and of the work expected of an academic member of staff. In Australia there was a ten-year episode of 'stasis', from the mid 1970s to the mid 1980s, when growth stopped but the habits of thought generated by Period II persisted.

The third period has just begun, and we do not know when it will end. But it is already possible to point to at least some of its defining characteristics. There will be further growth in the system, but not to any degree in the number of institutions. Research will remain an essential purpose of the university but not of each individual staff member. Universities will become more different rather than more alike, and their importance to their communities will grow. Since we inhabit Period III we have some responsibility to make sure that the evolution of the university system in our time is a productive one, and if possible also a harmonious one. In the concluding phase of this lecture I will concentrate on what that means for academic life in the coming decade. But let me now return to the first two periods, for virtually all of our problems originated there.

Period I: From the beginnings to the 1950s

Academics are great defenders of what is, and I am sometimes tempted to regard them as in the same league as parliamentarians (with respect to the institution of parliament) and judges (with respect to the courts) as the apostles of the true conservatism. There is some sense in bringing these groups together, since their institutions are comparably ancient.

But of course their links with the past can easily be overstated: electoral reforms and the modern party system transformed parliaments in the 19th and early 20th centuries, and the court system has been greatly enlarged and diversified, while universities, to say it again, are very different institutions in 1990 from their counterparts in 1890.

It is true that Wilhelm von Humboldt was preaching the essential unity of teaching and research in the early 19th century, and that the Americans to some extent modelled their university system on the German one, because of its insistence on research. It is true also that the great university laboratories like the Cavendish and the Clarendon belong to Period I, and the leading journals in the basic disciplines were founded here too. It is true that there were some departments of some universities in which research was fundamentally important and vitally affected both teaching and the attitudes of staff to their work. Yet it has still to be said that in Period I universities as a whole were places for teaching and scholarship, hut not notably for research. And the research that was done was mostly of small scale, and relatively cheap.

Research is a very modern human activity. In the form we understand it today — the advancement of knowledge through experimentation, model-building and theorising, and the systematic testing of ideas against evidence — research hardly existed before the late 18th century, and its origin and setting lay in industry, not academe. In Australia what research was done was done in industry until 1926, when the national government set up the Council for Scientific and Industrial Research to support the nation's industries through research. Its child, the Commonwealth Scientific and Industrial Research Organisation (CSIRO), did the greater part of Australia's public sector research until after the war. Even in the USA, which was probably by 1940 the major world producer of research, pre-war universities did less than a tenth of the research that was done, and much more than twice as much was done by government research laboratories.

Of course, the universities could not have been big producers, simply because there weren't many of them and they were not large. Outside the USA there were no graduate schools, and the PhD degree was uncommon (the first person to graduate with the degree from an Australian university did so in 1948). Outside the few famous laboratories research was done as an adjunct to the teaching process, research granting schemes were few in number and poorly funded, there were no armies of postgraduate students and by and large the universities were not in any explicit way funded for research. The urge was there, and the talent, and the time, and some excellent research was done. But it was essentially an 'amateur' activity, harnessed neither to a national effort nor to the mission of the university (and of course in those days universities did not think of themselves as having missions).

True, the University Grants Committee in this country had already defined research as a primary function of a university and an indispensable element in the work of university teachers. But what that meant was not clear, and the UGC's grants to institutions were unrestricted in their application, with no portion earmarked for specific purposes.

Period II: From the postwar period to the 1980s

The catalyst for rapid change, in this area as in so many others, was the Second World War, and the role that science was seen to have played in the defeat of the Axis powers. Even before the war had ended President Roosevelt commissioned Dr Vannevar Bush, the Director of the Office of Scientific Research and Development, to report to him on how, among other things, 'the continuing future of scientific research in this country may be assured on a level comparable to what has been done during the war'. Bush's report, the famous *Science — the Endless Frontier* (Washington, 1945), is arguably the Holy Bible of Period II, and since it argued for and resulted in what was to become the National Science Foundation of the USA, the model for most of the world's research granting bodies, it has had an enormous effect outside the USA as well as inside that country.

