

# THE RESEARCH ROLE OF THE UNIVERSITY\*

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## 0. INTRODUCTION

I need to begin with some disclaimers. First, I have never done any research on research, so in a sense, the following remarks are very much those of a non-specialist. Second, what research I have done has been at the science/technology end of the spectrum, rather than the humanities end. Some of my remarks are probably quite inapplicable to the humanities end of the spectrum. Third, some of what I have to say will probably be standard folklore to those who work full time in universities. But many in university governing bodies are lay people, and may value a little tutorial assistance\*.

The main issues which I want to address are these:

- (a) What characterises university research and researchers?
- (b) What do researchers need?
- (c) What are their hopes and concerns about the future?
- (d) What are their current expectations of governing bodies?

## 1. UNIVERSITY RESEARCH AND RESEARCHERS

### 1.1 What Characterises University Research?

Forget for the moment the qualification university and just ask what characterises research. The first aspect is that of novelty. The first invention of the wheel could properly be thought of as a piece of research. Reinventing the wheel could not. The second aspect is that of transferability. A study on the expectations of pupils in Catholic primary schools in Maitland is hardly a piece of research unless it tells us something about pupils elsewhere or primary schools elsewhere. On the other hand, the first person who discovered that the circumference of a circle was always a constant multiple of its diameter generated a piece of successful research, since he was discovering a fact which was transferable in time and space away from his immediate location. The third idea is that research is concerned with the creation of patterns and the specification of interrelationships between concepts. As you may know, the physics behind radio waves and the physics

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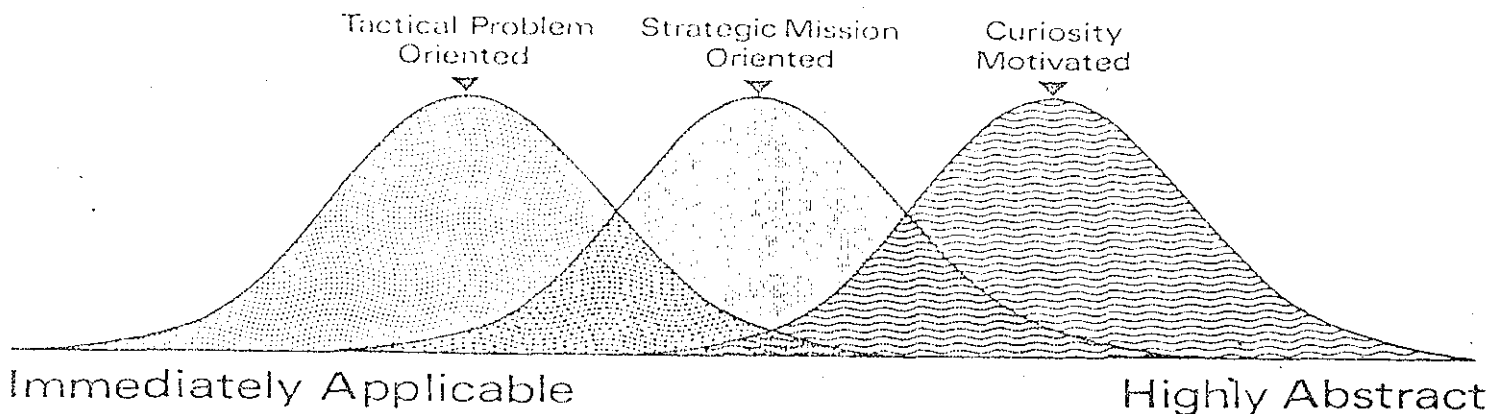
\* For the reader rather than listener one might add a further disclaimer. As a transcript of a survey address this suffers from the usual inadequacies: sentence structures more tuned to the ear than the eye, and lack of full development of many arguments.

behind electrical generators in power stations is very much the same. Developing this idea, and more generally, developing theory that gives order or coherence to apparently distinct phenomena is very much a research activity.

Now what is peculiar about research in universities, as opposed to research elsewhere? Figure 1 tells much of the story. Research in universities is particularly concerned with the right hand, more basic end of the spectrum, and in this sense is concerned with longer term goals. Moreover, the goals are often ones of simple intellectual enquiry, or of elucidating the structure of the universe; they are much less goals of producing a better product for less money than last year's model.

