COMMONWEALTH OF AUSTRALIA

Official Committee Hansard

HOUSE OF REPRESENTATIVES

STANDING COMMITTEE ON SCIENCE AND INNOVATION

Reference: Business commitment to research and development in Australia

TUESDAY, 1 OCTOBER 2002

MELBOURNE

BY AUTHORITY OF THE HOUSE OF REPRESENTATIVES

INTERNET

The Proof and Official Hansard transcripts of Senate committee hearings, some House of Representatives committee hearings and some joint committee hearings are available on the Internet. Some House of Representatives committees and some joint committees make available only Official Hansard transcripts.

The Internet address is: **http://www.aph.gov.au/hansard**

To search the parliamentary database, go to: **http://search.aph.gov.au**

HOUSE OF REPRESENTATIVES

STANDING COMMITTEE ON SCIENCE AND INNOVATION

Tuesday, 1 October 2002

Members: Mr Nairn *(Chair)*, Ms Corcoran, Mr Martyn Evans, Mr Forrest, Ms Grierson, Mr Hatton, Mr Lindsay, Mr Tony Smith, Mr Ticehurst and Dr Washer

Members in attendance: Mr Martyn Evans, Ms Grierson, Mr Lindsay, Mr Nairn, Mr Ticehurst and Dr Washer

Terms of reference for the inquiry:

To inquire into and report on:

The international comparisons indicate that while the public sector in Australia supports R&D at an impressive level, business investment is less impressive.

With particular consideration of:

the R&D drivers in small and medium sized business;

the needs of fast-growing companies; and

the considerations by which major international corporations site R&D investment.

The committee seeks to address three questions.

What would be the economic benefit for Australia from a greater private sector investment in R&D?;

What are the impediments to business investment in R&D?; and

What steps need to be taken to better demonstrate to business the benefits of higher private sector investment in R & D?

WITNESSES

Committee met at 9.00 a.m.

GREENHILL, Dr Paul Graham, Acting Chief Executive Officer, AMIRA International Ltd

LARKIN, Mr Don, Chief Executive Officer, Australasian Institute of Mining and Metallurgy

NAPIER-MUNN, Professor Tim, Director, Julius Kruttschnitt Mineral Research Centre, University of Queensland; and Fellow, Australasian Institute of Mining and Metallurgy

CHAIR—I declare open this public hearing of the House of Representatives Standing Committee on Science and Innovation inquiry into the commitment by business to research and development spending in Australia. I welcome representatives from Australasian Institute of Mining and Metallurgy. While this committee does not swear in witnesses, the proceedings here today are legal proceedings of the parliament and warrant the same respect as proceedings in the House. The deliberate misleading of the committee may be regarded as a contempt of the parliament. The committee prefers that all evidence be given in public but should you at any stage wish to give evidence in private you may ask to do so and the committee will give consideration to your request. Would you like to make an opening statement before we proceed to questions?

Mr Larkin—Yes, I would like to make an opening statement and then one of my colleagues will make some comments. I am the CEO of the Australasian Institute of Mining and Metallurgy. I am a non-technical person who has come into the minerals industry as an institute association change agent specialist. The institute is 109 years old and it has been a learned society. It represents the mining engineers, the geologists, the metallurgists and the environmental scientists—the professionals—in the mining industry. There are 7,500 of them, of whom about 500 are students, 500 to 600 are young graduates and approximately 1,000 are overseas. A lot of our members practise outside Australia; that is why we are Australasian.

Our members are employed by mining companies, government research institutes, universities and corporates, and there is an ever-increasing number of consultants and contractors in the industry. They are bound by a code of ethics and they take responsibility for the welfare, health and safety of the community at all times before their responsibility to their profession, sectional interests and other members. Therefore they are committed to the sustainability of the mineral sector and enhancing their professional excellence.

In the submission I have prepared, I have covered the fact that Australia is a minerals dependent economy now and into the foreseeable future. It is a very sophisticated, smart industry and it contributes significantly to the balance of payments. It is currently worth about 47 per cent of Australia's merchandise exports and 37 per cent of total exports. I have given other statistics in the submission, in particular the impact of mining products and services adding about $2 billion to our exports, which are covered by the services action agenda. There are other statistics in the submission about the impact on regional employment and development and about employment trends in the industry.

There are two or three important things that impact on the industry. One is the globalisation of the industry with the major corporates joining together and taking one another over. The challenge for the industry and for the Australian government is to attract these major corporates, which make decisions on a global basis, to invest in R&D in Australia. The flow-on effects from that will be in the education sector, where we can provide the human capital or the skills resources for these global companies to practise worldwide. There are the issues of sustainability, such as engaging the stakeholders and the other players in the industry, having a licence to operate, taking advantage of these skills, and building the smaller juniors to take the place of the Western Minings, the Rios, and the BHPs and be the innovators for the industry.

I have talked a little about the institute and the changing institute. That is not the main focus here so I will not go into that. I am not a technical person. Both my colleagues here, who are members of the institute, are very much involved in R&D and I think it is appropriate to ask Professor Napier-Munn to make a few comments.

Prof. Napier-Munn—The AusIMM is my professional institute, and I represent them in that regard, but I also work for a research and development outfit that does contract R&D for the worldwide mineral industry. We have a commercialisation company that commercialises the outcomes of that R&D, and because it is part of the University of Queensland we have an educational role as well. So I see this problem through a number of different windows.

Firstly, we would like to make you aware that Australia, in our view, has the world's best R&D infrastructure in the minerals area. There is no question about it. Anyone in the know would agree with that statement. It is reflected by a number of issues. For example, two or three of the major companies have their major R&D operations here. BHP Billiton has recently pulled back its US R&D business and absorbed it into Newcastle. Alcan has recently moved most of its R&D into Queensland. Rio Tinto has had its R&D operation here for a long time. The CSIRO has a number of divisions devoted to this, and there are a number of world-class university groups. So it is a pretty powerful infrastructure. The question perhaps for this inquiry is how to keep it that way. The world mining industry is changing very fast. It is a global business, it is moving towards sustainability issues, and time does not stand still. South America, for example, has potentially competitive companies doing what we do here.

I want to make three points. First, how do we keep that excellent R&D infrastructure at the forefront of world's best practice and continue to be competitive? By the way, that questions one of the premises, as I understand it, of this inquiry, which is that business does not invest enough in R&D. Our view is that although it could always invest more—as could government, of course, and I am sure you will hear that plenty of times—the mining industry in Australia has been a very enlightened supporter of R&D over 40 or 50 years. How can we keep it that way? We would like to see the world's mining companies, equipment manufacturers and service providers spending more money in Australia doing their work here.

Our organisation in Queensland does 40 per cent of its business overseas. Paul represents the mining industry's own research broker, AMIRA International, which is a unique organisation. It is owned by the industry. It now does a significant part of its business overseas. The business of doing R&D for minerals in Australia is an export business. So we have to find ways to encourage companies to come to Australia. The obvious mechanisms are grants, tax breaks and the things that attract companies to come and do business here.

The second point I want to make very briefly is that the hard part of R&D—I am sure you will hear this many times—is the D and the commercialisation process. Having ideas is easy and doing research is important but relatively cheap. Commercialisation—making it useful—is incredibly difficult, very risky and very expensive. We need to look at what is required to take R&D outcomes and make them useful. We need capital; people who understand the process; a simple and consistent regulatory framework, which is a very important aspect that irritates and confuses a lot of people who try to commercialise R&D outcomes; good government funding schemes—there is no question about that, and that is not part of the private contribution; and a culture of valuing honest failure. There is a stigma attached to business failure here, which is rather a pity. In the United States it is regarded as a necessary qualification on your CV—as long as you have not failed through incompetence or dishonesty. I am not sure that the committee can legislate to change the culture, but it is worth thinking about. Commercialisation, which is my second point, requires a number of elements to make it work, and it needs to be supported by both business and government.

The final point to make is that, as Don mentioned, there is a sector identified as the mining technology and services sector—the MTS. There is an action agenda under way at the moment looking at that. It is a surprisingly large exporter—it generates about $2 billion of business a year. We would like to raise that to about $6 billion in the next six or seven years. R&D is part of that sector. R&D is an export item. People export R&D from here and it is worth quite a bit of money. It is good business sense to link education to R&D. The institute of which Don is the CEO is concerned for the longer-term and about continuing to train enough professionals for this industry. I will not bore you with the statistics but the rest of world is collapsing in terms of the training of mining industry professionals—South America is surviving, North America is disappearing and Europe has gone. We are standing almost alone and we are concerned about the number of professionals being trained. I would like the committee to keep in mind that training people is part of the R&D function, and that is probably best done in universities—so that is a plug for universities, where I get my salary from. It is worth thinking about R&D in the context of training people.

Those are my three main points. First, we have a great infrastructure—how do we keep it that way? Second, we need to devote time to thinking about what is necessary for the industrialisation step in the R&D process, which is by far the most difficult part. Third, R&D is a service, it is an export item and it is part of the education process.

CHAIR—Thank you for your contribution. You have made some very pertinent comments. The comment you make about the infrastructure here in Australia being very good is very encouraging as well. We had some evidence only last week from people who commented that with the takeover of a number of Australian mining companies by larger international companies there was the danger of taking R&D offshore because they already had facilities in another country et cetera. At least one example was given at the time. Is this part of what you are concerned about with the loss?

Prof. Napier-Munn—I do not see it that way. Look at the evidence—the three or four biggest mining companies in the world. Rio Tinto does most of its R&D in Australia. BHP Billiton does most of its R&D in Australia; it does some in Johannesburg and will continue to do so for specialist reasons but it is consolidating some of its work in Australia. Anglo American does nearly all its R&D in South Africa for good historical reasons and I think it

would be difficult to persuade it to change. Alcan has just moved here. Comalco has all its R&D in Australia. The only people who do their R&D outside Australia are mining companies who have almost no Australian properties. I am not sure which is the one being thought about that has moved. I am not aware of that. I would think that it is not part of the main trend.

You are quite right: one of the rapidly changing elements of the industry is the amalgamation of smaller companies into larger ones. Whether overseas companies are taking over Australian companies or Australian companies are taking over overseas ones is a moot point. In Rio Tinto's offices in London you hear a lot of Australian accents. They think they have been taken over by the Australians.

CHAIR—Given that you say we have some of the best infrastructure—and I do not doubt that at all—and given our exchange rate, which has been quite low for some time, and the high quality of our graduates and people in the industry, do you have any suggestions that government ought to be looking at to further encourage other companies to use those facilities here? It seems that the climate ought to be right for attracting more research and development to be done in Australia given those factors.

Prof. Napier-Munn—I would like to make one comment, and I am sure Paul will have a view too. I will give you an example. We do a lot of work in South Africa. In fact, a significant part of our revenue comes out of research contracted to us by South African companies. They are looking more and more to doing it locally in South Africa because, although our exchange rate is pretty good for the rest of the world, the South African one is not. We are actually quite expensive for the South Africans because their exchange rate is very low. South Africa is a major mineral province and will continue to be so, and it is worth attracting them. As to the rest of the world, anything the government can do to make contracting R&D to Australian institutions and organisations cheaper in some way would be a good thing. I do not think there is any doubt about the quality of the people here. Increasingly, the globalisation trend that you quite correctly referred to means that the rhetoric coming from companies is that they will go where the best people are, almost exclusive of price. I think the truth is that they will certainly pursue the best people, many of whom are in Australia, but price is going to be a factor. Paul might have something to say about that.

Dr Greenhill—It is always a vexed question. The decisions made by these companies are affected by where they are made—obviously that is critical—and at what level they are made. There is a lot of pressure these days from boards who tend to be non-technical on companies' technical decision making and recommendations. At the end of the day, I would endorse everything that Professor Napier-Munn has said. I do not believe that the cost issue is a great one for companies. Having said that, the complexity of the systems of getting access to it are issues which companies deal with. If we compare Australia's system of support for R&D within universities, particularly industry related programs, with equivalent programs within South Africa and Canada in particular, who are our two direct peers from this point of view, Australia's system unfortunately lags far behind theirs. There are schemes within Canada and South Africa called the THRIP scheme, where the government essentially says to the companies or to the institutions, in particular, 'If you can get money from the industry to do valid research under certain conditions, we will not gainsay that decision by trying to assume whether it is good or bad. We will merely provide you with additional funding against a formula, and that just happens to be one to one at this point in time.'

From that point of view, the process of application and involvement is extremely simple, and it is therefore extremely attractive for companies to participate in that way. Canada has a system that is not quite the same, and there is a tax relief system there as well. However, it is somewhat more attractive for companies to participate there. Such a change within Australia to a simpler system with similar characteristics would certainly encourage those companies—Australian based and international—to be involved in Australia. Let me add an endorsement: companies will go where the best people are. Companies will absolutely go where they believe they can get the best results. Therefore, if we have the expertise here, a Canadian company will support research in Australia over research in Canada for that reason. That is our experience. We manage about $40 million worth of industry funds under that sort of scenario.

Mr MARTYN EVANS—I agree with a lot of what you are driving at there. A lot of it seems to go not only to the issue of government assistance in the form of tax rebates and tax-driven research—I suspect that the value of it in driving company investment 150 per cent or whatever is overstated—but also to the issue of the complexity of these schemes and how that is a disincentive to actually get investment.

You have also introduced a new element in the issue of complexity, and that is the whole regulatory framework around which these operations take place in the R&D context. Using the mining industry as a pointer to this, we used to have a lot of activity around NL mining companies—the no liability companies. Is there some merit in a no liability research structure—an NL company in a research context—or variations on that theme? Can we isolate in some way start-up enterprises from the broader regulatory theme where we have one standard—in the context of major corporations like BHP Billiton—and have a different context? Obviously fraud and theft and so on would be regulated. The regulatory burden, the cost structures, the fees and the government red tape are a necessary part of day-to-day operations these days and everyone has to live with them but, clearly, in the case of small start-up R&D enterprises, you have been making a case this morning that they find not only the R&D system but also the general framework a burden. Am I hearing that correctly?

Prof. Napier-Munn—Yes, that is exactly right. You have moved downstream a little bit in your discussion from where Paul was a moment ago. It is worth thinking about this industry in two parts. Unusually for industry, there is a lot of international precompetitive, collaborative R&D that goes on; in fact, AMIRA handles a lot of that for Australia and the rest of the world and we participate in that. That is, if you like, general good-for-industry R&D and people get advantage from it by using it in a smart way. There is then competitive R&D that leads to particular developments that need a commercialisation process, and I think that is what you were referring to. As I think our submission says, it is our view that all groups—that is, from the lone inventor, who is still an important element in the process, all the way up to the very large sophisticated corporate R&D animal—find the structural and legislative frameworks quite difficult to manage. I am not competent to judge whether the NL model is a good one, but anything that can contribute to that is a good idea.

In that context, going back briefly to what Paul said, the South African THRIP scheme is pretty remarkable. South Africa, which I know well, is trying to dig itself out of a horrendous set of social and other problems and it does not have a lot of money to fling around. But the government says that if a university, for example, has been given $100,000 by Anglo American, who are they to say that that is a good or bad idea? They think that Anglo will only have paid

that university $100,000 for a good reason, so they will give the university $100,000 too—end of discussion. So there is no applying for grants, there is no peer review and there is no waiting a year and a half to get a decision—the university has that discretionary money and it does good things with it. We cannot compete with that; that is a competitive advantage that South Africa has over Australia. I think the government should look at liberalising some of those schemes a bit. The equivalent scheme here is the ARC. The ARC are a good organisation and I am going to talk to them right after this session. They are doing good things on a limited budget but the process is very bureaucratic. The process with our competitors in South Africa is very unbureaucratic.