The very title of his report captures the spirit of Period II. The 'endless frontier' is an allusion to the central theory of the American historian Frederick Jackson Turner, who argued that American society had continuously renewed itself through pushing back the frontier. Bush, in his letter of transmittal to the new President, Harry S. Truman, said:

> *The pioneer spirit is still vigorous within this nation. Science offers a largely unexplored hinterland for the pioneer who has the tools for his task. The rewards of such exploration both for the Nation and the individual are great. Scientific progress is one essential key to our security as a nation, to our better health, to more jobs, to a higher standard of living, and to our cultural progress.*

And Bush was not talking about targeted or applied research. If he did not originate the linear model of research and development, he certainly believed in it. New products and processes, he said, were not born full-grown. 'They are founded on new principles and new conceptions which in turn result from basic scientific research. Basic scientific research is scientific capital.' His proposals were straightforward: increase the number of men and women trained in science (Bush was no male chauvinist), 'strengthen the centres of basic research', encourage industry to do more research itself by providing incentives, provide scholarships and fellowships, and establish a National Research Foundation to support basic research. If this seems an ordinary enough agenda, remember that Bush was writing in early 1945. His agenda has been very widely adopted.

The National Science Foundation, as it came to be called, was established finally in 1950, and became the world's most visible and best funded research-funding body. There is some irony in the fact that this exemplar of basic research funding was, in fact, the result of a compromise intended to balance government control and the 'free play of free intellects'. Bush's original intention was to include divisions devoted to defence and medical applications (similar to the Defence Advanced Projects Agency (DARPA) and the National Institutes of Health (NIH) today) in a foundation with no political control. This proved unacceptable, and with the inclusion of a director appointed by the President, the Foundation restricted its agenda to basic research where government interference would be minimised.

In the model that resulted, the NSF was to provide funds for the best scientists, who would compete by setting out what each proposed to do if successful; these proposals would he judged by experts in the field, who would by doing so exercise peer review. There would in principle be no fixed sums or proportions for this discipline or that one: excellence would rule, wherever it led. Setting research priorities would have been inappropriate.

The National Science Foundation was seen to be a great success; its funding grew, and it was replicated by other countries as the conviction took hold elsewhere that science, especially basic science, held the key to the future. Although the NSF model had to be adapted to the different political and governmental arrangements of each country, what did not alter was the ruling article of faith that the best way to advance knowledge was to set up a reactive funding scheme based on competition for available funds and peer review. Indeed, in many Third World countries, perhaps most visibly in India, the ideology came to significantly shape political and government arrangements with respect to development.

Moreover, that perspective could be and was applied to the social sciences and to a lesser degree the humanities: our capacity to deal with the major social, economic and political problems that beset the world, like racial violence, poverty and totalitarianism, depended upon our understanding of humans and their society. The best way to provide that was more and better basic research in the social sciences and the humanities, and science councils were expanded to take in these concerns (the NSF again acting as a model), or, where that was not appropriate, separate social science research councils (as in Canada or Sweden or the UK) or universal research councils (as in Switzerland or the Netherlands) were established. In these bodies too, a reactive mechanism was the rule and peer review was the key.

To anticipate the story a little, the result has been an astonishing advance in the knowledge that humanity has of the physical universe and of its own part in that universe, an advance that is perhaps without any precedent in human history. The flowering of research in the second half of the 20th century is arguably our century's most useful gift to the 21st century; certainly our grandchildren will have great need of it. I am not suggesting that growth in fundamental research underpinned economic growth after 1950. While the last word has not been penned on this question it is probably true that the causal arrows point the other way. But the advances that have occurred in biology, computing, prehistory, linguistics, astronomy, economics, geology, political science and physics — simply to take the areas where I have read enough of the story of that advance to recognise its sweep — have transformed our view of the world and our place in it. We have come to see problems as inherently capable of solution, and to regard research as the mechanism through which important problems are solved. It is hard to imagine a virtuous world of the future in which research was not an essential activity of human society.

Affluence and demography

The arrangements set up to fund research could have existed, in principle, within the framework of static funding, but in fact they almost universally coincided with a sustained increase in funding for research. The end of the Second World War was followed (as had not been the case after the First World War) by a long period of

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economic growth and prosperity, even in the countries which had been vanquished. Democratic governments found that the combination of growth and the income taxation system provided them with a small increment each year which could be used in ways pleasing to the party in power. Research was not one of the principal beneficiaries (the education system, health and social welfare were the big gainers) but it was seen as virtuous and connected to other virtuous purposes, like defence, health and education. In any case the research base was in the beginning quite small, and increases to the research endeavour had little impact on the national budget.