FIGURE 1

THE SPECTRUM OF R&D



1.2 Why Have University Research?

This brings me on to my next point, which is a very rapid defence of, or specification of the arguments for, university research. Different individuals assign different weightings to each of these arguments, but there seems to be a general consensus that all provide valid reasons for conducting university research. First, university research as a cultural activity is ennobling of man, as is

man's involvement in art, music and the creative arts, for research is also a creative activity. Such activities are a mark of civilised man. Indeed without such activities, we could hardly call ourselves civilised. Second, research is an essential concomitant of successful honours and post-graduate education. We are concerned at least in postgraduate education with research training and/or formal instruction in the most advanced aspects of the subject. Research instruction for a student really means that that student is serving a research apprenticeship, and clearly a research activity is a prerequisite for having research apprenticeships. My next point is that a research activity is very important for generating the ability to transfer technology from overseas. If Australia is to flourish in an economic sense, then we need to have some mechanism for filtering and disseminating within Australia that 98% of the world's knowledge which is created overseas. Let me outline with great oversimplification how this makes university research important. Appropriate portions of the new knowledge have to find their way of course into university courses, and the selection of the appropriate portion demands an overview position. This overview can hardly be obtained without involvement at the frontiers of the field, i.e. without in almost all cases a research activity. In case this sounds too abstract, let me record that strong arguments can be made that this process has been ineffective in the computer science area in Australia, that this has had costly consequences to the nation, and that some of this failure is attributable to the weakness of university computer science departments.

The fourth reason for having university research is that material benefits often flow from university research. It is important of course to note that these material benefits are often unexpected and so cannot be planned for; thus, while we can say that university research in a statistical sense benefits the community, it may be very hard to say of a given research project that it will or will not benefit the community, at least until well after that project is completed. This leads one to conclude that though the funding of much mission oriented research is important, it should not be at the cost of funding for curiosity-motivated research. Indeed, in terms of the words of E.A. Shneour\* one needs to retain "the essential flexibility and opportunity for serendipity on which original discovery depends ... it is not too much of an exaggeration to suggest that had the present bureaucratic structure been in operation when poliomyelitis research was in its heyday, we might today have a compact, efficient, computer-operated, portable iron lung, rather than two vaccines". An outstanding example of the payoff from university curiosity-motivated research in Australia is provided by the control of crown gall. This is a cancer of stone fruit trees, and curiosity-motivated ecological studies at the University of Adelaide led to techniques ultimately of inoculating seedlings, which have generated savings to Australia annually of about M\$4, and savings worldwide annually of about M\$100. A recent ASTEC report\*\* on the direct funding of basic research cites this and a number of other examples of the material benefits to flow from basic research.

### 1.3 What is a Successful University Researcher?

Since many of you have not been researchers, I thought it might be helpful to describe to you some personal characteristics of the typical university researcher. First and foremost, he has to be highly motivated. Perhaps he is even addicted to his research, as a heroin user is to his biochemical escape from reality. The researcher's drive is to express himself through piecing together an intellectual jigsaw rather than to be a saviour of society, i.e. curiosity rather than a material objective motivates him. Like an artist he creates patterns, but of ideas, not of paint. You doubtless have visions of researchers toiling for hours in the laboratory with test tubes and instruments, or at a computer. These activities are in a sense the drudgery, if you like the 99% of his work that is perspiration. It is the thinking part

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\* Science 195 (4282): 939, 11 March 77.

\*\* "The Direct Funding of Basic Research", Report to Prime Minister by Australian Science and Technology Council, December, 1978.

of his work, the 1% that is inspiration, that provides the payoff to the man who has become a research addict. My experience is that research, especially the thinking side, is very similar to long distance running. One must push oneself round the next curve, knowing that somewhere ahead, hopefully within reach, is the goal. Mental energies flag like physical energies. The will drives on knowing that a stop now is fatal and it curtly rejects interruptions of telephone calls or children, and adopts a jaundiced and even condescending view of the demands of university administration or administrators. To reach the point of intellectual breakthrough, one must, taking a cue from Lady Macbeth, screw one's will and mental energies to the sticking point. One of my colleagues says simply that all researchers have to be masochists. If and when the breakthrough comes, the experience is often an emotional one. And when the researcher looks back, he acknowledges that it was the doing of the task that was what counted, and once the task has been done, it has little interest.