Mr LINDSAY—I want to follow up that point, and BHP Billiton comes to mind. It has a budget and the board have said, 'We are to spend one per cent of our budget on cultural things.' You find that they struggle to find somewhere to spend one per cent and they end up saying, 'Gee, we are under budget; we had better get something spent.' Relating that to the South African experience you have just described, could Anglo American be in a position where it just wants to shovel out some cash, so that from a government perspective it is a concern that they would have to match the cash that was just dispersed because they had to disperse it—or am I being too cynical?

Prof. Napier-Munn—Perhaps your profession leads you to be a bit cynical in that regard. I should not speak for individual companies, but we deal with all of the major mining companies and my guess is that that is not true. Budgets in the mining companies are pretty tight. Margins are tight and, as you well know, return on capital has been abysmal throughout the industry all over the world, so there is not a lot of money to chuck around. All the money we see flowing into R&D is a limited resource that is very hotly competed for, so I do not think that is correct.

Mr LINDSAY—You made the point that people seeking to do good research in your industry will go where the people are, almost irrespective of cost. If you were in the government, then, would you perhaps be approaching this issue not by looking at tax breaks or whatever but by looking at funding people?

Prof. Napier-Munn—I think that is a very smart idea. We all know that everything is about people. If you can get the best people into the institutions—into CSIRO, into the universities and into commercial R&D companies—the business will follow. Do not forget, we are tending in this discussion to talk about the majors but a lot of the mining companies have quite a different structure. They do not have a lot of money to chuck around and price can be important for them—and it can be for the majors too. Anglo Platinum is one of the richest mining companies in the world at the moment, because the platinum price is so high, and it has more discretionary funds than other companies. However, it is saying to us, 'We would prefer to do business in South Africa because it's cheaper,' and that is purely an exchange rate issue. So it is a complicated situation, but you are quite right to concentrate on the people.

Mr LINDSAY—In your statement you used the expression 'competitive commercialisation taxation considerations'. You probably did not even know you had used that.

Prof. Napier-Munn—I apologise for saying that—it is a completely meaningless phrase.

Mr LINDSAY—I was going to ask you what it meant.

Prof. Napier-Munn—Could you please repeat the phrase.

Mr LINDSAY—'Competitive commercialisation taxation considerations.'

Prof. Napier-Munn—I am sure some of you are aware that the business of what some people call commercialisation—I do not like that word; I think industrialisation is a better word for taking the R&D outcome and turning into a useful product or service—is a very difficult process. Whatever government or business can do to assist that process is what finally generates the business on which government taxation depends, and so on. It is highly desirable for the government to find ways of facilitating that process, and obviously taxation concessions are a part of that—but only one part, because plenty of the companies do not pay any tax, so it is not that great a concession for them.

Mr LINDSAY—Everybody throws the term R&D around, but I was interested in your evidence about splitting R&D and saying, 'There is an issue with research and there is an issue with development.' Should the government deal with this by basically having two policies—one for research and one for development?

Prof. Napier-Munn—You are absolutely right: the term R&D means many different things to different people. Research, I think, is the search for new knowledge and the generation of intellectual property. Development is starting to make use of it, and commercialisation is getting it sold as a product. It is very well known that, as you go down that route, it gets much more expensive. It can cost 10 times as much to commercialise an idea as it cost to do the original research. It is also commercially very difficult. So I absolutely agree that government should be looking at the process in its different forms because it has different requirements.

Mr LINDSAY—I will come back to you with some more questions later.

Mr TICEHURST—I am interested in a couple of items you mentioned in your submission. Obviously this submission is based on large companies, but we also have to look at the effect of R&D on smaller businesses, even microbusinesses. You made the comment that patents should be in place before any R&D application is processed. With all the bureaucracy associated with grants, a lot of smaller companies do not bother filling out the paperwork to get the tax concession because in some cases it is just not worth it. The patent application can be even more difficult and also quite expensive. So why do you believe that the patent ought to be in place before an application is processed?

Prof. Napier-Munn—That is a very good question. I must change hats now and speak for the lone inventor who is behind that part of the submission. I have studied lone inventors: the people who actually mortgage their houses to drive an idea. There are plenty of them around in our business. Some of them really produce the goods. All they have is the idea and the only way they can turn it into an asset is to protect it. So those guys tend to see patenting as an absolutely essential step on the road to riches, which is how they see the whole business, because otherwise somebody can just walk away with the idea and do it themselves. You are quite right that patenting is very expensive and quite difficult. There is a well-established process for it, of course. A lot of these guys will mortgage the house to pay $100,000 for the patent simply because that is all they have. In my view, a lot of R&D is not patentable and it is not necessary to patent it. So that part of the submission should be read in the context of inventors who need

to protect their ideas and properties—that includes corporations—where the idea is patentable. A lot of R&D relates to ideas and useful things that are not appropriate for patents.

Mr TICEHURST—You also talked about university trained people. In your submission, you said that a lot of companies are now employing TAFE qualified operators as computerisation moves more and more into the field of manufacturing and surgical operations. My experience has been that in many cases, in manufacturing particularly, TAFE trained people are certainly much more practical, hands on. The same thing could apply in R&D when you get to the practical level of R&D.

Prof. Napier-Munn—As Don mentioned, this is a submission from an organisation that represents 7,500 people, and you will not get all of them to agree with everything that is in the submission.

Mr Larkin—There are 7,500 different views.

Prof. Napier-Munn—No, we have about 15,000 different views! So that is one particular point which I personally do not regard as a major issue. The major mining companies recruit across the spectrum of skills. They need people to operate the plant, they need the high-end PhD level people to do the smart stuff and they need the core professionals in the middle. There is no doubt about one thing which the submission says, and it is correct—that is, for cost-cutting reasons the companies have reduced their skilled work force substantially in recent years. That has led to a difficulty—I think Paul would agree with me, as R&D people—in companies taking up the outcomes of R&D. They find it harder to capitalise on the results which they have paid for; they do not have the people in the operating sites to do it because their bottom line has required them to cut costs. So that is a bit of a vicious circle.

Mr Larkin—I made that comment in relation to a Japanese investment in a zinc processing plant in Townsville—

CHAIR—A Korean investment.

Mr Larkin—Yes; you are correct. They would have employed a metallurgist and had a research area et cetera. They now employ the process people and fund the TAFE college by taking the TAFE outputs to analyse the processors. The computer is more important than the fundamental discipline.

Mr TICEHURST—I was interested in your comment about how we need to develop a culture to accept failure. Another acronym that I have come across for R&D was ‘wreck and destroy’, because in a lot of R&D in a practical sense, when you try to get new ideas, that seems to be what happens. If you go down the wrong track, you start again. How do you think the government could influence that culture to accept failure as being part of the process?

Prof. Napier-Munn—We just throw you the problems; you have to work out the answers. That is a cultural thing. It is very difficult but it is very important. I simply do not have a good answer to that, except to say that I have some very bright colleagues sitting up in Queensland who have 50,000 ideas a day. Getting great ideas to pursue is not the problem; it is turning them into something useful that is the problem. It is an entrepreneurial process and that means taking

a risk to make a profit. There is a significant incidence of failure in taking those things to final commercialisation. We have to find a way of accepting that failure will sometimes happen and that people emerge from it probably better qualified to manage that process in the future, which should be seen as an asset. It is a cultural thing, and I do not have an idea off the top of my head as to how government can help. If I think of one, I will write a short submission to the committee. I do not know whether Paul or Don has a better idea.

Dr WASHER—Could you expand on the annuity holding charges on patents? I do not know much about that, but it is quite high. It is about 18.1 per cent. How does that work? What is the mechanism for that? If I file and hold a patent, it means I get charged annually by the government for holding that patent, do I?

Mr MARTYN EVANS—Item (c) says:

The Government "take" on R&D ...

Dr WASHER—I know nothing about it, so I am interested in this question. It has been mentioned, but I did not even know we did this.

Mr MARTYN EVANS—I noticed that as well.

Mr Larkin—I cannot answer that directly. It was provided by a person that I acknowledge later in the paper, Robert Beatty, who assisted in putting this together and looking at it from the small inventor's point of view. If it is a wish, I could come back and expand that further.

Dr WASHER—It seems a crazy thing for us to do.

CHAIR—That would be good. I had put that down on my list of questions as well, to get some examples, because it was something that I had absolutely no idea about and it does seem strange.

Mr Larkin—I will come back to the inquiry and expand that further in writing.

Dr WASHER—Again, the temptation is for the government to pick winners, which is what we have done. Traditionally, in terms of research and development, we are looking at biotech—mining did not get mentioned—photonics et cetera. There is a tendency now for the government to say, 'Well, we can't do everything, but we should focus more of our R&D in certain areas.' The mining industry is obviously our biggest winner and investor in R&D, and I thought you would be the people we should pick as No. 1 top winners. The competition we seem to have is the THRIP scheme in South Africa as a model that we should embrace, which is what you are illustrating to me. Can you elaborate on that? You told me it is a dollar for dollar investment. So as an industry I put a dollar in a university, and the government matches that—or a rand for rand investment in South Africa. How is that targeted? If I go to a university with a million rand and I say, 'Okay, I'm putting a million rand in; I want that R&D,' do they do this to be directed in a certain way within industry, or does it go generally into mining research and development? How far is it targeted, and how much does the government match or manipulate that targeted shot?

Prof. Napier-Munn—As in a couple of the other questions, we should probably come back with a more thoughtful response, because I am not 100 per cent familiar with it. When the scheme came in a few years ago, it was dollar for dollar. I do not think it is now, because it was so successful that some universities were absorbing a lot of money. They cut back the formula, but the principle is the same.

I believe that initially it was absolutely general. There was no targeting of particular industry sectors, but I think it is possible that they may now be targeting industry sectors. We know that mining is one of them because we have a very substantial joint venture with one of the universities there, and we know that they profit from this. The irony—if I can make this point—is that AMIRA runs a very large program in which we are the major contractor. We subcontract some of that work to the University of Cape Town. I will not bore you with the details but the formula as to how all this works means that, in a sense, the University of Cape Town profits through their THRIP scheme from the work that we do. They get the money; it stays in Cape Town and none of it comes over to Melbourne or Brisbane. I think we can find out what the latest rules of the game are for you, but the key element is that it is very free of government decision making or bureaucratic impost.

Dr WASHER—One idea proposed to us by FASTS—the Federation of Australian Scientific and Technological Societies—which I thought was a great idea, was that we should look at funding annually 100 postdoctoral scientists in industry fifty-fifty. So industry takes them up for a couple of years—they did not put a fixed figure on it, but I would imagine they are talking about a Singaporean model of about two years—and puts in 50 per cent of the money and the government funds 50 per cent of the money. Why I like it—and I want to excite you about this, if I can, because we need to market this a little further—is that it stimulates job opportunities for people, because you mentioned earlier that there is a lack of people going into the mining sector. I guess we are talking about science from a scientific point of view, and I guess that there would be surprises relating to job opportunities. I imagine that would be one of the components; remuneration would be another. The second thing is that we would interface our scientists with industry and, vice versa, industry with science. Do you see any merit in that idea?

Prof. Napier-Munn—Absolutely. I think it is a brilliant idea.

Dr WASHER—And it is simple.

Prof. Napier-Munn—Again, the companies can vote with their wallets, in a sense. The ARC has a scheme now, as I am sure you know, that is a sort of subset of that. It is the so-called Linkage scheme, which encourages funding by the ARC and industry jointly. But, again, it is a peer review process that involves a lot of time and effort and so on. If industry said, 'We want to work in this area,' and we had a couple of postdoctoral guys whom we would like to work with one of the institutions for a while and the government came up with the other half of the money, I think that would be a brilliant scheme; I think it would be very popular.

CHAIR—I mentioned before the evidence we had on mining research and developing going offshore with the takeover. The example that was provided by Professor Fell of FASTS was Acacia Resources, which was taken over by Anglo Gold of South Africa. In his evidence, Professor Fell said that Acacia Resources did a lot of R&D in Australia. On the other group, he said:

I suspect the Placer group purchase of AurionGold, if it happens, will have much the same effect.

Dr Greenhill—In one sense, that is true. However, both of those companies did not have, say, fixed facilities within Australia in the sense of a Rio Tinto or a WMC Resources and so on. From the point of view of that takeover, it did not remove that particular aspect. What it did impact on was exploration activity, because, in this industry, when you combine two companies like that, one of the things that tends to be removed from the organisation is duplication in the more speculative areas. In mining, exploration is exceptionally important; however, it still clearly falls into the speculative area. That had a significant impact—certainly for Acacia.

However, in terms of their expenditure—from the context of the industry association I work for, where we manage R&D—we have probably increased the amount spent by what is now the combination of those two companies from that source by that occurring. I am not for a moment suggesting it is necessarily a good thing that there be a continuing level of takeovers in the industry; however, just as a point of fact, that was our experience. For different reasons we would anticipate that, if Placer is successful in taking over AurionGold, that would have a negative impact on us. Those reasons involve the fact that Placer is a Canadian company, has its own research facilities within Canada and has a philosophy for using those in a different way from what we are used to. So they may regard it as a case for and against the argument.

Prof. Napier-Munn—I would like to endorse those comments. I think the example of Acacia and Anglo worked exactly the other way round. We have a lot of business with AngloGold. I think AngloGold is a large company with a much greater capacity to fund research than that of Acacia on its own. It is up to us to do it but, because they now have an Australian connection, it is more likely that we can get Anglo money into Australian institutions, not less likely.

CHAIR—Thank you for that. I am pleased I found that example.

Ms GRIERSON—In dealing with your industry, my instinct is that most of the innovation has traditionally come from CRCs and links to institutions and universities. Is that correct or incorrect?

Prof. Napier-Munn—That is incorrect, in my view. I have done some studies of this over the years and I think the answer is that there is no magic bullet; when you look at it the innovation comes from everywhere. It comes from current operations; it comes from equipment manufacturers, who have to stay competitive; and it certainly comes from corporate R&D organisations, universities and the CSIRO—it comes from everywhere. I think it is a mistake to think there is one principal flow of innovation that is an average for the industry. It just does not work like that.

Ms GRIERSON—I am pleased to hear that. So it just makes it difficult, does it?

Prof. Napier-Munn—It is difficult to target; you are absolutely right. I think the picking winners thing is a mixed blessing. The CRCs, in my personal view, have been a mixed blessing. I think a couple of them in the mineral area have done very well and have done some good things. I do not want to get into the CSIRO discussion—some of my best friends are in the CSIRO. They are reasonably well resourced and have produced some good things. The universities, too, distracted by trying to teach, have also done good things. The corporations

also have a particular view of life. I am an optimist: I think most of these guys are trying hard, within their structures, to do good work. By and large, it produces useful outcomes. But, from a government point of view, it is difficult to target limited resources into areas that will give you the biggest bang for your buck. I think it is difficult to identify those in our industry. But another way to look at it is that that is the strength of our industry. By the way, let us not forget lone inventors. When I look at the difference in the technology now, compared to 20 years ago, a significant minority of the innovations have come from individuals who can be identified.