Nowhere was the change more marked than in higher education. The new emphasis on fundamental or basic research pointed to the university, which after all did have a tradition of disinterested inquiry, as an appropriate home for those taking part in basic research, and that view was enthusiastically embraced by the universities themselves. And all Western countries experienced a great increase in the demand for higher education during and after the 1950s. In Australia the increase in the number of students was ten-fold, an order of magnitude expansion which greatly outstripped the growth in population and in national wealth, and completely changed the face of Australian higher education.

From the seven universities and one university college of 1950, with 31,000 students and 1300 staff, there were 35 years later 19 universities with a second tier of 45 institutions of advanced education with a combined total of 370,000 students. By 1985 all academic staff in universities were expected to be doing research, were likely to be contractually obliged to do so, and worked in institutions that were funded by the government on the assumption that staff were engaged in research as well as in teaching. Research was also undertaken, to a much smaller degree, in the advanced education sector, which was not funded by the government specifically for that purpose.

In addition to the funding incorporated in the universities' operating grants, academics had access to the funds provided by the Australian Research Grants Committee (ARGC), the local counterpart of the National Science Foundation, and to other research granting bodies set up at various times to pursue particular lines of research in medicine, energy, rural industries, and the like. (The move to research funding in Australia was modelled precisely on the National Science Foundation and the granting body was originally to be called the National Science Trust.)

No explicit research priorities directed this expansion. By and large institutions were built on the models that currently existed, or sometimes were deliberate counter examples (in the 1960s and 1970s there was something of a vogue for universities built around "schools" rather than around departments, since it was felt by some that departments constructed boundaries around themselves that were on the whole inimical to broad-ranging intellectual inquiry and research). The convention grew that if a university agreed to teach a body of knowledge it was appropriate, indeed mandatory, for its staff to be involved in research in that body of knowledge and for there to be a graduate program, with PhD students. The details were different, but something like this process went on across all the advanced industrial countries in North America and Western Europe, at much the same time.

The result was that by the 1980s there existed something in all advanced Western countries that had had no real counterpart in 1950 save in the USA. It can be properly described as a research system, and had three main elements, of different sizes in different countries: private industry, where the research was mostly dictated by the needs of the companies which organised and paid for it, government laboratories, where the research was dictated by national needs of one kind or another (defence, agriculture, health, meteorology, national standards and the like), and higher education, where the research was mostly dictated by the interests of academic staff. The pattern of staff research was in turn a function of student enrolment in particular courses, since that determined the pattern of hiring of academic staff.

These three elements interacted. The universities, which became progressively more involved in graduate education over these years, were responsible in particular for the supply of researchers and support staff for the other two sectors (though my own country continues to import such people from overseas — local supply remaining inadequate for some local needs), and for the great bulk of basic research — for "the knowledge base", as it came to be called. The government laboratories that had a particular focus or end-user supplied that service or that end-user (weather reports, polio vaccine, the Army), while those that had a more diffuse but strategic purpose were expected to carry out research which was in some sense in the long-term national interest.

Because good researchers do in fact follow their noses, no matter who employs them, a good deal of basic research was done in government laboratories, and to a much smaller degree, in industry. Industries that carried out or commissioned research did so for their own commercial purposes. And industrial or 'user' problems had an effect, mostly implicit, on what was described by academics as 'pure' research. This was most obviously the case in pharmaceutical science, medicine or acronautical engineering, but it was true also to some degree in geology, biology and chemistry. To complete the circle, academic researchers in the social sciences and in the humanities were always affected by conditions and problems of the contemporary world, no matter how apparently removed their research area was.

For the most part, the three sectors remained separate. There was a limited amount of industrial funding of both government laboratory and university research, and there was a limited amount of collaboration between government laboratories and university researchers, but by the 1980s it was widely agreed that the links between the sectors were weakly developed and should be much stronger.

Growth and stasis

No biological or social system can grow indefinitely, and the research systems of the Western countries were affected in their development by a profound change in the two factors which had been especially responsible for their growth: affluence and demography. The "oil-price shock" of 1974 marked the end of the long boom, though other factors (for the United States, involvement in the war in Vietnam) also played a part, while by the middle 1970s the children of the postwar "baby boom", whose demand for school and university education had produced the huge expansion in the world's education systems, had passed through those systems and were now in the workforce. Governments now had relatively less income and relatively greater demands upon it. In consequence, they began to look much harder at their expenditures to see whether they could be reduced or produce more beneficial effects for the same output.