## 2. THE NEEDS OF RESEARCHERS

### 2.1 Three Requirements for a Researcher

I'd like to discuss the three requirements: time, funding and useable communication channels.

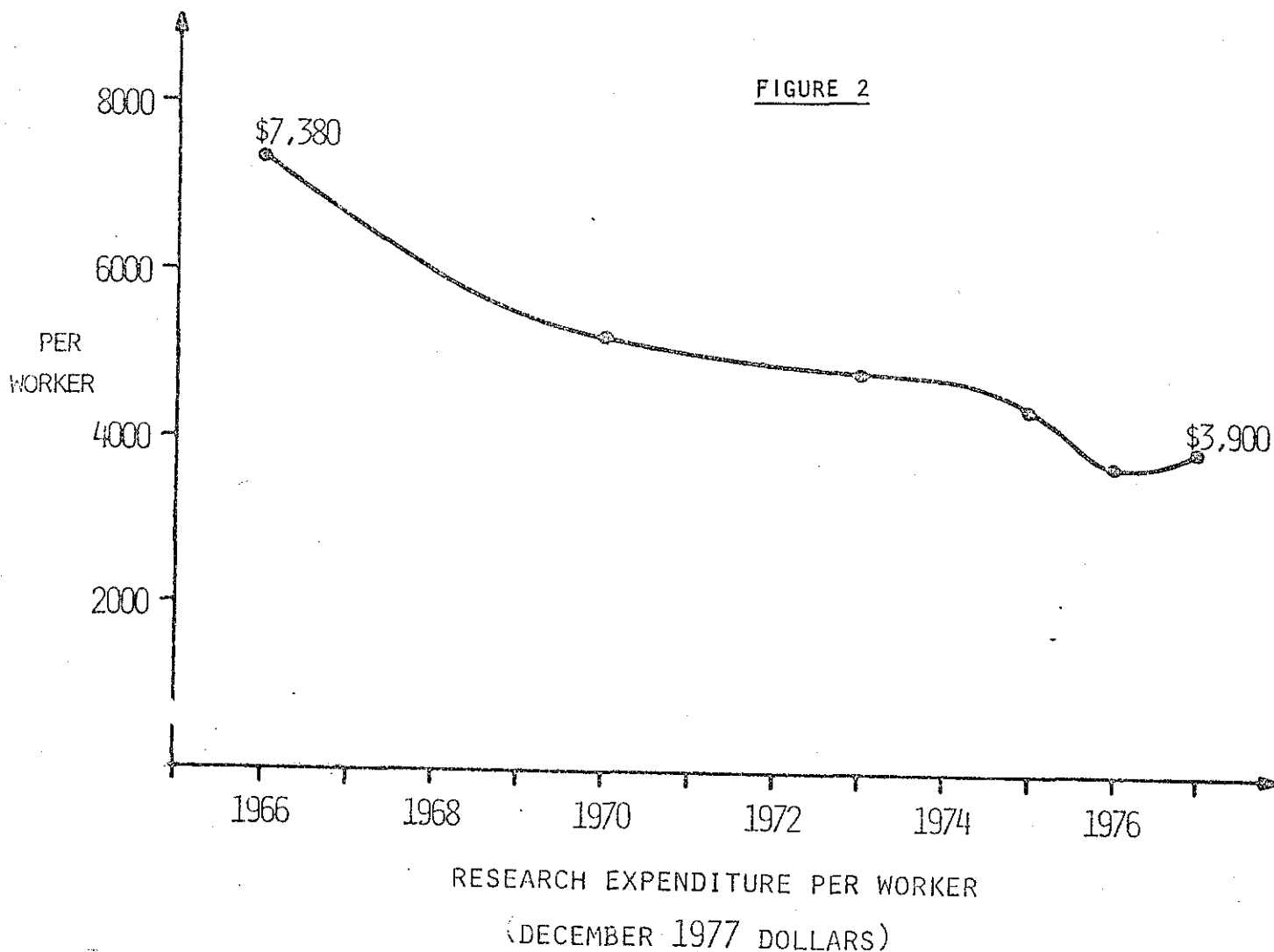
For researchers, as for most professionals, the urgent too often has to take precedence over the important. I know of one very research oriented department head who received a memorandum from his administration saying that he was required to physically inspect all keys on issue to all academic staff, technical staff and postgraduate students in his department every three months and send a return to the administration. Wisely, I think, he refused to comply. But nevertheless, the demands of university administration often make major inroads into a researcher's time. Administration and administrators are however not the only danger. There have been departments who have seen apparent advantages in putting on large numbers of courses, with the result that the lecture loads are so high that research becomes well-nigh impossible. Researchers must guard their research time against this sort of encroachment also.