Ms GRIERSON—I am assisting a small company, and they see themselves as being a lone inventor in the mining industry. Walking them through the stages has been revealing to me about how difficult it is. Their caution in taking their idea somewhere is very real; as you said previously, they do not want to lose their idea. They will link and partner to get the idea to certain stages, but then they will still hold back from taking that plunge because they will lose control of the idea. Registering the patent is one thing, but what about enforcing patents? Does that actually happen? Are the costs real? Are there companies that just enforce patents? How does that work?

Prof. Napier-Munn—That is another very perceptive question. At the corporate level, of course, patents do get enforced. Our little company in the university which commercialises our R&D outcomes has a few patents. I have had endless discussions with the patent lawyers, and they have said, 'If you are going to patent something, you have to be prepared to enforce it.' I said, 'What is the cost of enforcement?' They said, 'The going rate is $US1 million.' That is a significant part of the value of our company, so for small people it is unenforceable. The view is, however, that if you have a patent it does make the big players think before they swipe the idea. There is, we hope, some level of honesty and reasonable behaviour. If there is a patent, it is rather like putting a sign outside your house saying, 'This house is protected by such and such an alarm system.' I am told that just having the sign turns off about 40 per cent of possible burglars. I think patents are rather like that. It is a help, but defence and implementation are very difficult.

Ms GRIERSON—In the mining industry particularly there are many associations, professional groupings and industry groupings. What role do you see them having in supporting R&D?

Prof. Napier-Munn—Can you say a bit more about the groupings you have in mind?

Ms GRIERSON—I am thinking of groupings like yours. You are a professional collective basically, but there are many councils, mineral councils—those sorts of bodies. There are probably more in this industry than in many others. Do they interact in any way? Do they duplicate or do they assist R&D? What do you see their roles as being?

Mr Larkin—I have come from outside the industry, so I have tried to look at how it all fits together. We are like the doctors or the accountants, but we are different from them in that we are many professions bounded by an industry. They are generally one profession across many industries. So we represent the professionals. In the past, we have been primarily only concerned with continuing professional development, but we are now starting to speak out on issues. We are starting to get more involved in providing whole career opportunities for the professionals in the industry. The peak body at a national level is the Minerals Council of

Australia, and they represent the top 30 or 35 companies. They are the voice of the corporate world. Then in each state there is a chamber of mines, which represents at a state level for state legislation that affects the industry. They have both the corporates and the smaller companies. In Western Australia there is AMEC, which represents the smaller corporate companies.

Ms GRIERSON—Do you have any breakdown of your own membership in terms of how many of them are employed in corporations and how many are employed in research or university centres?

Mr Larkin—Yes. I do not have the figures at my fingertips, but I can get them. We are tertiary qualified people and 60 per cent would still be employed by corporates, but there is an ever increasing number going out to contractors and to be consultants. If you would like those figures, I can get them.

Ms GRIERSON—No, that is fine. Thank you.

Mr LINDSAY—Gentlemen, we will shortly be out of time. I have a couple of quick questions and I would like some quick answers. Looking at the other end of what we are looking at, have you thought about how, if the government makes an investment into R&D in some way, there could be a prospect of it being paid back in the future? What sort of mechanism would spring to mind that would encourage governments to make an investment because they will get a return? I am just picking your brains here.

Dr Greenhill—That is a vexed question, shall we say, rather than anything else.

Mr LINDSAY—Governments all the time hear 'Gimme, gimme, gimme,' rather than 'This is the benefit.'

Dr Greenhill—I think the benefit for government in the way it manages the country is in having an economy that is healthy. You are asking, 'Is there a direct way of repaying that is like a loan to a bank?' and I am saying, 'Is that the role of government, or is the role of government to support the infrastructure that enables—

Mr LINDSAY—No, I am asking you: have you thought about it?

Dr Greenhill—We have thought about it, but we have not got the answer.

Mr LINDSAY—Stop there. Tim, you avoided that question; try avoiding this one: do you think that university turf wars impact on the country's ability to do R&D better?

Prof. Napier-Munn—Yes.

Mr LINDSAY—Fantastic answer; thank you. HyShot at UQ: Australia leads the world in supersonic research—

Prof. Napier-Munn—Hypersonic.

Mr LINDSAY—Hypersonic, yes. Australia leads the world, but that project group struggles and struggles to get a few dollars here and a few dollars there. What do we do about it?

Prof. Napier-Munn—There is no one-word answer. I cannot speak for that group, because I only know what I read in the newspapers and I have met the guys a couple of times, but there are plenty of schemes around that purport to help groups like that. They have had over many years a few million dollars, as I understand it, in funding of one kind or another. I do not know whether there is a pat answer to that, but eventually, of course, it has got to be someone who has a commercial interest in the outcome and puts serious money into it. Whether or not it has got to that point yet, I simply do not know.

Mr LINDSAY—Just changing tack again, in the way ahead, do you think that big players have seen their days in R&D, or is there still a place for big players?

Prof. Napier-Munn—I think it is getting harder to get the marginal benefits in R&D, and it is becoming more and more multidisciplinary. I worry about the small players. The big players are the ones that are going to do the big work in the future. I think that has been shown to be the case across all industries. I do not think the mining industry is any different. But I think there is a place for the small players, too; I think the fit is quite good.

Dr WASHER—To follow-up on Peter's question, are you talking about the oxygen-hydrogen combination ramjet engine that does, or proposes to do, 7,000 kilometres an hour et cetera?

Prof. Napier-Munn—Yes, the air breathing, very fast jet engine, which goes at mark 7 or something.

Dr WASHER—Professor Napier-Munn, can you elaborate on CRCs? I have been exposed to some criticism about CRCs and the fact that they are the major source of funding from the government. Their functionality is sometimes questionable, and you alluded to some lack of enthusiasm. Frankly, what do you think of CRCs? Should the government be putting out a quantity of money through the CRCs?

Prof. Napier-Munn—Yes, they should. By and large, they are a way for government to get some good leverage on good work and to force universities, industry and CSIRO to work together, which was one of the original purposes of Ralph Slatyer, who invented them. I think they have been very successful and are a good mechanism for government. Perhaps when our American colleagues look at this—when we say, 'We have got $3 million from the government, $3 million from industry and $3 million in matching funds and it is a horrendously complicated democratic process of reporting and audit and all the rest of it that inevitably goes with government related things'—they laugh (a) because of the amount of bureaucracy and (b) because of the noughts on the end of the figures involved; they talk about an extra nought or two in terms of the amount of dollars. One thing to think about might be focusing what money is available. Critical mass is the big issue. It comes back to the big corporations—critical mass in particular technical areas.

Mr Larkin—We have one message that we would like to leave with you. We talk a lot about the need for a much simplified tax system. Maybe the whole R&D system needs to be simplified.

CHAIR—We are always trying to simplify government. Thank you very much for your very valuable contribution this morning to our inquiry.

Prof. Napier-Munn—Thank you very much for listening.

[10.02 a.m.]

GERRAND, Professor Peter Hamilton, Member, Council for Knowledge, Innovation, Science and Engineering

GRACE, Mr John Patrick, Member, Council for Knowledge, Innovation, Science and Engineering

LAVER, Mr Peter, Member, Council for Knowledge, Innovation, Science and Engineering

CHAIR—Welcome. Do you have any comments to make about the capacity in which you appear?

Mr Laver—I chair the advocacy committee of KISE, which is responsible for submissions to inquiries such as this.

CHAIR—I would like to point out to you that, while this committee does not swear in witnesses, the proceedings here today are legal proceedings of the parliament and warrant the same respect as proceedings in the House. The deliberate misleading of the committee may be regarded as contempt of the parliament. The committee prefers that all evidence be given in public, but should you at any stage wish to give evidence in private you may ask to do so and the committee will give consideration to your request. Would you like to make an opening statement before we proceed to questions?

Mr Laver—KISE is the advisory council to the Victorian government on matters relating to innovation, science and engineering. It has operated both with the current government and, in a slightly different form, with the previous government for close to 10 years, so it has a major impact on policy in science and technology within Victoria. It is a mixed body with a mixture of industry people who have an interest in research, and researchers themselves. We have members like Suzanne Cory, who heads the Walter and Eliza Hall Institute of Medical Research, and a number of other medical researchers. We have government people as members, and about five ministers are members of KISE. The Premier chairs it. It is our habit, in submissions to these committees, not to bind ministers, so you will notice that the submission is in the names of the non-ministerial members of KISE.

We come here today as three members with significantly different backgrounds. We plan to take the submission as read and to talk in general terms relevant to our particular backgrounds. My situation is that I worked for BHP for 40 years, including five or six years running the research function within BHP. I was the chairman of the incentives working party for the Innovation Summit, and I chair a small start-up company that is attempting to manufacture a ceramic fuel cell, which is a CSIRO technology that is currently in the process of being developed.

My colleague Professor Gerrand was the foundation CEO of Melbourne IT and has had extensive experience in the telecommunications industry and CRCs. Mr Grace was Managing Director of AMRAD and has extensive experience in the pharmaceutical industry. They can

probably describe their backgrounds in a bit more detail. I assume our submission has been read and will take that for granted. I think my colleagues are both anxious to make a short opening statement.

Prof. Gerrand—I bring three areas of experience which might be of interest to the committee and help me respond to parts of the KISE submission. On the industry side, as Peter said, I was the founding CEO of Melbourne IT, which started in May 1996, built from scratch to the publicly listed global company it is today. I stepped down about a year after listing it. These days I chair an industry cluster called the Victorian Photonics Network, which comprises about a dozen small to very large firms involved in R&D in photonics in Victoria plus about five universities which carry out active research in that area. I have been the chairman of the Telecommunications Society for the last nine years and was a member of the IR&D Board selection committee in information and communication technologies for three years in the late 1980s. When I was running Melbourne IT, I was supporting five start-up companies as a small incubator. Then I became a foundation director of Information City Victoria, which is a federal government funded—BITS funded—incubator management company. On the CRC front, in the early nineties I was supporting them as an executive at Telstra. When I became an independent academic, I became an official visitor on behalf of the Chief Scientist to three of the CRCs in the mid-nineties. These days I am a director of Australian Photonics, which is the management company for the Australian Photonics CRC, one of the largest and most successful CRCs.

Mr Grace—Thanks for the opportunity to be here. In a bid to assist the questions, I will mention a couple of points—and hopefully there is a loose connection between them. I have been involved in research and development at an industry level for 30 years. I started out at the bench—never really as a scientist; the term was more 'bucket chemist'—working in food technology. I was with Mauri Brothers and Thomson which, at the time, had a food industry research laboratory at Darlinghurst in Sydney which employed more than 60 people. I do not think you could find a food industry laboratory in Australia today that employs 60 people. It was really a sign of the times: the general protection the economy had at the time—which I did not agree with subsequently—nurtured that environment. Mauri Brothers has gone through a number of metamorphoses, but each time the R&D activity has contracted. In the food industry the issues are more about ownership than about R&D—and ownership issues feature largely in that area. I mention that experience in relation to any questions about the food industry.

My view on your inquiry into the support mechanisms of government is that we first have to answer the question of whether we do R&D in the first place, and that question really goes to what sort of economy we want for the country. If you look at the breakdown of the US economy versus ours in relation to the manufacturing sector, you will see that the US has 33 per cent more manufacturing contributing to the GDP than we do. I think that is where we have an opportunity for wealth for the nation in the future. As to what support the companies want, I group them into two categories: those that do not make money and those that do. Those that make money are concerned about EPS—earnings per share—and therefore, as their R&D expenditure increases, they have to ask questions about how that is going to impact on shareholder value and on their bottom line. Any program that impacts positively on reducing the cost or improving the EPS is therefore very important. As for those who are losing money—start-up companies—the issue is cash flow, so the recent change to enable them to access the scheme is good. I have never had a look at the paperwork, but these companies are very small and those sorts of things are certainly very important.

Ultimately, in terms of business support for R&D, you cannot get away from the issue of priorities and targeting. Working with the KISE group has certainly been a very interesting exercise. Part of my current dilettante set of activities involves investment banking and being a member of both the Australian Research Council and KISE. One of the KISE initiatives is the STI—the strategy for supporting extra infrastructure. This involves placing R&D activities within universities et cetera, based on application, to help the infrastructure—a gap analysis. What we support in R&D is a fairly important issue. A phrase that was coined by somebody else that I think is always useful is 'the tyranny of size'. We talk about the tyranny of distance. The tyranny of size is really the big issue, particularly in the latter part of my career—which is in the pharmaceutical and biotechnology area. I keep reminding myself that good friends at Merc spend more money on research and development than Australia does in business—in everything. They only look to develop one new drug a year, and they might buy one of those every second year from somebody else who has developed it, like a start-up biotech company. The whole Australian listed biotech R&D sector does not spend as much money on R&D in the sector that Merc spend it on as Merc do. So the tyranny of size is a very big issue for us. Ultimately, the decisions about incentive programs cannot get away from addressing issues of scale and focus, which are also linked to priorities. Thank you for the opportunity to give those opinions. I am happy to answer any questions.

CHAIR—To give us an idea of the role of the organisation in the Victorian government, did KISE have a fairly major involvement in decisions like, for instance, the synchrotron that is going to be established in Victoria? Is that how your organisation works with the Victorian government?

Mr Laver—Yes. KISE had a major role under the previous government of appropriating $310 million over five years for additional science and technology initiatives. The synchrotron was not part of that, because it would swallow that very quickly, but the synchrotron was regularly discussed and a report on its progress is regularly made at KISE meetings. But it was not paid for out of the specific fund that KISE was responsible for allocating to science and technology. It was a larger lump than that. Of course, there were some other factors at work with respect to the synchrotron that related to interstate rivalries.

CHAIR—Is the role of KISE basically to recommend where a particular budget amount, which is presumably given to you by the Victorian government, should go, or is it a broader role, from an advisory point of view?

Mr Laver—The first role was to recommend the budget and to convince the government that it was worth allocating a certain sum. That money runs out next year. KISE is currently applying itself to how it shall be replaced. The feeling is that the money has been spent fairly satisfactorily, basically in three areas. One area has been supporting programs within other departments, such as science programs within Natural Resources and Environment and special education provisions for science teachers within Education, which has been an area of considerable interest to KISE. The second area has been the science and technology infrastructure fund, where a competitive bidding system has provided infrastructure projects, usually on a $1 for $1 basis with the proponents. But our shared infrastructure—the testing equipment and basic facilities that a number of different research bodies can use—has been very successful. There has been a very high level of interest in that and very high quality proposals have been made across the full field of sciences.

The third area is in miscellaneous initiatives such as running the Victoria Prize to reward scientists—which is a mini version of the Prime Minister's science prize—and a number of conferences, programs, symposia and various other things. In all of these, KISE has some input in advising government as to how that money is best deployed, but particularly in the area of science infrastructure it has been a KISE committee that has actually determined where that money should go.

CHAIR—Thanks for that. One of the comments you make in your submission is the need for improving linkages between universities and industry. This is certainly something that has been raised in other submissions as well—and some of the gaps that still exist. Do you have any particular suggestions or comments as to how those linkages can be improved?

Mr Laver—I should say that I have been a chancellor of a university and I am an auditor for the Australian Universities Quality Agency, and this is one of the things during an audit that we talk about quite frequently—it is important. Unfortunately, the cultures of the two organisations are sufficiently different in Australia that they really do have a lot of trouble communicating. The problem is that universities see industry money as somehow coming with strings attached and, because quite often it is not competitively granted in the same way as ARC money is, it seems to be second-rate money, if you like, for researchers. On the industry side, industry gets very impatient with universities that do not seem to have a great focus on completing things on budget and on time. Also, their main aim in life seems to be to publish the results rather than to actually commercialise them. That is changing, and there have been some spectacularly good examples of relationships. I think the aim must be to identify those and to build on them. The Business Council higher education roundtable runs annual awards for industry-university collaboration, and the committee should perhaps ask that organisation for some examples of things that have happened in the past. I have been a judge of those awards now for four or five years, so I have been privy to some of the outstanding things that have been happening in that area and they really are quite heartening. The problem is that there is not nearly enough of them.