The joint effect of these changes was severely felt in universities, for the university world had become used to expansion. I will use my own country as the example, but I know that the same process occurred throughout the countries of the advanced world. Between 1950 and the late 1970s there was a sevenfold increase in the number of staff in mathematics in the Australian universities, comparable increases in the sciences, and even larger growth in the social sciences.

In effect university staff doubled in number three times: first from 1950 to 1960, then from 1960 to 1967, then finally, and not completely, from 1967 to 1976. Growth of this kind and at this pace transformed the expectations of academics, who not unnaturally began to see it as the norm. Graduate programs grew rapidly, and there was a place for every PhD — in the early period, two or three places. Australia imported thousands of academic staff, mostly from other English-speaking countries. The universities were explicitly funded for research in 1963, and the ARGC was set up to provide funding for the more expensive research, on a nationally competitive basis, in 1964. The future deemed limitless, and great plans were made.

Then, an abrupt stop. Student intakes, which had been growing by six or seven per cent a year throughout the system in the 1960s, began to level out in the late 1970s. The Commonwealth Government, which had taken over all funding for higher education in 1974 and had abolished student fees, had a deficit budget in the same year and an even larger one in the following year. The ARGC had its funding severely cut in 1976, and never recovered its funding base. As successive governments struggled with budgetary deficits, higher education funding was pegged to student places, and these did not rise materially for a decade.

The system did not adjust quickly or decisively to stasis. There was an understandable belief that the change was temporary, and there was not yet a competing view of the proper way to organise and fund research. Even in the United States, where scepticism about the fundamental value of basic research had emerged in the 1960s, leading to a celebrated study of the origins of innovation, the 'curiosity-led' paradigm remained dominant, as it did also in the United Kingdom, where the limits to growth were recognised by the Government, if not by the universities. In essence after 1976, the system in Australia grew slowly or not at all in financial terms (and the role of industrial research and development also declined in this period, for a complex of reasons related to the oil-price shock). But paradoxically the number of researchers continued to grow, mostly because the graduate programs continued to produce trained researchers, who could be employed on a short-term basis at a low salary and on short-term finance: 'post-docs' became a research phenomenon in Australia, as they already were in the United States and Europe.

There were, however, straws in the wind. While the money for basic research did not grow, that for 'mission-oriented' research did, in most countries, including Australia. The serious study of 'performance' in research began to develop, most obviously and most effectively in the United Kingdom, but also in the Netherlands, which led the way in application. Some countries, Sweden being the exemplar, moved the pattern of funding in research so that more basic research was done in fields thought to be important to the national interest: basic research was perceived to have strategic value. Countries that had large government research laboratories reviewed these extensively in the mid-1980s with a view to keeping them close to industrial and other users. The catch-cry was 'relevance'.

At the same time, one Western country after another began to see research and development as an indispensable weapon in the fight to improve economies that were lagging behind in the new competitive international marketing game whose rules seemed to have been set by Japan. The remedies proposed were nearly universal: value must be added to traditional products, there had to be a shift to products and processes based on knowledge rather than on raw materials, engineering and technology had to be given their due, some areas of research (usually the same ones) had to be given priority and so on. Since Japan was not considered strong in basic research but the West was, one bold remedy saw the West 'leap-frogging' Japan through the aid of basic research, producing the products and processes of the 21st century before the great rival could do so. That strategy unquestionably involved 'picking winners', the fields of research which would generate the products and processes which in turn would revitalise the economies of the West.

The strategy attracted criticism for at least three reasons: because of the inherent uncertainty involved in forecasting the future, because the approach seemed to subvert the traditional ideology of research — that researchers must be allowed to follow their own sense of what was important — and because the strategy involved differentially funding areas of research on grounds other than excellence.

Was science in a steady state?

Western governments, in the field of research and development, were not unlike corporations in the retail field. The latter spent a lot of money on advertising, and would spend even more if they could be convinced the result would be an increase in market share; governments felt much the same way about research and development. A lot of money went into it, and everyone knew it was important, but no one could say confidently that any given piece of research would provide any kind of return. So governments began to insist on being provided with 'priorities', with statements that some research endeavours, or research fields, or research programs, or research projects were more important than others for good and stated reasons.

Their dilemma was most forcefully set out by the British scientist John Ziman in a paper entitled *Science in the Steady State*, which developed views expressed some twenty years earlier by Derek de Solla Price.