The fact that in our universities we do not account separately for academic staff research time provides administrative simplification to our operations. The cost is that expenditure of this resource may not be adequately scrutinised.

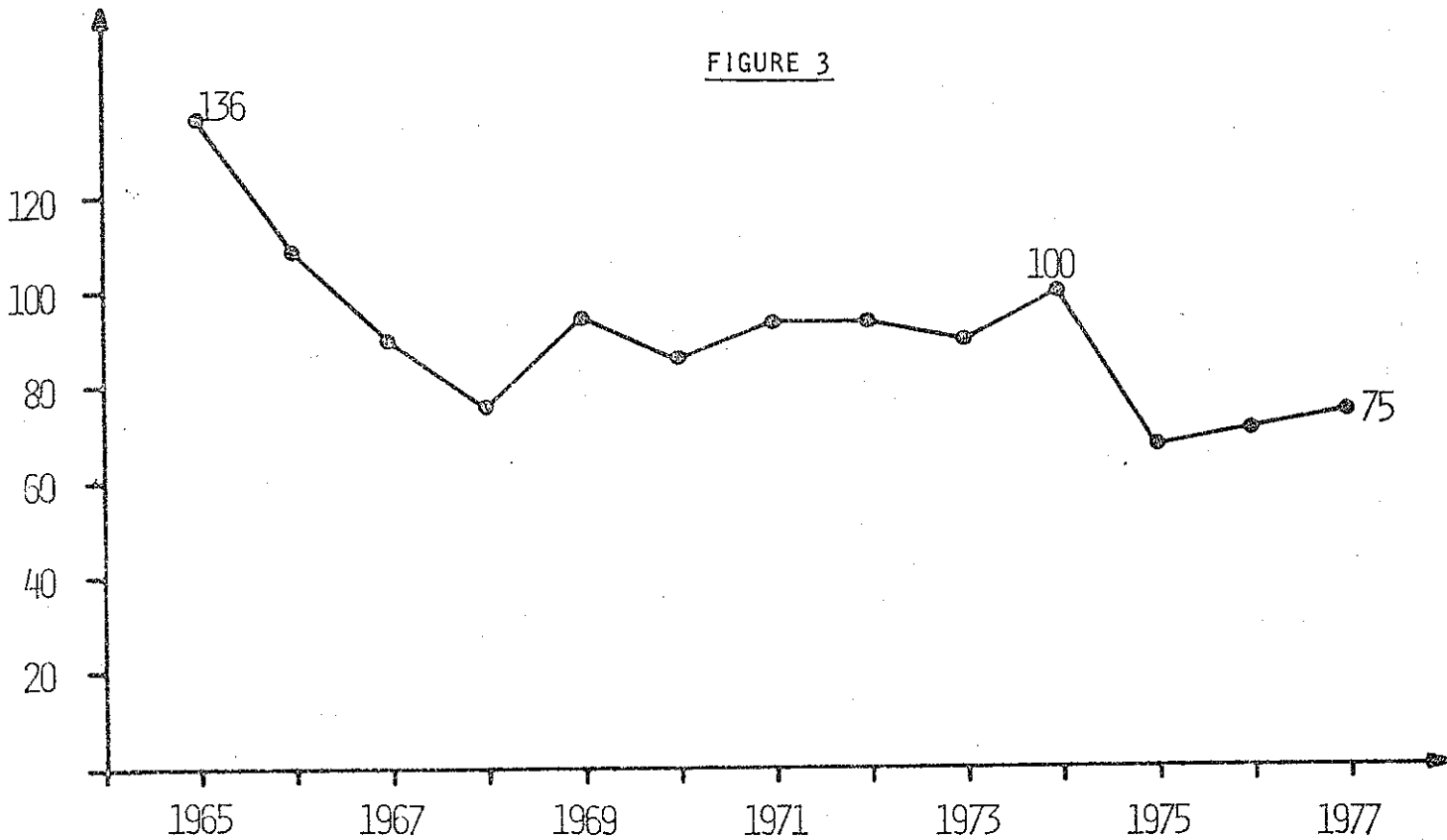
Turning to funding, the first statement that one can make is that it is very hard to find an average figure which should be supplied to a worker to guarantee that many of his talents are not going to waste. Further, the