CHAIR—It seems to me that in other countries, where you would say that that culture is a lot better, there is a lot more interchange of personnel between universities and industry. That is something that I would say we are still lacking in Australia.

Mr Laver—I will leave that to people closer to it. It is very hard in Australia for a university person to leave the university, preserve their superannuation and various other things, start up a company, fail and then come back to the university. That is not part of our culture and it is not part of the taxation and superannuation systems; whereas in the US, it is. In fact, it is almost a badge of honour for university academics in the States to have started a few companies and done their dough and come back into the fold of the university—they eventually get it right. Peter, you are a bit closer to that.

Prof. Gerrand—Yes. I have a few comments. Firstly, it is actually becoming structurally more difficult in Australia for people who have had a lot of R&D experience in industry to come successfully back into universities. By contrast, with engineering in Germany—particularly in information and communication technologies—they have rules that virtually make it impossible to be promoted as an engineering academic in the universities without a significant spell in industry, so there is a lot of interchange of people throughout their careers. That leads to the industry having a lot of confidence in the academics and to it being prepared to

the industry having a lot of confidence in the academics and to it being prepared to invest much larger sums in funding university research than has generally happened in Australia.

We inherited more of a British culture around universities where there was a big separation between their interests and those of industry; whereas, in the US, where they have made national heroes of inventors like Thomas Edison, they have had great pride in their 'techs', such as the Georgia Tech and the Massachusetts Institute of Technology, both of which have produced many Nobel Prize winners. So there is much more ready interchange of staff between industry and universities. It is very hard these days to even get a basic lecturing position in a university without a PhD, for a start, and there are a lot of industry researchers who do not have a PhD. The promotion criteria in universities still give very little weight to the R&D achievements that people might get in industry.

Dr WASHER—Mr Grace, you mentioned the food industry. I guess we have always heard that you need a certain critical mass to get R&D really rolling along and commercialise it. We have a massive agriculture based economy, yet it would seem to me that the food industry, in its R&D, commercialisation and manufacturing practices—sending out the raw product—has not been that successful. Have you got any comments on that?

Mr Grace—The commitment by companies to spend money on R&D is directly related to their capacity to make profits in the future. The one salient feature of the food manufacturing industry is that it is a very low margin business. Therefore, commitments to spend money on research and development are always impacted by that. The other expression, which is just for your amusement, is 'nobody eats blue ice-cream'. In other words, innovation in the food industry, doing something different, is always up against understandable and appropriate conservative behaviour about what people eat—fresh food versus manufactured food.

My first job was with Cottees in 1969. It was taken over by General Foods, which came in and brought 'toast poppers' and artificial cream. These things were an absolute disaster. But there was a lot of R&D involved in that, such as making orange juice by putting a whole orange in the machine—you got the lot. It was called comminuted orange juice and it was much more efficient. So the idea of doing R&D in this sector is always against those margins. In regard to Australia at this point in time, the R&D that is done has been done somewhere else, be it at Kellogg's, Nestle or wherever.

Regarding the proposition about the agricultural value-adding chain, agriculture—as you know—is important but diminishing in terms of percentage of the economy. It is always facing competitive situations from other countries. The mythology that 'just because you grow it you can make good food' is certainly impacted by the tyranny of size. There is no-one here to use the stuff. The issue of size has come on top of us because companies make more money by consolidating than they do by running little operations.

I am not sure whether that answers your question, but certainly R&D in the food industry is always going to be impacted by the low margins. R&D in the pharmaceutical industry is very high because, allowing for other debates about pricing and such things, the risk is there—if you do produce something that can demonstrate a benefit, you get a reasonable price for it and therefore the margin is fairly high in those sorts of products.

Dr WASHER—The other part of the question concerns some of the phytosanitary and trade barriers. For example, if we grow rice, we have about a 600 per cent tariff in Japan. If we make sake out of it, the tariff is only about 100 per cent, so it pays to sell it as sake rather than as a raw product. That is a crazy example of the different tariffs.

Mr Grace—But my question would be: who controls the market for sake?

Dr WASHER—Professor Gerrand and Peter Laver, one of the things you have there is knowledge—and I guess knowledge means education. How are we progressing in Victoria in mathematics and science education? I ask this because this is your main interest. What are the barriers there? Without that education, we are not going to have the R&D people of tomorrow in this country.

Prof. Gerrand—That is an issue which is frequently discussed in the KISE council quarterly meetings. The non-government members are very pleased that the Victorian government is taking a whole of government approach on this and recognising that you ultimately cannot build very strong R&D based industries unless you have children—even at primary school, but certainly at early secondary school—making decisions to go into science, engineering technologies et cetera.

In terms of addressing the important national problem of scarcity of maths and science teachers, a number of initiatives are being looked at. One of the members of KISE, John Vines, has put up a proposal that perhaps nationally we could take advantage of the large number of qualified engineers and scientists who are losing jobs in various parts of industry as a result of very heavy cutbacks in staff middle management et cetera. This could be done by having more rapid conversion courses to turn these people with university degrees in maths science and maths based engineering into maths and science teachers. I believe that is being looked at within the education department in Victoria at the moment. There has also been, for about a decade, a lot of effort from several of the Victorian universities to have some of their younger academics and researchers go into the schools as models. They talk to the girls and boys there about their careers and try to attract them to those careers as well. That has been paying some dividends, particularly in increasing the proportion of young women doing engineering in the Victorian universities.

Mr Laver—Dr Nelson does have an inquiry running in this area and KISE will be making a submission. If you would like to have a copy of that we would be able to send it to you in a week or 10 days. Our main focus is to see what the science community and industry can do to help address the problem. We see that there are mentoring programs, assistance programs and work experience programs for teachers. There is a range of things that are non-financial rewards for teachers that may make the profession more attractive, so that is one area. The second area that we are very concerned about is that too many kids are getting turned off science in the middle years. By the time they get to the last couple of years of school they have lost it. We are proposing some things that can happen in those middle years, for the 13- and 14-year-olds, where these days we are losing a lot of kids who could otherwise be quite interested and useful in this area.

Mr MARTYN EVANS—I notice that you provided some very helpful comparative statistics about Australia's place in the world structure of these things and how we benchmark against

other countries. We have some quite distressing placings in some of those league tables, but when you look at our place for tax credits for firm-level research and development, on the tax credit stake we are no. 6. This is well above the relative position that we might expect to hold in the global ranking where Australia would normally place. So we are well above the average on our expectation on tax credit positioning. If you look at that we are actually well up in our generosity, as a country, for firm-level R&D tax credits but then well down on what the firms then ultimately produce from those tax credits. This seems a little counterintuitive if the tax credits are actually doing their job. Does that then say to us that perhaps the tax credit methodology is, in Australia's context and given your quite perceptive remarks about the tyranny of size and so on, not quite delivering the goods in Australia. This is something I have suspected based on other evidence that the committee has had and my own observations over time. Is that something that you might also have picked up? When you look at the rankings that you present, if they say anything to us other than that we are doing badly on the R&D commercialisation front and the delivery front, they also say that we are doing quite well on delivering the tax credits but we are not getting what we ought to get from them.

Mr Grace—Having filled in the World Economic Forum global survey on at least one occasion, I know there is a certain anecdotal aspect to it in terms of the way you fill it in. I just mention that. From a start-up company point of view—which has primarily been my experience—you can make a proposition that the support schemes since the AIRDIS was first put in place have been quite reasonable and useful to such companies. You can have criticisms about process and about the way that schemes are presented; R&D is not something you plan to do when you get the grant, and you sometimes can it before the grant is even halfway through because of technology changes. There is inflexibility and there are a whole lot of process issues.

The answer probably is that the statistic is sound but that then you have to deal with the other issues, such as investment in those sorts of companies. Currently, as I mentioned, I am involved in the investment banking business, and there is no private capital for start-up companies. The VCs are not investing. The fashion will change and they will all swing around and throw money around again, one hopes, at some time in the future. Or the other way: what is the quality of the science that is being worked on? The issue I always faced over the years was getting enough quality science as distinct from the quantity of it. In government funded R&D, the issue is not how much money is spent but what you do with it. Maybe the schemes are not too bad for the start-up companies, but there are a lot of other issues around the implementation of it.

Prof. Gerrand—One of the federal government programs which seemed to give the most direct correlation between tax credits and outcomes for Australia was the Partners for Development program run from about 1986 to 1996. If you remember it, the major overseas owned vendors in both information technology and telecommunications could not win contracts with any level of government unless they participated in the scheme. It required them to invest quite heavily in R&D activities in Australia, but those R&D activities had to be very strongly linked to export. What we saw in the telecommunications industry was that, when that scheme started in 1986, the total exports in both equipment and services were at the level of only about $100 million and they rose steadily in almost a linear fashion to over $1 billion in 1996. It was unfortunate that that scheme was then disbanded. That was the case: you saw this correlation; you saw this focused spend on R&D towards export activity. It really took off.

Mr MARTYN EVANS—Let us consider what you have been saying about the tyranny of size and about Australia's unique position in some of these areas. If the government is still spending the same kinds of sums, when you look at the complexity of many of these issues—the speed with which R&D moves, the flexibility that is required of companies operating in this area, the relative difficulty of extracting money from government under these circumstances and the accountability requirements and the necessary regulation and bureaucracy associated with them—is there merit in looking at ways of injecting government funding into the science infrastructure around these operations which would benefit the companies looking for qualified people, looking for science, looking for innovative infrastructure, looking for assistance with testing and for qualified personnel at a slightly cheaper rate and so on, rather than trying to second-guess what companies are doing in terms of post-subsidy of their R&D?

Mr Grace—The words 'focus' and 'scale' are absolutely paramount to success in R&D in the areas that I have worked in. I recall that, when the Australian government funded the Australian Genome Research Facility sequencing laboratory, they invited Craig Venter, the founder of a company called Celera, to speak. That was the private company that did the Human Genome Project. Our local scientists proudly announced that they had recently bought an Applied Biosystems machine No. 597—or whatever—and that it was fantastic. Craig Venter got up and said, 'Our problem is that we cannot find enough technicians to put in the 300 that we have just purchased.' So the scale dimensions are just extraordinary.

I also know scientists, like Metcalf in his latter career, who have sat there with their plates and counted blood cells for years and who are terrified by the competitiveness of a company in their basic research—not in applying it. You cannot get away from that scale and focus. So how you deal with it is a conversation that would go longer than this section of the hearing, but it really is quite an important feature of any government policy.

Mr Laver—With respect to infrastructure, of course that is what the Victorian government fund is about. They have recognised that shared infrastructure is actually an advantage. To touch on tax credits, just the name is wrong. If Australia had as many good technology innovators as they have taxation innovators, we would be a much stronger country. I think Kaiser's view is that the sooner you can disengage the R&D incentives system from the tax system the better because it is driven by the wrong things. The amount of money it costs the government could be spent more effectively if it were a rebate scheme or some other form of scheme a little bit more sensible than the tax scheme.

Mr LINDSAY—In your submission, you mention some smaller countries, one of which is Finland. Your evidence is that R&D performance in Finland is dominated by the private sector. You said that the private sector accounts for 70 per cent of the nation's R&D spend. That is not the situation in Australia. Do you think Finland's situation is isolated? Should Australia sit up and take notice of it? Where do you think we are going in Australia?

Prof. Gerrand—There is a lot to be learnt from every one of these countries. In the case of Finland, a very large proportion of that private sector activity has been around one company, Nokia, which has been a fabulous success. It is certainly worth looking at the lessons by which the Fins, probably having a greater sense of national pride than Australians, have been supporting companies like that. You cannot readily map the lessons directly from that country to Australia, but you can learn a lot of lessons from where they are doing things right.

Mr LINDSAY—In relation to Israel, there was some evidence given—and you may have heard me ask an earlier witness about this—about repayable grants where R&D was commercialised. Should the committee think about incentives for R&D which involve some kind of a repayment?

Prof. Gerrand—My view is that the repayment comes from the outcomes of the R&D spend which are increased employment and hopefully increased export revenue which is the major return. If it is done successfully, that level of return would dwarf the payback of the R&D grants in a loan sense.

Mr Grace—My quick answer is no. The reason it is no is that the level of bureaucracy that would be associated with accounting for the companies that owed the money, allowing for the companies going bankrupt to be explained to the electorate, dealing with the money after you get it and saying what you are going to do with it would pale into insignificance compared with the complexity of getting the money in the first place.

Mr LINDSAY—Your strong evidence to the committee is: do not even think about it?

Mr Grace—Correct.

Mr Laver—Rely on company taxation.

Mr LINDSAY—Currently in Australia we have the Backing Australia's Ability program. I see that Ireland has the Technology Foresight Fund. Is Australia using the right language to communicate what the government's intentions should be? Among the practitioners, is the government marketing what it wants to happen by using the right language?

Prof. Gerrand—I do not think there is anything wrong with the language. There is always a recognition that these programs are very beneficial, but they tend to operate, per capita, at a lower scale than those of some of the countries we would like to be competitive with.

Mr LINDSAY—In your submission it says:

> ... there could also be merit in aligning some business R&D incentives with national research priorities.

Is that a minefield? How do you do that?

Prof. Gerrand—This has been an area in which Australia has, until the last couple of years, been very reluctant. It is always dismissed by the phrase 'the danger of picking winners'. The fact is that you have to take some risk and pick winners, consolidate and focus, if you are going to get the critical mass of investment to pay off. I think it is one risk that we, as a nation, have to embark on.

Mr Grace—But being on the council of the only organisation that has actually dealt with priorities—namely, the ARC—has not caused us any particular grief. My personal view on it is that the government is the stakeholder, representing the people of Australia, and this is the first time in my 30 years of interacting with government where the stakeholder has actually said, 'This is what we would like you to spend the money on.' I think it is rather refreshing. Whether

you get it wrong is almost irrelevant to saying, 'This is what we would like you to do with it'. 'Picking winners' is a dry economist argument for doing nothing and I do not think it is acceptable.

Mr LINDSAY—Part of your submission also said that investment incentives should encourage the most valuable R&D activity. How do you determine that?

Mr Grace—I did not say that it was easy. My proposition is that, in government, you cannot abrogate the role and say that you will not be going through some sort of process. It should always be driven by the probability of success and excellence. Therefore, in the case of the ARC's submission to the priorities inquiry, it was done by getting the top scientists—who were in the room at the time going through all the grants—to undertake a brainstorming session and work out what we think we are really good at and what are areas that there might need to be work done on. We asked the people who were, potentially, recipients of that money but who were, nonetheless, the ones who had the expertise. That is one process but there are lots of processes for doing priority setting.

CHAIR—I would like to follow up on what Peter was saying. We constantly talk about the culture problem in Australia. Do you think things like governments picking winners and not being afraid if there are failures are really part of the way in which we will change the culture?

Prof. Gerrand—I believe it will in the sense that you are providing common national goals with which you can align education, research and industry development. So it brings these different groups together for a common purpose at that very fundamental level, and that really helps.