Ziman had noted how the research endeavour in Britain had grown almost exponentially and had then levelled out, at least in budgetary terms. Since exponential growth cannot continue indefinitely he looked for the causes that had produced the levelling-out, and concluded that they were international and not confined to Britain. In essence, science was being strangled by its own success. Advances in knowledge were causing a proliferation of research fields, an internationalisation of the research endeavour, an increase in the complexity and cost of research techniques, apparatus and infrastructure, an ever-greater horizon for practical applications, and an expanding demand for interdisciplinary research. But national budgets were not growing at the same pace, and demand for highly skilled people from other sectors of the economy was increasing steadily.

A measure of the problem is the growth in the number of serials — learned journals — which now consume the greater part of the purchasing budget for any major university library. No one knows how many serials there now are, but my own country's National Library holds more than 100,000 serials, and the holdings of major university libraries, like that of the University of California system, are comparably large — librarians will tell you that most journals are little used outside the specialities that produce them, that on average an article is read once, and that most articles are never cited by those who come afterwards. It is hard to escape the conclusion that our problem is not in producing research — we are conspicuous over-achievers in that — but in organising that production. To adapt a familiar metaphor, we have let a million flowers bloom, but we have forgotten to develop a cut-flower market.

Ziman himself concluded that concentration and selectivity were simply unavoidable. If research were as important as researchers said it was, and countries wished to remain competitive in research, whether industrial, strategic or curiosity-led, they would have to make some decisions about the areas they intended to be competitive in, and ensure that these areas had the necessary mass and funding. This would be true even if science were not in an absolutely steady state, and the research budget were increasing. For the size of the national research endeavour in the advanced Western nations (approximately $16 billion in the UK and $3 billion in Australia) was such that very large increases in funding over short periods of time were now quite improbable. The age of doubling the research endeavour every seven to ten years was over. Unless decisions were made to prefer one line of research activity to another, constant funding would mean a reduction in the output and efficiency of research and development activity. Even increases in funding would require priority decisions, since increases would not be sufficient to fund every line of research at an appropriate level.

While Ziman's analysis was the first to treat the research endeavour as a global intellectual process whose growth was governed by some uncomfortable conditions, elements of his analysis were familiar enough. The notion that countries had to decide what kinds of research and development they were going to be 'good at', while

still unacceptable in the USA, had been taken to heart in the 1970s in smaller countries like Sweden, and was the basis of the astonishing increases in GDP of Japan and Korea. The priority-setting that these countries engaged in involved government, industry and the universities, and was a blend of national direction from the highest levels of government and industry with scientific direction from those in the laboratories and in touch with world research trends — a mixture of 'top down' and 'bottom up'. And in these three countries basic research, the kind favoured by academics, was not ranked especially high.

The working-out of these processes has been uncomfortable for the universities. Very simply, research could not be controlled as simply as teaching. If fewer students enrolled, fewer courses or classes could be offered. But research kept widening, and its cost kept growing. Governments could keep a lid on the bubbling research saucepan, but only at the cost of increasing the pressure and the unhappiness within. Moreover, the astonishing growth in research activity had effectively internationalised the research profession, and the best researchers found it easy to move to where the best research could be done. As has frequently been remarked, university people belong to two 'colleges': the one that pays their salaries and the invisible one that determines their intellectual allegiance, usually defined in disciplinary terms. The invisible college controls reputations in research, and since the university world now defined the 'best' academics as those with the greatest reputations in research, universities are in the uncomfortable position of seeing their best staff threaten to leave unless they receive the wherewithal necessary to keep them competitive with their peers, which cuts across traditional notions of 'parity of esteem.'

Period III: From now on, for quite a while . . .

I have not thought it necessary to spend much of my time on the details of the conflict between government and the higher education system. They differ in timing and in heat from country to country. What is important is understanding the engine of that conflict, which can now be seen as sharply differing conceptions of the proper place of research in the modern university. Because I believe that John Ziman's analysis is essentially correct, I believe also that the universities need to think again about research, and why it is done, and who should do it.

I have worked in universities in Britain, the USA and Australia and lectured in and visited universities in several other countries, and they are marked more by their similarities than by their differences. The notion that all academics should do research seems to me defensible only if one believes that research is somehow good for you.