appropriate figure for one worker will often be very different to that for another worker. Industry works on a figure of about \$60,000, including salary, for each research worker, and maybe \$20-\$40,000 would be appropriate in universities with exclusion of salary, for an above average worker. In any case it seems that there is no dispute about the fact that support now is too low in the sense that much greater productivity would be possible from the present set of investigators by giving them significantly more money.

Two graphs\* tells the story of what has happened over the past few years, and require no comment (see Figures 2 and 3).



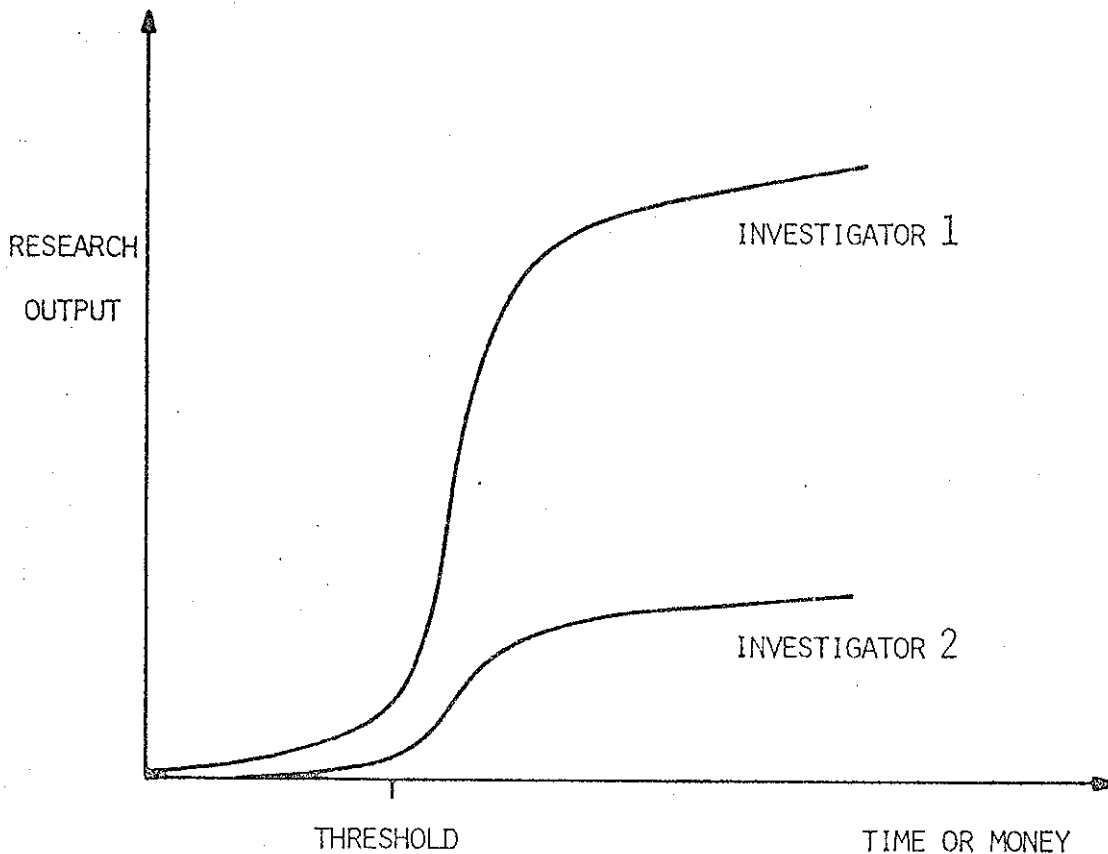
\* Figures obtained from ASTEC report cited previously.