Mr Grace—I think ultimately it is on the individual level: how do governments create an environment where the individual feels that they either are not penalised—as Peter was talking about before—or are empowered? The Vice-Chancellor of Melbourne University has enacted the right of the researcher to have the intellectual property assigned to them. That is a bold experiment and may prove to be successful or otherwise, but those sorts of things at least create an entrepreneurial view in the mind of the scientists; the culture is individual. Then there are issues, basically, of national preparatives. Priority setting per se creates as much debate about government interference as it does about government support.

Ms GRIERSON—I am intrigued by what you said earlier in your drug company example of an actual corporate plan which says, 'We'll buy up the best at a certain rate and therefore we'll own that.' Peter, I am interested in using your company as an example. How do we protect those sorts of initiatives, innovations and success stories from being bought up by overseas interests and therefore being lost to us? Once you are a company, you can be taken over, and intellectual property goes with it; intellectual property laws will not stop that. How do we do that if we are going to back winners or identify areas such as energy or biotechnology?

Mr Grace—Assemble the institute of actuarial practitioners together and ask them to model the country based on what it would look like with a certain number of these sorts of companies still being owned by Australian investors and then try to influence their investment practices. Ultimately it is they who have the dough and who buy the companies that determine this game. We are a capitalist society.

Ms GRIERSON—So you see real investment incentives as one way of doing it?

Mr Grace—If you are arguing culturally, the issue sits, culturally, with that group. How you might impact on the culture I am not qualified to give a view on, nor do I have any sensible views about that. But certainly the food industry was absolutely exemplified by the Campbells-AMP story—there is no question about it. Harold Cottee sold to General Foods because they walked up and gave him £800,000—'Here it is: here is £800,000.' In Japan, Campbells Foods would never have bought Arnotts Biscuits, because the people who owned it—like the Mitsui Bank or whoever it was—would not have allowed that to happen because it is part of Japan. It is a cultural investment proposition. As a superannuant, I might argue that they should not do that—that they should get the best money.

Ms GRIERSON—So you think some sort of status that protects them would actually limit their viability?

Mr Grace—The argument—which I agree with—is that if you interfere with the free market you will have problems, but this is about the projection of the wealth of the nation in 50 years in some sort of actuarial sense. How are they going to pay life insurance payments and superannuation payments in the future if the nation itself does not have the wealth? If it gets the wealth from tourism and mining, that is fine—that is a model. But if R&D is part of that wealth, then those sorts of companies should continue. In Peter's industry there are numerous examples of companies being acquired. It is not about patents—you just buy the patents when you get the company. Patents are very important but the question is why you are buying the companies, and maybe there is no answer to it.

Ms GRIERSON—But, if we have priorities, there must be bigger incentives to make those companies link into the priorities.

Mr Grace—You get scale and focus. Companies that are successful in the biotech sector like CSL and Cochlear—that is a loose usage of the word biotechnology, but nonetheless they are in that sector—have the right scale: they are large companies in that area. It does not mean they are protected from being acquired by even larger companies, but at least they can be viable in this country.

Prof. Gerrand—I am very happy to respond to that. On one hand, I think it is very important that Australia retain ownership of a number of key global brands, such as Qantas, Fosters and Telstra, so that we are taken seriously internationally, at least as a second-tier country economically. But it is not essential to worry too much about Australian companies being bought up by overseas companies if Australia still retains the key benefits, particularly if the high-value employment stays in Australia and Australia can capture the revenue benefits from that. In the 1980s, particularly, and the 1990s it was sad in one way to see a number of Australian information technology and telecommunications equipment companies reaching a revenue size of $40 to $50 million a year and then being snapped up by overseas companies.

What I take heart in is that, with the continued spending on more basic research in universities around CRCs—research of a kind on which industry is not prepared to spend at all—you have practical reasons why an R&D group of an Australian company would be allowed to stay at their home base instead of being transported to the US or elsewhere. A good

example of this is the Radiata Group when it was bought out by Cisco a couple of years ago. This is a group of about 30 engineers on campus next to Macquarie University who had the vision to seize a commercial opportunity by designing the first integrated circuit based chip to support some new broadband communication links which will become absolutely essential for computing equipment in the future. While this group was bought 100 per cent by Cisco, the fact that the people largely do not want to move and are close to very good sources of new graduates and postgraduates flowing through, and the fact that Australian researchers now in international terms only cost about half what they would cost in North America, has made it absolutely sensible that that group and that R&D activity stay in Australia. If we can keep these outcomes going, it is less crucial to worry about the actual purchase.

Ms GRIERSON—So incentives to keep those here would be better than any limits on corporate takeovers?

Mr Laver—By definition, if someone buys some technology, it is worth more to them than the people who own it—the money does not disappear. The incentive should be that they reinvest it back—rather than go and build another hotel resort in Port Douglas or something, they should reinvest it back into further technology development. The government has to provide an environment that makes that investment attractive. That is the important thing.

Ms GRIERSON—You say that in Backing Australia's Ability there has been a tightening of the definition of eligible R&D activity. How has that occurred, and what do you think the outcome will be?

Mr Laver—The problem previously was that eligible R&D activity could either be high risk or innovative; now it has to be both. By some definitions, it is very difficult to get some research that is done in Australia classified as both high risk and innovative. Innovative means that incremental research on something existing cannot really be supported. If it is not high risk, some of the innovative work that is done, for instance in the mining industry, would be problematic—so it is really just a definitional thing. If I recall, the evidence given to the Senate by Treasury was that they were going to claw back $350 million a year or something just by changing that definition. So it is really a money-saving thing on the part of the Commonwealth that has restricted the application of the concession. Again, it comes back to revisiting the thought that we should try to disengage this from the tax system and try to manage R&D better, rewarding people who have clear objectives, a clear research plan and the ability to execute it, rather than the self-assessed taxation concession system that is driven sometimes by entirely different parameters.

Ms GRIERSON—You also suggest in your submission that the incentive programs that exist at the moment are biased towards small enterprises. Why do you see that as a limiting factor?

Mr Laver—Certainly, the start scheme is for small enterprises; the tax system, of course, is for anyone. I think history has shown that the most successful developers of new technology have been significant companies with substantial existing cash flows and the like. I am chairing a company at the present time that is starting from the ground up and I know how difficult it is living such a hand-to-mouth existence of having to basically spend all your shareholders' money. There is no revenue, so, instead of spending your money on developing your technology, your chief executive is wandering around the world—as he is doing at the

moment—trying to convince people to give him money. This is a different priority. If you have a large company with an existing cash flow, it is a lot easier to accommodate those things because all you have to do is compete with other forms of investment within the company.

Ms GRIERSON—You also say that incentives should ensure that the benefits of innovation are understood as widely as possible and passed on through the industry. I did not quite understand what you meant by that. What is missing at the moment?

Mr Laver—There are a lot of companies within Australia that have a mindset that it is easier to license or buy technology from overseas than it is to develop it themselves; they have not recognised that there are some opportunities there and I think more needs to be done to promote it. The feeling within industry—I think you will hear this from other groups—is that government is somewhat indifferent to this at the present time in the way it has clawed back the tax concession, which used to be worth a lot more than it is. It is not so much the money itself but the inference that it is not seen as being as important as it used to be, basically.

Ms GRIERSON—Would you suggest that we do not generally have a success culture in this country, or that government is not promoting a success culture sufficiently?

Mr Laver—That is a bit philosophical, but I sense that you could support an argument along the lines that basically the tall poppy syndrome is alive and well, even in these types of areas.

Prof. Gerrand—I would make the comment, not totally flippantly, that in the US they have Thomas Edison as a national hero—here we have Ned Kelly.

Mr TICEHURST—In your submission, you talk about impediments to R&D and mention the short-term return on investments now looked upon by, say, the Telstra arm. This, in turn, is preventing the equipment suppliers from putting more money into R&D. The suggestion is that if the tax rebate for R&D were 200 per cent this could probably be reversed. Do you think there is a need to look at a different method of taxation on capital for infrastructure development? For instance, at the moment if you put capital into any particular project it is not a deduction for the business. It can certainly depreciate over time and you can run up tax losses, but until you start to make a profit you do not get any real return. Do you think there is some merit in looking at a different method of infrastructure treatment in the business sense? I am thinking that, with broadband being a future demand, that is going to be a driver for capital investment. But until there is a reason for pricing changes on the current structure so that other suppliers can get involved, do you think we should be looking at the treatment of capital in the infrastructure area to make it more attractive for companies to get involved?

Prof. Gerrand—Firstly, I would like to emphasise that, in the telecommunications and IT industries particularly, we face an ongoing structural problem that the financial institutions as major investors in the publicly listed telcos, as the key purchasers in the supply chain of the industry, are taking such a short-term view. This has drastic flow-on consequences in that the telcos are spending historical lows on their own capital expenditure. In the last year, Telstra spent only about 17 per cent of total revenues on capex, whereas in the 1990s the average was about 22 per cent, and in the 1980s about 24 per cent. That means that the major equipment vendors in Australia—the Alcatels, Ericssons, Siemens et cetera—are getting very few orders,

and that really inhibits their ability to be able to contribute in CRCs, let alone independently invest in R&D here.

Nevertheless, the major vendors on a worldwide basis are sufficiently big to have resources to borrow money so that, even while they are downsizing horrifically in terms of shedding staff around the world, they are still extremely motivated to maintain some major R&D. When the telcos are forced back into renovating their networks in two to three years time, the vendors will have key products that they can sell. The result is that the Australian subsidiaries are competing with the other subsidiaries of these same companies around the world to be able to maintain their employment and their R&D strength et cetera. It becomes very important to look at the internationally competitive position of our tax structures and grant structures et cetera versus our competitors. I would say that is a key area to start to look at. I am sure you will get direct inputs to the inquiry from some of these major players later on. I am sure they will have a lot more chapter and verse to give you on that matter.

CHAIR—Thank you very much for your valuable contribution to this inquiry.

[11.04 a.m.]

GILLIN, Professor Murray (Private capacity)

YENCKEN, Mr Arthur John (Private capacity)

CHAIR—I welcome Professor Gillin and Mr Yencken to this hearing today.

Prof. Gillin—We represent ourselves but we are actually from the Australian Graduate School for Entrepreneurship.

Mr Yencken—I am a practising management consultant and I am doing a geriatric PhD at Swinburne on university commercialisation through spin-off companies.

CHAIR—I would like to point out to you that, whilst this committee does not swear in witnesses, the proceedings here today are legal proceedings of the parliament and warrant the same respect as proceedings in the House. The deliberate misleading of the committee may be regarded as a contempt of the parliament. The committee prefers that all evidence be given in public but should you at any stage wish to give evidence in private you may ask to do so and the committee will give consideration to your request. Would you like to make an opening statement before we proceed to questions?

Prof. Gillin—We would like to take this opportunity today to present some recent research that we have been doing, particularly by John as part of his PhD program, so I am going to ask him to lead.

Mr Yencken—We are not going to offer you any magic cures or instant solutions. Our presentation is about what we see as some of the structural issues. I will start off with the elements of a national innovation system. You have new knowledge, which is often wrongly called innovation. Innovation is taking new knowledge and making a commercial success out of it. You have technology absorptive capacity—that is, the ability to exploit that new knowledge—and you have an environment that is not prejudicial to such exploitation. One of the things we are very disappointed about, which came out of the National Innovation Summit, is the almost total focus on new knowledge, invention and R&D, rather than the middle one, which is how to improve our technology absorptive capacity.

Recent research in Europe, particularly econometric analysis—you have a copy of my paper; I gave it to the secretariat—shows that national absorptive capacity is very closely related to the proportion of research scientists and engineers who work in business. In Australia this is abysmally low; it is 26 per cent in the latest ABS figures. Similarly, the ratio of business R&D expenditure to gross R&D expenditure is 46 per cent; in the UK it is 61 per cent and in America it is 72 per cent. We are dealing, firstly, with people. We need not only scientists and engineers but also technology managers and entrepreneurs to make it all happen. The lack of statistical data makes it difficult at times to say anything realistic. The last innovation survey was in 1996-97.

I will skip to the next sheet. It points again to the importance of technology capacity. It is the key issue in absorptive capacity and technology catchup. A *Yellow Pages* medium business innovation study that we did shows that in SMEs the negatives of the business environment are things like taxation, legal costs, costs of people and costs of technology. The positives are their own internal skills base and their access to technology et cetera. We have focused on the SME sector; the multinational one is rather different. It is a question of how you give them value for money by doing research in Australia.

If we go on to how you increase business R&D in existing companies, all the work coming out of Europe—for instance, a very interesting paper entitled *Benchmarking industry-science relationships* has just been published by the OECD—shows the importance of linkages between research providers, universities and the CSIRO, and the research users, the companies. In that *Yellow Pages* survey we asked companies that said they had reported product and process innovations whether they also had any collaborative linkages and with whom. Only four per cent had linkages with universities. So you really need to look at how you generate inter-firm sharing to fund research and new technology needs—AMIRA is a very good example of this—and how you allow people low-cost access to new technology. The teaching company schemes in the UK are outstanding examples of this. We did have one here but it somehow disappeared.

Almost a standout is the participation in collaborative ventures, the CRC program has generated $1.34 billion direct expenditure by industry and there are over 900 companies involved in it. That proves the power of the collaborative method. The CRC program is administratively difficult and expensive. There is a case to look also for similar simpler collaborative initiatives that will overcome some of the structural problems in Australian industry.

Let us not neglect the importance of new high-tech start-up businesses. I have done 25 case studies of these spin-offs from universities et cetera. Their R&D expenditure per employee is many times that of established companies. As well as helping to provide better linkages for existing companies, there is a case for increasing the number of new high-technology ventures, both spin-offs from universities and those driven by university students and staff or by CSIRO, students and staff.

CHAIR—Thank you for your opening comments. You mentioned in your submission that the ongoing expenditure in R&D by those spin-off companies is much higher than by established companies. Do you think the reason for that is that they have come from a research culture? Is it partly a cultural thing? Is there some other reason? How many of those companies, several years down the track, are still operating in that way? Are they operating at all? Have you done any work on that?

Mr Yencken—To answer the second part first, my estimates of the survival rate of these companies after five years is about 75 per cent. Some work by Mustar in France gives the same figure. That is significantly higher than the survival rate of other types of new start-ups. My case studies are qualitative so I do not want to claim any statistical accuracy, but certainly expenditure on R&D tends to increase rather than decrease as funds become available to these companies. The average is seven new high-tech jobs after three to five years, so there is a new job aspect and a high-tech and increased research expenditure aspect. A lot of this research

expenditure is internal. Some of it is contracted out—outsourced—but gradually they find that they need to do it internally.

CHAIR—Through highlighting examples of those spin-off companies can we have some influence on other companies and their relationships with universities? Presumably, the companies that spin off out of public research or out of universities maintain those good linkages with universities, which we do not seem to have with industry generally. Is there something that we can do?

Mr Yencken—It varies. Some of them maintain very close relationships with their parents; others expand their range of research sources. Helen Livingstone's Warren Institute paper showed how Cochlear had to diversify their R&D but keep their product development in one place. One thing that is noticeable about these new ventures is that they are very quick to establish strategic alliances. I chair a new venture that has come out of Swinburne in very large-scale data storage. We are moving very quickly to establish some strategic alliances with the major players in this field. They are much more prone to develop these alliances than perhaps established companies seem to be.