I will be brutally frank: the notion that all academics are good at research (and should therefore be funded to do it) is bunkum. The notion that without a solid and continuing performance in research an academic simply cannot be an effective university teacher at any level is likewise bunkum. But these two notions are built into the culture and the rhetoric of the modern university, and they need to be given a decent burial. In countries which have a 'dual funding' system these notions are also built into the ways in which universities are funded, so the burial is necessarily a protracted affair, and the wake seems everlasting.

Perhaps it will be thought that I have dismissed these two notions in too summary a fashion. Let me then add a small *douceur*. There are, it seems to me, two indispensable pre-conditions and a further desirable one, if you seek to be an excellent teacher, of anything, at any level. The indispensables are that you should know your subject, and that it should still excite you. Competence and enthusiasm are the base for everything else. The desirable pre-condition is that you should have been trained in the arts and skills of teaching itself. Paradoxically, very few university teachers have any training in those arts and skills. What they have been trained in, if they have their PhD, is research. If continuing activity in research contributes to greater competence in the discipline that one has to teach, rather than to greater knowledge of a tiny specialisation within that discipline, then it is playing a part in the business of teaching.

I remain to be convinced by evidence that it is the only way to establish or maintain competence as a university teacher. I would accept that those undertaking their PhD training should be taught by those who have established their competence in research, for the PhD is a degree in research. But it is not obvious that the needs of undergraduate education should be given by PhD training.

What can be said about the emerging rationale for research in the Period III university is something like this. The university will have to choose what it wants to be good at. In the natural sciences and engineering to be good at something in most fields will involve the expenditure of increasingly large amounts of money. Money will remain limited, even when the system grows. Universities, like countries, will have to collaborate if certain kinds of research facilities are to be available to their staff. Some universities will become known as research institutes which also do some teaching; some will become known as teaching institutions where some research is also done. There will be a wide range in the mixture of research and teaching which is seen to be appropriate for an institution which is called a 'university'. And within universities not every staff member will be able to do research, let alone the research that he or she would like to do in the best of all possible worlds. Those who do it will have demonstrated their talent for it by performance, or by finding sponsors or patrons, or by the acclaim of their peers.

And here is the human relations problem. Most academics are, in my view, driven not by power, or by riches, or by sexuality, but by the desire to be honoured and esteemed by their colleagues. I do not wish to be misunderstood and I do not have the time to develop this line of argument as I would wish. In this area I am a kind of Adlerian, rather than a follower of Jung or of Freud. It seems to me that the organisation of research, with its prize system, from the Nobel down through fellowships of learned academics, medals, prizes, invitations to give lectures (like this one!), honorary degrees and all the rest, is explicable only if academics are driven by the need to be esteemed. And within the higher education system only one element of life and work is organised to attract esteem — and that is research.

What this means in practice is that appointments and promotions in universities are governed by research performance. It means that there are two classes of academic: the ones who are in a position to do their research and the ones who can't get the money or time to do theirs. It means that when a research-funding body like mine makes a grant it is fundamentally affecting career prospects.

In consequence, research funding bodies are besieged by people who want money to do research because in large they part seek recognition and promotion. In Britain, the USA, Canada and Australia at least, the chance of an academic's gaining a chair is critically affected by her performance in gaining research grants (and much less, I should add, by her performance in deploying them). Failure to gain a grant will in general hold an academic back. It may be that we need indirect mechanisms like this to make sure that humanity gets enough high-quality research done. On this, as on most things, I am open to persuasion. But I have to say that I wish that the people we funded consisted only or mostly of those who delight in the intellectual battle that is at the heart of the research quest, and who do it because it is fun and they get a kick out of it. All this would be less of a worry if peer-review systems in research had chronometer-like precision. But of course they do not. Not only is grantsmanship a real skill, but there are large elements of luck and uncertainty in the process, recognised by all who serve their fellows through membership of peer review panels.

In comparison with research, the other elements of the academic career get pretty short shrift. Teaching is seen by the majority as just a job, and there are few awards for it. Administration is scorned and administrators are often disliked. Community service is beneath serious notice for many academics. I want to argue that this value system is seriously at odds with the reality of the modern university, and that a more sensible and more humane reward system needs to be developed quickly.