AVERAGE REAL ARGC GRANT AVAILABLE PER STAFF MEMBER  
 100 = \$1782 (DECEMBER 1977 DOLLARS)

Successful research requires that certain thresholds of time and money investment are essential if anything significant is to come out. And when these thresholds are attained, there can be vastly different output between individuals. Figure 4 sums up the idea. Particularly in the case of money, there seems to be a knee in the curve: dollars to the right of the knee are much less effective than dollars to the left. But of course in today's climate, this point is of theoretical interest for almost everyone.





RESEARCH OUTPUT IS A NONLINEAR FUNCTION OF  
TIME AND MONEY INPUT

FIGURE 4

## 2.2 Useable Communication Channels

The inclusion of this form of words may strike you as strange. Let me explain what I mean. It's obvious that with 98% or so of the world's scientific literature originating from outside of Australia, we need to have good libraries which have records of that literature. Perhaps it is slightly less obvious that we need to have good access to mail and telephone. Most active and successful researchers are plugged into a small international in-group who exchange preprints and ideas well before publication. Being a member is clearly an advantage - one has advance information, but it also bears obligations. Mails are used greatly for communication, but now the telephone is beginning to be used also. During the last year, I have spoken to Belgium, France, Holland, U.K., New Zealand and the U.S., the latter a number of times. To Telecom's displeasure and my Vice-

Chancellor's pleasure, the majority of calls have originated from overseas.

Colleagues are also an important communications channel. One scientist's mind is, for another scientist, a type of laboratory in which he can try experiments. There is no question as to the synergistic effect of colleagues down the hall. In fact, I am unaware of a single highly successful researcher *in my discipline who does not have like minded colleagues down the hall*. In ASTEC's recent study of basic research, one of the major problems identified in universities was the degree of fragmentation, including fragmentation within departments. Fragmentation means that there is not someone down the hall to talk to.

But it is not just the colleagues down the hall that are important, it's the colleagues elsewhere. Study leave and regular short trips are needed if someone is to stay plugged into the in-group, and even to keep up in his discipline generally. I myself wouldn't work in Australia if I could not maintain this sort of contact, and I am grateful that our university has an enlightened attitude in these matters. But the need for travel is underemphasised in Australian universities in comparison with many universities elsewhere. For example, I am told there is one Australian university which limits travel to \$60 per head per annum, and another which provides no overseas travel assistance other than for study leaves. Contrast this with a comment I heard from an Israeli professor last year that all Israeli academics receive a sizeable amount for travel each year, and in the case of full professors at his institute, it was approximately \$2,000 per man. We sometimes forget that although in 1946 it took two and a half years of average earnings to fly return to London, now it takes somewhat less than 3 weeks, at least at the cheapest rate, and 2 weeks to San Francisco. Perhaps some of our rather restrictive policies in relation to overseas travel could stand some loosening.

I understand from a member of the ASTEC secretariat that in a recent UNESCO study aimed at identifying the factors which made a research group effective, communication in the broad sense described above showed up as one of the few significant non-skill factors.

### 3. FUTURE OUTLOOK

#### 3.1 Future Hopes of Researchers

You'll all know that researchers feel there are insufficient funds to

support them. You may not know that they are looking for different styles of support, and/or the removal of some constraints on the way existing funds can be spent.

Those of you who have read the ASTEC report on Basic Research will have seen several suggestions that have met with a fair degree of approval from the research community. In respect of the ARGC, two of the significant ASTEC suggestions are that the ARGC initiate program as opposed to project grants, and extend greatly the use of postdoctoral awards. Program grants would be centred round the very best people, might run for several years rather than a year at a time, would expect very often to cover groups rather than individuals, and would allow for expenditures in a wider range of categories than those typically permitted by project grants. For example, travel to overseas conferences might be chargeable to a program grant. The proposals to increase the number of postdoctoral awards and to cover groups with program grants in a sense can be viewed as proposals to provide more communications channels to the best researchers - in this case communications channels to highly qualified individuals down the hall. Particularly with a fall off in graduate student numbers, these moves are seen as most welcome.