Prof. Gillin—The significance relevant to the research that we have been doing and in the generic sense of what I call the entrepreneurial approach is that the people who have been involved with knowledge development, knowledge generation and knowledge transfer have an extremely useful social, business and research network. Therefore, I am arguing that the development of networks and understanding a culture of networking are absolutely essential if you want to gain the benefits of significant research. Remember that we are disrupting the market with these high-growth companies—we are not just talking about businesses that are on the corner of the street; we are talking about high-growth businesses. Their role is to disrupt the market, because that is the way they grow. We can only do that when we have a very good business concept based on reliable and effective technology—not only technology, but we are basically talking about technology.

Mr Yencken—I was in Linkoeping University in Sweden the year before last. For the professor who heads up all this type of innovation activity there, that is only part of his job. His other job, which is funded separately and not by the university, is acting as the key resource person to a group of about 100 local small to medium sized knowledge based companies. He is able to get them to work together to identify their problems and the research sources they might use to get solutions to those problems. That is missing in Australia: those companies in Sweden were prepared to share their ideas and share information about their problems.

CHAIR—That is a good example.

Mr LINDSAY—I am very interested in your evidence about the survey that found the six key structural factors that discouraged innovation. You put them in order of importance, and the cost of research and innovation was down at No. 4; it was not significant compared to tax, legal costs, the cost of training and so on. Would you like to elaborate on that? Is that universally the belief in Australia?

Mr Yencken—It was quite surprising, actually. The economist from the *Yellow Pages*—Pacific Access—and I were very surprised at the result. We thought that the cost of people and

technology would be much higher. It shows that, while we have done a lot to improve the environment in which all this takes place, there is still a long way to go. I see no case for increasing tax deductibility, because small businesses do not have much profit to deduct the tax from, but I see a considerable need to look hard at the capital gains tax type aspects of investing in these small companies. You are dealing with a generator of new knowledge, an entrepreneur or technology manager who exploits it, and a business angel, a venture capitalist or the other category—family, fools or friends—who provide the initial investment. Issues like seed funding are critical. A lot of us have reservations about whether the Commonwealth pre-seed funding initiative will work, because it involves giving away equity at that point, as opposed to the UK Challenge Fund and the Scottish Proof of Concept funding which do not.

Mr LINDSAY—Professor, do you have a take on this?

Prof. Gillin—Yes. I was going to extend it, because the way these fit this decreasing order is very much a function of the problems of developing an entrepreneurial culture. I am arguing that both entrepreneurship and innovation—which is the tool of entrepreneurship—is the culture that we have to try to develop. Many times we try to develop in a very linear fashion: we start from research—which we are supporting—and assume that because we are doing research, in some magical way it will convert into many dollars and high growth.

My point is that if we are going to be part of the global community, as I believe we are, we have to look at the issues that affect business, because moneys are going to flow across those boundaries. The licences from patents, the available knowledge and the knowledge generation we are talking about are going to travel across those boundaries. Therefore we have to look at all these supportive aspects of doing business, because innovation really occurs when you gain a value that somebody will pay for as a result of whatever you have put in. It is an economic term, not a technical term. If innovation is going to be successful, we need to get value for our activity.

In one of my previous activities, I was the Australian government defence R&D attache in Washington. I looked very carefully at the way in which corporations in particular, but even smaller companies, gained value from incentives. I am not just talking about financial incentives, but they do drive things. They had an incentive which was really at the cutting edge. Companies that sold products to the government—it was to the government and it was in defence, so it was a big area and they were big dollars—had an arrangement, which still exists and which occurred in transportation and energy as well, called an independent R&D fund whereby you could get back four per cent or even up to six percent, depending on the industry, of the sales you did as money to invest in R&D. That had a phenomenal driving force. I had some reports on it, but they are probably 30 years old now.

I am arguing that what you draw from research comes because there is a business value in it. It will not happen because we pontificate and say it is a great thing to do. I ran the enterprise workshop program for a decade and I was on the Prime Minister's Science and Engineering Council. The Prime Minister then was Mr Keating, who was pushing very hard for going into Asia. I went back and looked at all the business developments—for export, because we are global—that had come out of the enterprise workshop to find out where they were focused. The interesting thing I found is that they looked at what you might call Western cultures, particularly the US, Europe and England. I could not understand that. Here was the Prime Minister telling us

we should all be focusing on Asia, yet the activity of business was focused in the other direction. When we looked at it, we found that most of the opportunities that were generated came out of opportunities from our own culture—our own way of living—which were not automatically transferred to Asia.

I am not arguing that we should not look to Asia; I am trying to make the point that real opportunities and growth do not just come out of pontificating on research; they come out of opportunities that are recognised as areas in the marketplace that can be developed and sold. The interesting thing about the characters in the case studies we have been looking at is that the researchers who recognise an opportunity and something to develop and achieve in the market, as opposed to just being academics, are the ones who will make it happen.

Mr LINDSAY—You have made a strong case about the need for business value. Does that reflect back into the universities? Do people in universities know and understand that?

Mr Yencken—When we did the ARC study consultancy on research commercialisation, we found that an estimated one-third of university researchers in Australia were interested in building any external relations. In Scotland it was about half. But there are some other interesting examples from the CRC program. I had seven years involvement with it, so I saw some significant changes taking place. The newer CRCs are very much user driven. In other words, you have a screen which says, 'These are our problems; these are our opportunities,' and the researchers bid into the things that are research sensitive, to use Greg Tegart's term—in other words, which research can do something about. This is quite the opposite of how it used to be in early CRCs, where it was a case of 'look at all that lovely money; let's divide it up equally—after all, we've always divided research funds up equally'. It is a radical change. In jargon terms, it is fourth-generation strategy research, where the users are integrated into prioritising, reviewing and decision making about continuation and termination. That is one of the recent successes of this program.

Mr LINDSAY—I will bring you back to where I started: the factors that discourage innovation. The second factor was the legal system. I do not know whether we have had any evidence about that yet.

CHAIR—No, we have not.

Mr LINDSAY—What could the country or the government do in relation to the legal system that would help in the objectives that we are trying to achieve?

Prof. Gillin—I think that some of these points were covered in the tax review committee, but the one that I am most familiar with comes back to this point of us being in a global aspect. If we look at trying to do research and holding it all unto ourselves so that we can feel that we have a national entity, we are going to lose out on being able to achieve export growth. We teach this very point. If you want to grow a company—and we are talking in this case about fast growth companies, not just fiddling around—you have to gain exports. That is where the market is. To gain that knowledge, you are going to have to partner, just as John was saying before. It could be in extra R&D, in access to the market or in finance. It means that you are going to have to do business offshore. In some cases, you want to form alliances. Sometimes you want to form a partnership. Sometimes you might even be taken over. The important issue is the legal

requirements for structuring business transactions—and I am talking now about legal transactions. We have our own requirements and the US have theirs, and they are by far the biggest market. It seems sensible that we need to look at how we align our legal requirements for making businesses effective and grow in a way which is not a disincentive for bigger companies and other players overseas to want to do business or make an alliance with us. That is what we are getting at. That is where some of the problems really arise.

Mr LINDSAY—If the committee wanted further information on that—and I guess that you are not a legal eagle—where do you think that we should look?

Prof. Gillin—No, I am not a legal expert, but I know where to get the information. I would go to some of my friends in Freehills initially but, as I say, if you wanted some extra information, I could find some people to provide that in a very senior way.

Mr LINDSAY—I will talk to the committee about that.

Mr TICEHURST—Firstly, I can agree with your comment about the low rating of the cost of R&D because, if it is a business advantage to carry out the development, then you do it. In many cases, particularly in small companies, it is hardly worth the effort of filling out all the paperwork required to get a grant. You just go ahead and do it. Looking at the challenges here to improve business R&D, you are talking about increasing the rate of new, high-tech, small firms. What do you define as being high-tech, and how do you feel that the government should be involved in creating those types of firms and assisting them to survive?

Mr Yencken—There should be seed funding to take new knowledge from 'proof of concept' to working prototype. This costs a lot more than the research. This is the biggest hole in funding. There is plenty of venture capital around, but there is practically no seed funding. There are a lot of initiatives at the state level. A company that I am the chair of is involved in the COMET program. The COMET program is excellent at helping fund the gathering of market intelligence and the development of a business model, which is so critical in the early stages of a new venture. The Commonwealth government has COMET and Victoria has a similar subsidised program.

The big thing that I would like to see is access to seed funding without having to give away equity, because in my view seed funding is what you need for applied research, patents and things like that. You need it to improve your valuation before you have to sell equity. If you have to sell equity at that early stage it will complicate later investment and you really have to give things away too early. So I would say that there is a lack of seed funding.

I would say that there is also a lack of experienced people. One of the chaps at the University of Nottingham calls them the 'surrogate entrepreneurs'—the people who come in, usually about year two or three, to drive the company and who have experience of start-ups. They do not necessarily have experience of that technology, but they might have good established contacts with major players. To me, we need seed funding and we need to get more people who are competent in this intermediary management role—entrepreneurs, for want of a better word.

Mr TICEHURST—You are actually talking about high-tech. What sorts of developments would you consider to be high-tech?

Mr Yencken—That is a good question. I have always tried to avoid the semantics. I think it is in the same way that I talk about more basic research rather than strategic research or whatever. I think that 'knowledge based company' is probably a better term—Europe uses the term 'knowledge based company'. These are companies that are in one way or another derived from new knowledge. It does not necessarily have to be technology. There is one very interesting proposal, which did not fit the CRC guidelines, for the development of new knowledge on the legal aspects of deep-sea mining. I would consider that as a knowledge based venture rather than just a scientific one.

Prof. Gillin—I think I would support that. The term 'high-tech' tends to sound as if it is highly technology-oriented, which it usually is, whereas 'knowledge based' is a much better term because that can apply to any area of activity where we are using new understanding to gain growth and potential returns. There is just one other point that I think is relevant. I think that seed funding is absolutely essential when you have actual activity on the ground. One of the concepts that I believe is essential is the development of a culture that is able to develop new ventures—I am talking about within our whole society, both at secondary school and university level. I was a dean of engineering once upon a time and a past president, so I think I can comment on this. Engineering education in the main basically teaches you as if you are going to become an employee. That is what we do and those are all the examples that we use. It is the same in business education in the schools. They do not teach you as if you can be somebody who creates your own freedom.

That is where there is such a classic difference between our culture and US culture. Young people go to do MBA programs there—they do an MEI program, in Australia; that is our program—not because they just want to get a bit of paper to get a job in some big company, but because they want to learn how to actually create new ventures. That is different from our normal MBA program. That is another subject, but I would just come back to that training issue here. Training is not just about learning how to do exercises. It is actually about the development of the person so that we get a cultural change where we get excited about people managing their own businesses. That is necessary, because without it we will always be trying to catch up.

Mr TICEHURST—You might be pleased to know that I attended a function recently where some year 10 students were doing 'youthful innovation'. They were learning this sort of stuff in year 10 and it was quite heartening to see.

Ms GRIERSON—I take the point that building a knowledge based company and culture is particularly important. I think in your submission you suggest that we need to improve our technology absorptive capacity and to do that we need to reward companies for employing more researchers and scientists. We also need to reward them by promoting their ability to employ those incubation resource people, whether they be in finance or entrepreneurs or whatever. Do you think then that we spend too much on project-specific grants and not enough on that culture building? If you do, how should we change that?

Mr Yencken—I will just make a comment on the incubator question. I was in Switzerland working with some people who had originally been funded to help small manufacturing companies—but they had all gone broke in the eighties, so they moved into establishing new companies. They have a lot of small incubators there. Their case managers are helping existing

companies but have also acted as resource people to the incubators. Incubator people here tend to feel that they are isolated from established companies, and yet they have a lot of the skills that are needed to help established companies. I think the balance is a bit too much towards project funding rather than towards facilitating the development of the people who can make it all work. Some of them are scientists; some are not. My case studies show that, once companies get the first round of equity investments, they bring in someone who has done it before—maybe an Australian coming back from the USA. I think it is a balance. How the powers of darkness would view that balance of funding, I do not know—I mean the Expenditure Review Committee.

Prof. Gillin—Can I just have a go and extend that point. I think the issue is not so much that we want less money on supporting projects as they need it to grow, but the focus. My argument is that government—I am generically stating that—tend to focus on providing money that can be seen to provide a particular outcome, like a project with certain milestones. I understand all that. I have been on many groups of activities. I am going to suggest to you another concept. It is one I have been putting forward for many years, but it never gets picked up—although it is currently being thought about in the Australian Institute for Commercialisation, which is a grouping that has come out of Queensland.

When I was an engineer in the government service, they had a program called Industrial Mobilisation. It was for industrialists. It was a great networking opportunity brought in after the war to ensure our industrial capacity would be available for any future needs. It was an excellent exercise. It brought people together. They had training visits, involvement in activity; they saw what was happening and they could interact. I believe that we are at the stage where we need to think similarly in a very broad concept. I have called it for the moment 'Commercialisation Mobilisation'. I do not like the two words, but I have not thought of better words. That is what I am on about. Commercialisation mobilisation means that we provide a program which brings together players from all levels, not just top company people but research people, academics, CRCs, SMEs and big corporations. We bring them together into that development of a network. That network includes training, visits, interactive activities and even partnerships. The point I am getting at is that what you are doing is starting to create a cultural understanding amongst all those players of how commercialisation works. I am blowed if I know how you can do it unless you get people together, because this is a people issue; it is not just a money issue. The whole of entrepreneurship and the whole of innovation are driven by people, and we have to understand the way people interact. That is my generic concept.

Mr MARTYN EVANS—Among the issues that have been raised, I was very taken—like one of the earlier questioners—with those factors listed in your survey as impeding innovation. The taxation system and the legal system were listed at the very top. Doing something about some of those areas would also require in some ways, apart from some general reforms, the identification of the early stage companies, the start-up companies who are engaging in innovation and the R&D effort in the science and engineering sectors. One would not particularly want the property developers, the shelf companies or the other non-innovative companies—although some of those tax consultants are of course very innovative, far too innovative for our liking, and that makes the parliament sit late at night countering their efforts! Let us discount them as innovators for the purposes of this inquiry and say that we want to isolate those companies and that we wish to favour R&D start-ups with a more deregulated and simplified corporate structure, to try and abolish some of those item 1 and 2 disincentives that

your survey indicated. We would have to tag in some way those companies that were engaging in the kind of behaviour that we wish to reward with a simplified structure in some form. How would we tag them? How would we identify their behaviour in a way that would let them through the gate but not the property developers or whoever? I do not mean to criticise property developers.

Mr Yencken—Let us go back to that survey data. It was a surprise, but remember that a lot of very small companies were involved. I go back to a time when I was working on the development of the food research institute here and we were talking to a lot of small companies on the food production side. They were not at all interested in R&D; they were interested in regulations. You need to perhaps qualify those findings as probably being the findings of small to medium sized businesses as much as about the findings of innovative small to medium sized businesses. There is another issue in this whole area of advice. I have noticed in the past that most advice to Commonwealth government comes from senior technical executives of large companies. No disrespect to their excellence, but I suspect that the Commonwealth would hear some different messages if it talked to the top technical executives of some small companies as well. This does not happen easily, even at the National Innovation Summit.