The modern university has many purposes. It advances and communicates knowledge for different reasons and to different audiences. It educates the best of the society's young people and increasing numbers of those older members, who are seeking advanced training or high-level retraining. It depends very largely on other people's money, whether from the government or from the pockets of parents, students or firms. It is important to the society in which it is located for a wide variety of reasons, and that importance is likely to grow, not to diminish. It is a large organisation disposing of annual expenditures that run into hundreds of millions of pounds; since money for the things that the modern university does is abominably scarce it is vital that those expenditures are effectively and efficiently managed.

Yet academics are expected to provide all of this — research expected — without themselves being trained. And with the exception of research again, their efforts, however virtuous and effective they are, are unlikely to be widely appreciated within the university, let alone outside it. Given the shortage of funds for research — and I remind you that if the Ziman argument is accepted the shortage will be continual and the competition for it will be ferocious — the outlook for many academic staff will be grim if research remains the only arena for garnering esteem. There are already a lot of unhappy academics. Their number can only be expected to grow if nothing changes.

I propose instead a radical rethinking about the academic career. With due acknowledgement to the Lord Buddha I offer as a starting point the concept of The Five-Fold Path to Honour. In the modern university the academic staff member should recognise that she can be expected to contribute to five essential tasks, which can be conceptually distinguished but usually possess some overlap:

- *teaching and learning*, which require no elaboration here
- *research*, the acquisition of new knowledge
- *scholarship*, which I define in this context as the organisation and distillation of existing knowledge
- *collegial administration*, or making the place work, and
- *community service*, meaning the extension of the university to its community, in all its aspects.

These are essential tasks because if any one of them is generally done badly the university will suffer, as finally will the community which supports it. It is therefore essential that all of them are performed well, and further essential that performance in them is measured and evaluated, and that high performance is honoured and celebrated. A great teacher, a great department head or dean, a great popular communicator deserve their fair share of the honour that now goes to the great researcher, and to a lesser extent has always gone to the great scholar. To gain that share their endeavours will have to be rigorously assessed by the best in the field. And that means some kind of peer review system, and the notion of 'best practice'. I do not suggest that this will be easy, or that it can happen within a few months. I am certainly not suggesting a soft option to the demanding rigors of research.

I envisage a career system in which all paths are critically reviewed. An academic staff member will, at any one time, be pursuing an agreed mix of one or two of these career paths. Over the span of her career, a talented academic may well demonstrate excellence in each one of them. Some academics may explore thoroughly only a couple of these paths. My expectation is that the university will need most of its staff most of the time to provide some teaching, and that such teaching will, if it is any good, be related to scholarship or research.

No doubt the Nobel Prize will continue to be the Holy Grail of science, and no doubt the best researchers will know a wider world than the best teachers. I am not in search of a grey uniformity. But I do suggest that the modern university has to tackle the task of recognising the diversity and the importance of the tasks its academic staff are expected to accomplish, and to provide a career structure in which excellence is the desired performance level in each of the activities that the university regards as essential, and is appropriately rewarded.

If that is done — and it can be done if the will is there to do it — then the modern university will in a few years' time be an exciting and creative place in which to work. More, the quality of teaching ought then to be much higher, there ought to be fewer dismally run departments, and the community will have a genuinely higher regard — and for good reason — for 'its' university. And finally, though most of us in my kind of job will sometimes feel the need to place this first rather than last, rather fewer people will do research, and more good research will be done, and there will be more money to fund it.

The dying of the light

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The modern university has at least six distinct functions.

It conserves knowledge, through library holdings and scholarship. It transmits knowledge by guiding the learning of students and through community education programmes. It advances knowledge through basic research. It applies knowledge by applied research and consultancy. It refines knowledge through critical review and scholarship. It also fulfils the role of certifying standards of entry to a range of professions having different levels of commitment to intellectual endeavour.

The period during which Australian universities have covered this full range of functions has been a comparatively brief one. The emergence of institutions meeting these international criteria arguably dates only from the 1950s when Australian universities began to award the PhD; before then, Australians wishing to be recognised for advancement of knowledge were forced either to travel overseas or enrol as overseas candidates of the University of London.

The adoption of the Murray Report recommendations led to funding of universities at a level which allowed modest support for basic research. More recently a range of research granting bodies have made it possible for many researchers to obtain reasonable levels of support for their activities. Australian universities have achieved a measure of recognition overseas; for example, an Honours graduate from an Australian university is usually recognised by British universities as being of equivalent standard for the purposes of admission to higher degrees, and our graduates are eagerly sought by reputable American institutions.

It is no exaggeration to say that this hard-