It will probably be known to you that the Tertiary Education Commission has expressed a wish to increase the special research funds provided to universities. Some of you will also know that a recent increase was not evenly spread amongst the universities, but was concentrated in a limited number. A proposal to increase the funds, and to a lesser extent the proposal that some funds should be distributed on a selective basis, has met with much acclaim. I support the distribution of funds on a selective basis, though not on a selective basis to universities - only to centres. We have no universities in Australia that are excellent universities in the sense of say Harvard or the University of California, Berkeley. Rather, all our universities have some bad departments in them, and some universities have more good departments than others. The problem with selective support to a university is that all too often this support gets spread round both the bad and good departments of that university. On the other hand, the TEC initiative to fund Centres of Excellence, or, less emotively, Centres of Concentration, is an initiative which selectively sends the money to where it can secure the most benefits. It is understood that if and when centres of concentration arise, their numbers in the first instance are likely to be very limited. One might however hope for a continuous, albeit

slow, expansion of the concept. Finally, in relation to the TEC, the university researcher would like to be reassured that not only does his university receive special research funds on account of the research mission of universities, but there is a satisfactory allowance for academic staff research time built into the university funding arrangements that is not built into the CAE funding arrangements. This would imply that if a CAE and a university were the same size with the same faculty mix, student/staff ratios would need to be lower in the university than the CAE. In qualitative terms, this is presumably so. But the research community would be much reassured by the opportunity to peruse quantitative data.

There are other future hopes of researchers which relate to procedures and policies within individual universities which I shall discuss later.

### 3.2 Future Problems

A number of problems for the future will already be clear to you. One which stands out is that of low academic staff turnover. Perhaps though I could sketch some others which are more research oriented. The throughput of post-graduate students, like that of new academic staff, might go down: after all, many people undertook postgraduate study in the past in order to become qualified for a university position. Perhaps an expansion of industrial research and development will for some departments cause a flow of students to be maintained, but this is by no means clear.

One consequence of lower postgraduate student throughput is a more rapid intellectual ageing of permanent staff. Another consequence is that those academic staff who require research assistance will have to pay salaried individuals, rather than graduate students, and this imposes an increased burden on their source of support.

Lastly, I would like to just sketch in the barest outline two further potential distorting influences which could affect our ability to function in the long term. For a long time we have had some mission oriented bodies supporting research in universities, the National Health and Medical Research Council, the Electrical Research Board and so on; more recently, we have had NERDDC. One scenario is that such bodies will proliferate, and the universities' dependence on them will grow. The money is attractive, but the freedom to choose research goals is roughly inversely proportional to the money provided to

meet those goals. Second, the implicit social contract that so far has existed between researchers and the public and lets researchers do their own thing could conceivably be rewritten with great cost to universities, simply as a result of the mere involvement of universities in things like genetic engineering, nuclear energy, microprocessors, marine petroleum geology, behaviour modifying drugs and the like - all areas have the potential to stir up public emotions.

#### 4. THE ROLE OF GOVERNING BODIES

But there are many current problems within universities, entirely of their own making and within their capacity to solve. Rather than leaving you at this point with a feeling of satisfaction that the problems of the future are being delineated and in due course will be solved, I hope I can leave you with a feeling of disquiet, or at least a feeling that you, the members of governing bodies, can all do a little better.

In no sense do I want to suggest that you should run your universities this way or that way. That is, of course, not your role. But it is, I believe, one of your proper functions to answer "us" to the question "Quis custodiet custodiet?", to verify that appropriate procedures are being used to run your university, and to call for the setting up of procedures when they are not present.

In relation to your university's research activity, your task, I believe, can be summed up by saying that you should protect the strong researchers from the weak researchers, your steeples and centres of excellence from your mud huts and shanty-towns of mediocrity. What this often amounts to is protecting the less political members of the university from the more political. And that can even mean protecting people you see little of from people you see a lot of.

I've generated a short checklist of questions which as a researcher, I'd commend to you for study. It is not comprehensive, simply representative.