Prof. Gillin—Can I illustrate that with a couple of points? I really do not have a simple answer, because it is a very complex issue, but I believe there are some elements that are worth exploring. I have had a program going for about 14 years, a master's degree in entrepreneurship and innovation, which runs offshore in Singapore and Israel, as well as here. We have actually looked at the students, the graduates and the outcomes that come out of that sort of program—although the last actual research is probably about five years old. We have had about 600 graduates through now, and we found in that research that, of the 87 per cent of the graduates who went into new venture creation—which was most of them—50 per cent were inside corporations, and the other 50 per cent were in start-up companies. I am saying that because it gives me a handle on some of the parameters you are trying to utilise. The first one I would be looking at is: what is the job creation capacity of this company? From the survey, we found that, for each new venture started, an average of six new jobs were created. This was up to two years after graduation. The other side of the coin would be the level of exports: what are these companies doing to increase the export percentage? I think we can get a handle on some of these parameters, but I do not have a simple answer for you. I would be using those sorts of things: true outcomes, which will automatically differentiate from the property developer.

Mr MARTYN EVANS—I respect what you say about the difficulty, but I think it is an issue that we have to grapple with if we are to address some of the disincentives to innovation, which I think go beyond the straight-out question of assisting with simple R&D subsidies and rebates. We also need to look at some of the disincentives that are hidden and are in the invisible area of the regulatory framework that people confront as well.

Prof. Gillin—There is the other example I mentioned earlier—that is companies with sales to a government department get the percentage back. By using those targeted outcomes, you can overcome the problem of the property developer and then give it the benefit that you are after.

Mr MARTYN EVANS—I agree.

Mr Yencken—Some of the benchmarks suggested by the OECD are very relevant. I do not know if you have seen the report entitled *Benchmarking industry-science relationships*. It is very relevant to this discussion.

Dr WASHER—The Federation of Australian Scientific and Technological Societies recommended to us the very simple formula of having 100 postdoctorates per annum funded by the federal government on a fifty-fifty basis with industry over a couple of years. In other words, trying to get top scientists—your engineers, if you can take that example—and putting them in industry where they can learn administrative and business skills, and the second stage is where the government actually puts 50 per cent of the money in to stimulate industry to employ. What do you think of that idea?

Prof. Gillin—I was a part of the start-up of the National Teaching Company Scheme in Australia in the early 1980s. John Farrands, who was then the secretary for Science—and who was my superintendent once upon a time—was a great supporter of that. But that scheme seems to have died. It was a very powerful scheme, because it is was not just a gift. You had to be actually achieving some growth activity. It was not just limited to small new companies either, although many of them were. On the basis of a proposal to utilise knowledge, whether that was science or engineering, you could get a significant resource in the form of a scholarship arrangement or a fee to pay for that person working in that company. The important issue about the Teaching Company Scheme, though—which comes back to our absorptive capacity and the interaction—is that the individual was actually attached to a university department as well as working in the company. So you had this linkage and integration. Focus is required; I am not at all happy about just palming out money for people to have a job. I think it has to have focus to it and it needs a delivery system that provides that focus. That would be one example.

The CRC system is a very powerful example. I am the visitor to the advanced composites down here at Fishermens Bend—carbon-fibre composites were a part of my early research days. The success of advanced composites has been strongly aligned with industry and the research being tied together in a cooperative way. They are having difficulty but they have recruited a significant number of engineers. Most of the graduates from the PhD program that is a part of it have actually gone back into business, back into industry. Hawker de Havilland, which is part of Boeing these days, has an extremely effective development team, for which Boeing bought them and for which indeed we are designing components to be used on Boeing aircraft. That is unheard of. Those people are still in Australia but that has come about by this focused understanding of getting the knowledge links together and facilitating them. So I support what you are saying but I would use the focus technique rather than a 'let's have it for the heck of it' approach.

Mr Yencken—One of the most successful initiatives in the UK is their teaching company scheme, which is exactly this. It would be well worth looking at exactly what they are doing.

Prof. Gillin—We actually had it here in Australia but it faded out. I know you are politicians but I was a local politician once upon a time.

Mr LINDSAY—No, I am a member of parliament.

Prof. Gillin—I was a member of a local council. One of the problems we have within the parliament is its short-term nature. You people need to be doing things to be seen and to be re-elected. One of our problems is that so often projects become part and parcel of that term and then they are forgotten about. This teaching company happens to be one of those. It was a very high-profile thing and then it lost interest and went away.

CHAIR—Not for want of trying to extend the term.

Prof. Gillin—Sorry, Peter: you are a member of parliament; I accept that. I was a member of a local council once.

Dr WASHER—We were talking about drivers or tax incentives to drive R&D—which I think Martyn alluded to, and the tax office certainly alludes to—being full of rorts and problems et cetera. Whether that is true or not does not matter; that is the impression. The other parameter that I was even more interested in is the reward once you get there. It is very hard to rort that; that is a great system. You can say, 'Let's pull the capital gains tax off these people, let's allow incentives for them to be able to reinvest that money without tax burdens.' The reward has seemed to be a good way to do business; it seems fairly foolproof. If the two of you had the job of designing a simplified system to drive R&D—it is so damn complex; I do not understand it, and I was involved in some of it, and I am sure everyone else around this table would love to give you a dissertation on the whole thing—and to reward what is done, what would you do in terms of the tax or monetary incentive?

Prof. Gillin—My belief is—and I do not think you would disagree with this—that the government's role in this whole issue is to set the infrastructure so that we have an exciting environment to work in but which has checks and balances, quite clearly. The Americans have done that. Indeed, we are hoping to have out next year Professor John Altman, who, when he was in the Kauffman Foundation for entrepreneurship, which is a public institute, analysed how government facilitates entrepreneurship in the US. I can get a copy of that paper if you want to have a look at it, because it really does identify some of these issues that you are raising—for example, in the tax system the reward system for the SME or the high growth small company that is taking all the pain. We heard about the pain that was being suffered in these small companies. My entrepreneurs who have been successful tell me that you have to suffer pain, there will be no reward without pain. It is not that we have to coddle them so that they do not feel anything; they have to be able to put in their own resources and risk it and feel that pain. The point is, if they have done that, will the reward at the end take away the benefit a la capital gains tax? That happens to be one; options is another one. That is what we are talking about with reward. It is not about giving people welfare. That is not what we are on about. We are on about them proving, having suffered the pain, that they really should be rewarded because of their contribution to wealth generation and job generation and all the other things that go with that. But I do not have a simple answer for you. If you asked us, we could probably go away and start to think about it, but I do not have an answer off the top of my head.

Dr WASHER—In every other business enterprise, that is how you would drive it. Here we are looking for leading lights—small companies starting and being successful, showing they have suffered and put up with all of the difficulties, getting through and being well rewarded. That is the magnet; it is not how you fill in that complicated form to get your R&D tax benefits, which you have got to be a rocket engineer and hire 10 lawyers and about six accountants to fill

in for you. Our tax system is too complex to achieve that with ease. But the rewards are simple. If someone or a group has done something, it is transparently obvious they have been successful. They are making the money. That is what the whole thing is about at the end of the day. They are setting the example, and I would have thought that that is where our focus should be.

Prof. Gillin—Indeed.

Dr WASHER—I am really looking to be challenged on that.

Prof. Gillin—No, I think the focus has to be on that end.

Mr Yencken—I think perhaps you have to distinguish between the rewards to the founders and the rewards to the investors. You could in some ways say that the investors are agents for the founders—they have their own systems, they have their own taxation and things like PDF and so on. But the rewards for founders will come through things like options, which are taxed to hell, and maintaining enough equity in the business. These are the things that sometimes, the options one particularly, get stuck at the tax office.

Dr WASHER—Can you elaborate on that? What is the tax on options? I should know, but—

Mr Yencken—I would rather that you got a professional opinion on this. But as I understand it, if we want to give the inventors in the company that I chair 10,000 options each, then they have to pay tax now on the perceived value of those options. But I may be being too simplistic. I know it is quoted to me regularly as a problem, but I am not a tax person.

Prof. Gillin—By way of analogy, to try and get away from the real complexity, I take the view of sport in Australia: the government supports and the people support that it is an absolute necessity to facilitate the performance of the real high-flyers. They go through quite a lot of pain to get to that performance level, but they also get very well rewarded. My argument is that we have got to develop the same conceptual model for these high-growth knowledge based businesses. I think we can do that. Culturally, in Australia we accept the hero sportsman, but we are not really quite so sure about businesspeople.

CHAIR—I have a couple of quick questions. Going back to the key structural factors in that audit, do you know what actual question was asked in that survey? I also found the results quite surprising, although the clarification that it was from small businesses—

Mr Yencken—It was part of a big set of questions where we asked people to rank a whole lot of issues as to whether they were very helpful, helpful, hindering, very hindering—I cannot remember the actual scale, but there were about 20 of those, and they were randomised so that you did not get leading questions. We then analysed the survey data and we found an incredible consistency in the way the responses came up. We had a filter question: 'Have you in the last three years done any innovation in product, process or company structure?' Then those people were asked to rank a whole series of things, and you have some of them there, in terms of whether they were helpful or hindering. That was how we did it. The survey report is on the Pacific Access web site if you want to get hold of it.

Prof. Gillin—If indeed you were to ask a researcher, you would find that that list would be reversed. That is the significance of it: it is coming from the people who make, develop and spend the wealth. We would probably say that with the cost of technology we have a rule of thumb: to do research $1, to do the development $10, to do the commercialisation $100. You can understand, if those are the figures, that that is why the cost of technology is at the bottom. It is not that it is not important, do not get me wrong, but it is relative. It is the way in which you look at these things, and that is where it is coming from.

CHAIR—I also understand that it was because they were predominantly small and medium businesses. I do not think some of the larger companies would answer in that way. In fact, I have quoted numerous times that one large company that has invested heavily in research and development in Australia made the comment that, if you make those decisions based on the taxation system, you are making the decisions for all the wrong reasons, which is exactly what, Professor Gillin, you were saying before. The reason for the research and development is to develop the business.

Prof. Gillin—Could I come back to the point that Mr Evans raised. The issue that I see here, in terms of the outcomes, is that if you ask for job creation capacity in those large corporations, you government people have got problems. If you look at the outcomes for the high-growth, knowledge based industries—which are not necessarily SMEs; they might be quite significant—you will see that that is where the growth is coming from. My argument is that if you want to facilitate the development, you have got to look at where growth is.

Mr Yencken—Could I add to that. It is very clear in Europe that the thrust behind encouraging new spin-outs or start-ups is regional development, regional growth. A study some years ago by Chalmers University in Sweden of the employment generated by spin-offs or start-up companies over a period found it was somewhat greater than that generated by Nokia or Ericsson. The Europeans see regional growth as a very key issue.

CHAIR—Finally, Professor Gillin, I would like to go back to the theory on commercialisation mobilisation that you were talking about. You are probably aware of the Australian Innovation Association. They are relatively new. They will be giving evidence to us tomorrow morning. It seems that what they are about fits with what you were saying. Their membership, for instance, includes those at the cutting edge of R&D and R&D technology commercialisation, investors who have a genuine interest and proven track records in R&D investment, and universities and non-profit organisations which may have commercialisation arms. Those are the sorts of people who are members of that association. Dr Jim Fox—

Prof. Gillin—Yes, I know Jim.

CHAIR—and Mr Jim Carlton are coming tomorrow morning. Thank you very much for your time and evidence this morning. It is greatly appreciated by the committee.

Proceedings suspended from 12.02 p.m. to 1.30 p.m.

RAE, Professor Ian David, Technical Director, Australian Academy of Technological Sciences and Engineering

CHAIR—Welcome. I would like to point out to you that, while this committee does not swear in witnesses, the proceedings here today are legal proceedings of the parliament and warrant the same respect as proceedings in the House. The deliberate misleading of the committee may be regarded as contempt of the parliament. The committee prefers that all evidence be given in public but, should you at any stage wish to give evidence in private, you may ask to do so and the committee will consider your request. Would you like to make an opening statement before we proceed to questions?

Prof. Rae—Very briefly, I would like to say that the academy was pleased about the original tone of the inquiry, which spoke about R&D expenditure as investment. We welcomed that; it is a sentiment that is widely shared among our fellows and something that we would like to do more to convince industry in particular—and perhaps government as well—that the nature of investment is a little bit like having a portfolio. When you reach your retirement—I am partly retired—you will become more familiar with this. One sets up a portfolio with diversity of investments and hopes that they will all pay off but rationally knows that they will not. The idea of having a portfolio is that there will be enough 'paying off' to maintain one in the style to which one is accustomed.

I think you need to see R&D in exactly that sort of light and not go into a lot of hand-wringing over money that has been wasted by people making promises they could not keep or perhaps even people cheating the system. Overall, if the portfolio is correctly set up, there will be sufficient return but it will not be a 100 per cent return. Not every project will succeed in the way the innovator has hoped. They are the basic things.

I should also say that we have gathered information from a number of our fellows. That information, directed to the questions that the committee posed, flowed in to me. I synthesised that to prepare the submission and then checked back with the people who contributed to it and with our president, who signed off on it. That process is one that we have used before in developing submissions to inquiries. That is not to say that our 650 fellows have all had an equal share in inputting to that. It was probably more like 20 fellows, who we judged had interest, experience and available time to help us with it. Thank you for the opportunity to appear and talk about this matter.

CHAIR—Perhaps I will start. In the submission you talk about how foreign owned companies are more likely to spend on R&D, in comparison to Australian companies.

Prof. Rae—Yes.

CHAIR—You had a figure for 1999-2000 that foreign owned companies were responsible for 42 per cent of total R&D expenditure in Australia. Were any of your members able to give you some examples whereby you feel that the benefits of this R&D are actually going offshore and are not staying here? We had some evidence earlier today which claimed that it is probably not such a big hang-up if it is coming from foreign owned companies because, if it is still being

done in Australia, it is employing people here and we are getting substantial benefits. Would you like to comment a bit more broadly on that?

Prof. Rae—I think we get benefit because the R&D that is done here is directed towards Australian aims and uses. We do not see R&D being done here simply because it is a cheap, high-tech place to do R&D. That is something else we commented on in the submission. There must be more to it than that. So we do see R&D being done in areas of interest to Australia, not just to the foreign owned company. I do not have specific examples that I can bring forward to talk to you about, but the general picture you described is one that we would agree with.

CHAIR—In a more general sense, are there things that we should be doing differently or better to attract more of that R&D investment from those foreign companies? Often, in a business sense, while sometimes you find yourself trying to improve what might be a very small part of the business, often the same amount of effort applied to the part of the business where you do well can get you a better result. In that sense, one could argue that, because of the amount—because foreign companies are investing quite well in Australia in R&D—perhaps we should be doing a lot more in that respect to get even more investment in that way.

Prof. Rae—Yes, it is a nice point, isn't it, that you look for further advance where you have already seen substantial investment? We would agree with that. It is not possible to simply have a one-size-fits-all approach. Discussions about change in the tax regime, for instance, are often based on the idea that there is one simple thing you can do to fix everything. I really think that is a chimera. That is not going to happen. It takes a lot more work to be quite specific. To go back to my portfolio example, each element of the portfolio would need separate handling, a different stimulus. That would need to be worked out by sympathetic government support and companies with ideas that they wish to develop. So there are things that government can do. They range over things like depreciation allowances and specific taxation allowances for activities or certain sorts of spending, but that would differ from company to company, and the time scale, of course, would also differ. Some things can be achieved fairly quickly. One thinks that small and medium enterprises are acting on a much more rapid time base than the giants.

CHAIR—For the committee's benefit, can you give us a bit of a breakdown on the members of the academy? Where do they tend to come from? Are they predominantly from academia? How many are there from industry et cetera?