##### 4.1 Checklist for University Governing Bodies to Combat Current Problems

What meetings do you have with your best researchers? Are they only, as at some universities, when jostling in an academic procession on graduation day, or as at others, before every council meeting. Some meetings I believe are highly desirable if you are to really understand the hopes of your researchers.

Do you have antifragmentation mechanisms? If CSIRO were to do a review of university research, they would probably list as their number one complaint

excessive fragmentation. Within a university, this means trying to have 8 specialties in a department of 8 people, rather than 2. It does seem that intervention from on top may be needed to cut short this serious problem. I know that the cry of administrators will be that elimination of fragmentation means interference with departmental autonomy. To that, my reply would be that where a demonstrated major problem exists, interference is justified. What departments do not care for is interference with no justification or on minor matters, as for example when they are told they can spend their special research funds on equipment but not on travel.

How often do you see documents discussing problems of the next decade?

Perhaps the Williams report, or the talks here, are your first exposure to problems of the next decade. If so, perhaps the urgent is stealing time from the important in your meetings.

Are your promotion systems meritocratic? I'm not concerned here with appeals procedures, with the number of referees from overseas you require for promotion to reader, or even whether your promotions committee is designed to include at least one active researcher, important though these issues may be. There are two issues which I want to canvass. The first is the question of whether or not you have held up some lecturers and senior lecturers in the salary scales and accelerated others. All lecturers and senior lecturers are not equal in research performance; some are very bad and others very good. A system when they all float up the scale in synchronism is not a system which is as meritocratic as it might, and perhaps should, be. My second point relates to the relative status of associate professors or readers and full professors. This problem has become more clearly focussed with the introduction, first of multichair departments and, more recently, of nonprofessorial department heads. You will doubtless be aware that there are two routes to full professor rank. The first and normal route is used when a chair is declared vacant and an advertisement is made in the paper, and the best applicant, assuming he is not too bad, is appointed. The second route is the personal chair route, a personal chair being awarded to a reader or associate professor who appears extraordinarily distinguished. The result is that two very different standards are applied. In the first route, often a *faute de mieux* appointment is made, and a *faute de mieux* appointment is often *la plus mauvaise des fautes*: someone becomes a full professor whose calibre is decidedly inferior to many associate professors elsewhere in the university. Lest you think I am exaggerating, I offer two quotes from Vice-Chancellors:

1. In our University, I consider it a matter of pure luck as to whether a person is an associate professor or a full professor;
2. In our University, it is harder to become an associate professor than to get a chair, once the chair has been advertised.

Perhaps universities in some way should mirror the society in which they are located, but I find it slightly objectionable that the propensity of Australians to gamble and commit their fortunes to luck is mirrored in the personnel policies of the universities. It seems to me there is a much stronger case for personnel policies to be more meritocratic, perhaps more like those at CSIRO. I am aware of excellent researchers leaving Australia, expressing great frustrations at personnel administration in universities; I'm aware that North Americans at universities stacked with Nobel Prize Winners regard aspects of our system as, quite simply, ludicrous. A zero cost adjustment would not seem impossible in which one raised one standard - that applying to appointment by advertisement - and lowered the other - that applying to personal chair promotion.

My last point on the checklist is this.

Is there a documented system for the selective support of researchers with a nontrivial portion of the budget? All universities with internal formula funding add a discretionary but often token gloss to reflect research strengths. I am talking about more than that. The requirements as I see it are these.

- (a) The system must be documented and public; it is not enough that there be reassuring generalizations to the effect that "we always look after our best research departments and researchers".
- (b) It must include time, as opposed to operating funds, which means that if departments A and B are of the same type and have the same number of students but the research activities of A are much stronger than those of B, then department A should get more academic staff according to some documented policy.
- (c) The selective support must represent a nontrivial portion of the budget. An amount of say \$50,000 - \$60,000 in a budget of M\$50 is trivial.
- (d) Two systems, one for departments or centres, and one for individuals, are probably required.

## 4.2 Summary

You will see that my philosophy is one of supporting the strong, and largely denying support to the weak. To this I would add providing seed support to the unproved. My perception is that universities are always ready to preach along these lines, but sometimes less ready to act. Perhaps being a researcher and governing a university have one thing in common. Success in the endeavour depends on how much one screws one's will and mental energies to the sticking point.