Prof. Rae—There are about 40 per cent from industry, about 20 per cent from academia, 20 per cent from government and probably 20 per cent retired and severed connections that would have come through those other channels. The process of gaining new fellows is that each year we ask our present fellowship for nominations, and we get something like 60 or 70. A winnowing process of examination by our fellowship committees would normally recommend that we induct into fellowship 20 to 30 of those each year. There is no quota. It is solely a merit basis that is used. That said, our fellowship does, from its industrial base, represent large industry rather than small industry. We have been a bit concerned that, as activity in the industrial sphere shifts towards small to medium enterprises, successive governments have tried to develop that area and see it as very efficient in generating new ideas, new business and growth. We have not recruited enough fellows in that area to match our profile against the profile we see happening out there. The reason is that most of our nominations are made by people from large companies—the company ones—since we do not have many people in small

companies; it is not easy to get nominations in small companies. But we have started at a state level to ask people—even though the nominators come from a big organisation—to look more carefully at the small organisations they interact with to try to draw in more people from that dynamic area. I guess our major area in small business is people in consultancy who have left formal engagement in a company and begun to work in a consulting or part-time capacity. They represent SMEs in their own right, but not the ones that one mostly talks about.

CHAIR—You need to extend your networking.

Prof. Rae—Yes, it is a networking function—and, as I said, talking to people who nominate, trying to encourage them to look more widely. It is easy for someone to nominate their successor or one of their senior managers as a CEO. It is the sort of thing we see quite commonly. For academics, it is easy to see senior people looking to their more junior colleagues to be nominated. It is not easy for people reaching senior levels in the technical departments of government—Agriculture, Environment, Industry, places like that, and Defence—to go to organisations they do not belong to themselves. They simply do not know the people well enough, I suppose.

CHAIR—But you obviously have a fairly strong representation out of industry.

Prof. Rae—Yes, we do. It is very broad ranging. It runs across the development industry particularly. Major developers—firms like Arup, Thiess, Leightons—are quite strongly represented. The mining sector is quite strongly represented—people like Hugh Morgan, for example, and Arvi Parbo and Peter Knight from WMC. There are very strong representations from them. They are some of the major ones.

Mr MARTYN EVANS—There is comparison between the major new innovations, and you talk about the long time scale for developing those. You refer to Cochlear, which took 15 years from concept to commercial development, and Rio Tinto and the new technology in the steel area, which was more like 20 years than three to five years. In looking at those technologies, they are obviously very important in innovative and economic terms. When you think about the number of those that there are and their impact on the economy and then you think about the number of innovative ideas that build on existing technologies—for example, we have GPS satellites in the air and then there are a number of technologies that build on those, and there are GPS receivers for hiking and then you put them into farm machinery and then you put them into cars and then you put them into something else—

Prof. Rae—Waste distribution has been one of my pet ones.

Mr MARTYN EVANS—we have a whole new area of technology that builds on that existing area. That does not take 15 to 20 years; that starts to move ahead. But obviously it is not as innovative as a cochlear ear implant.

Prof. Rae—That is true.

Mr MARTYN EVANS—So how would you and your colleagues rate those two areas? Is it more important that we try to build on the Cochlear types, for want of an example—

Prof. Rae—Yes, to move on.

Mr MARTYN EVANS—or should we be looking at those innovations? Obviously you have got to have both.

Prof. Rae—How do you do it?

Mr MARTYN EVANS—Is it really important for the mass of the economy and job creation to focus on those small incremental steps that build routinely within small time scales, or do they happen anyway and we really have to put the majority of our support behind the Cochlears?

Prof. Rae—I go back to my comment about needing different kinds of support for different sorts of innovation. The car industry is one that is constantly innovating. Both General Motors and Ford are releasing new models this spring and those new models are full of innovations, some publicly acknowledged and some not. I came across some—not in my academy capacity but in my private capacity—when I reported to Environment Australia recently about the use of alcohol fuels and their impact on the actual car. What impact does putting ethanol into the fuel have on the car? I spent a lot of time talking to the car manufacturers, and I learned a lot about the innovations going into this new range of cars. They still have cars. They still look the same—they still have rubber tyres and steering wheels. It is incremental, as you say.

This morning I was at a meeting called by my local council to talk about greenhouse emissions—the climate protection program. Part of the display were the two energy efficient cars that have been developed by Toyota and, I think, Mazda. They are cars with much higher fuel economy, much lower emissions, and they are using hybrid technologies that represent more than just incremental change of the sort I have been talking about. Nonetheless, they still look like cars. They have tyres and steering wheels and, if you hop in and drive them, apart from the fact that the engine turns off when you are cruising, it still seems the same. Where do we go along that line? What is the next really big innovation? I doubt that there is one. I think automobiles are going to be with us and there will be constant incremental innovation of that sort.

Look at other big ideas like the cochlear implants and direct smelting. Direct smelting came out of CSIRO originally with the support of Conzinc Rio Tinto, as it was in those days, and it really is a very big change to move away from traditional blast furnace technology for smelting a whole range of metals. We are seeing it happening in the energy area—and we are talking really big technology. The first stage we are seeing is the implementation of large wind generators. There has now been a lot more talk about a future in which we use tidal power more—the Western Australians are keen to do that in the north-west of the country—and also perhaps move to a hydrogen economy. That sort of change might take several decades. It needs continued support on quite a large scale, but it is quite different from the sort of encouragement or support you might give the car industry. They are typical of the size things that we are looking at and they are both, I think, going to go ahead.

Mr LINDSAY—Professor Rae, do you think that R&D can be summed up in the words ‘ideas to dollars’?

Prof. Rae—Yes. That is a good one. The way we think about the beginning of ideas, though, goes back almost to a Baconian philosophy of science or stance which is: we just go out and do experiments and after a while we have got a whole lot of data and we think: 'Oh, I see where it is going. Yeah. Right. Here is a theory.' One way to look at it is to say: 'No, I had a theory first. I had an idea first about how to do things, about some new material or some new way of doing things or getting somewhere, and then I started the experiments.' They are directed. I think that is the starting point—the ideas. Companies need to know that there are dollars at the end, though. There are many more ideas than there are possible dollars. It is not true to think that companies have run out of ideas. There are ideas buzzing around all over the place, but getting support for them is hard.

Mr LINDSAY—Which groups in Australia think about ideas to dollars? Who thinks about just ideas and who thinks about just dollars?

Prof. Rae—You are asking about the sort of spectrum that goes on between curiosity led research and actual directed development of the sort that I have just spoken about.

Mr LINDSAY—I guess what I am trying to get at is: do universities really think that down there somewhere there will ultimately be dollars? Do private companies just think about dollars and not about generating the ideas when they are thinking R&D? How do you get a holistic thing before people who are in this situation?

Prof. Rae—Private companies think about staying in business, and they know that because of the nature of the business environment their competitors will be generating ideas and looking for new things to do. They do not quite know how much unless they are well plugged into the industrial espionage network, but the general driver is to keep coming up with new ideas to stay alive. Some of the ideas are incremental. Ford will go on building cars. They will have incremental ideas that will keep them in business building cars in competition with the other car manufacturers and, in a sense, in competition with the regulators of emissions and fuel economy. But some companies will look to take the ideas further than that to change the way the company operates. Our major power-generating companies are starting to move into wind generation to a small extent. Maybe they will give it up eventually if that does not turn out to be the future or maybe they will move more into it—but at least they have given themselves an opportunity by starting to do the R&D.

Mr LINDSAY—The object of your academy, as I understand it, is the application of science and knowledge to practical things.

Prof. Rae—Yes. That is exactly right.

Mr LINDSAY—Why don't you have something in your philosophy about developing knowledge?

Prof. Rae—I guess we use 'application' in that very general sense to understand among our fellowship that that is what is meant: develop ideas, produce them, apply them and make dollars out of them. That is the aim of it all.

Mr LINDSAY—How significant are R&D applications seen in our community in relation to social or environmental responsibilities, for example?

Prof. Rae—Companies are just starting to embrace that philosophy, and their annual reports have started to reflect it. Again to go back to my meeting this morning, Quenos, a large chemical manufacturer, were there reporting on their greenhouse emissions. In the last seven years they have managed to reduce the ratio of tonnes of carbon dioxide to tonnes of plastic produced, from 1.36 to 1.02. They were pretty pleased about that. Their production of plastic had gone up and down depending on the market but their innovation and their care in their processes and so on and their recapturing of CO_2 had helped them to achieve roughly a 25 per cent decrease. That innovation is socially driven. They did not actually save any money doing that.

Mr LINDSAY—Does your academy think that Backing Australia's Ability has been successful?

Prof. Rae—Like Chairman Mao, I would have to say that it is too early to say—if you do not know it, that was his marvellous remark on the French Revolution—but I think that Backing Australia's Ability was a long-term business. It was pointing directions. It was not saying, 'You must do this or increment this from 0.24 to 0.28,' and that sort of thing. It was pointing a direction to go in.

Mr LINDSAY—So you are generally happy at this stage?

Prof. Rae—Yes, we think that was the right thing to be doing.

Mr LINDSAY—You do not have any advice for the committee on how that could be changed, or is it too early to say?

Prof. Rae—It is too early. We have not been talking in the academy about how it might be changed. We were pleased to see it happen and we refer to it as a sort of touchstone—as a good sign from government in general. We do not see it as party political either; we see it as a national government initiative that we are supportive of.

Mr LINDSAY—Tim Besley has said that innovation is one of those things like the weather that everybody talks about but nobody is doing anything about. Do you agree with that?

Prof. Rae—I helped to fashion that remark so yes, I do. We do much more talking about it than acting on it. As I said, companies are abuzz with ideas that are not being put into practice. There is potential innovation. Even when you get to the end of the day, though, with the innovative process that you were talking about applying and developing, those two cars that I talked about can now be produced for a selling price of about $40,000, so they are ahead of most of the comparably sized cars in the market in terms of cost. So you have to ask whether that R&D failed in the sense that it did not produce a car that is environmentally friendly and resource-efficient but cost-wise is competitive with other cars, or has the R&D succeeded and just not gone far enough? What do we do to get to the next stage, to where people say, 'I am not going to buy a $22,000 Toyota; I am going to buy a $40,000 one, because it is better on these grounds,' or is there some way of bridging that price gap so that the consumer is not looking at

an 80 per cent hike in price? But I think you would have to say that the R&D has not yet been completed on that one, because we have a good product but it is not competitive with the present product.

Mr LINDSAY—In terms of what the government might do to improve R&D in the country, I think you would agree that 'one size does not fit all' is a true philosophy. How can the government manage that when bringing down government policy? How does it not treat R&D as a black-and-white commodity and how does it handle shades of grey? Should somebody, something or some entity have flexibility?

Prof. Rae—I think it does need that. I know that in government there is a quasi-legal philosophy that it is easy to have fixed percentages, rules and times to make it easy to govern what is going on.

Mr LINDSAY—It is safe to have it like that.

Prof. Rae—Yes, it is safe to have it like that and it saves arguments—if the law says 20 and if you are at 21 then, tough luck, you are over the limit and that is that. But there are lots of regimes in which more consideration is given to having a fuzzy boundary. For instance, the peer reviewed research system that is run by the Australian Research Council uses a system for review of proposals where there are guidelines, but they are fuzzy. The result, of course, is that they are contested every year—people feel that they were discriminated against and so on. But in a fairly limited bailiwick like that, most people accept that fuzziness in the system in order to see merit emerging and appropriate support being given. Someone who needs $50,000 and someone who needs $400,000 can both be considered by the same committee.

Mr LINDSAY—Would your academy back the government if it had a go, took some risks, did not opt for safety and allowed the fuzzy boundaries?

Prof. Rae—Yes, it would. I think that we deeply believe in the portfolio model where not everything is going to work—that the government, with the best of intentions and the best of advice, will be seen to have spent a lot of money on something that did not produce any result. We would hope that there were not too many of them, but that is a necessary concomitant of operating in that way.

Mr LINDSAY—In relation to picking winners, your academy's philosophy seems to be 'Why not?' Is that your understanding?

Prof. Rae—We would be inclined to pick winners in particular areas. We talked about this during the research priorities exercise that Minister McGauran is running at the minute. We said that you do need to operate within certain areas that we judge are of benefit to the country. Clearly, if someone wants to work on salinity, we will be supporting work in the salinity area, so let us hear the proposal. We would then go through that fuzzy boundary process, but we would already have decided that salinity is an area to support. You might say that the car industry is worthy of that support as well, and we have supported it in other ways financially. That is an area where we are looking for ideas. That helps to put some boundaries around where the ideas come from.

Mr LINDSAY—In relation to the CSIRO, Dr Garrett has brought a fresh change, and he has got ideas about concentrating on key elements.

Prof. Rae—As in the flagship programs?

Mr LINDSAY—Yes. Healthy Country is an important one of those. What is your academy's view of that? Are you prepared to make a comment?

Prof. Rae—We think the process is good. We are surprised that it has taken Dr Garrett so long to get them in place. He has been very consultative about it. During the time that was developing, I had another window on it as well. I was a member of an advisory committee for one of the sectors of CSIRO, and we kept hearing different versions of what proportion of the appropriation money would go into the flagship programs—it was 70, then it was 20; it swayed around. We have kept in touch quite extensively there, because a number of the senior ATSE fellows are in fact leading that program. Graham Harris, who is the designated officer in charge of those things, is a fellow of our academy and someone I talk to from time to time about that. Jim Peacock, who is arguably the most senior of the chiefs, is also a fellow of the academy. Our liaison with the Australian Academy of Science on these sorts of matters is conducted with Graeme Pearman, who is currently and for another month or two the head of atmospheric sciences at the Australian Academy of Science. We like that process; we think that is good.

Mr LINDSAY—Do you think the culture of CSIRO can be changed to head in this direction?

Prof. Rae—It has been changed quite substantially already. It started back in the early seventies, with the executive and chiefs putting pressure on their researchers to work in areas of interest to Australia—so the chemists would start thinking about titanium as something that we ought to be doing some chemistry on. That was a soft touch but that has gradually increased over the years. The CSIRO is now recruiting people who are more in tune with that sort of thinking. It was very hard to change an organisation that had recruited people to be essentially curiosity led researchers. They were very good at it, and they resisted being pushed to work on more practical outcome type work. But I think the CSIRO is now recruiting people who are in tune with that and quite accustomed to it. They have met their target of external earning, although I see recently that that target has now been abolished. The government accepted the Chief Scientist's advice that those mandatory targets be abolished. The culture change had already taken place, according to him.

Mr LINDSAY—My last question is: in relation to the government's support for innovation, does your academy think that the dollars that go to CSIRO are appropriate? Could some of those dollars be made to work more effectively in another direction? Should CSIRO get more dollars?

Prof. Rae—We do not have a view on that. We have observed, though, that a lot of what goes in is shared with other organisations; it is not just kept in-house. It goes into the CRC program, for instance, and other programs. CSIRO funding is linked with other funding to do joint work.

Mr LINDSAY—The CSIRO is highly regarded in the world.

Prof. Rae—Yes, it is—and I mentioned the fellows in our academy who I think of when I talk about the CSIRO.

Dr WASHER—Professor, I like the idea of picking winners—I think that is a good idea—but can I ask you a bit about alternative energy suppliers and how a government may participate in that. For example, you mentioned the hydrogen—

Prof. Rae—Economy.

Dr WASHER—Yes—coming up. WA, for example, bought three hydrogen cell buses. That is, I guess, an example. Do you think state and federal governments, and probably local governments too, should be purchasing more of these fairly energy efficient but also environmentally friendly type vehicles to promote as one way we can help?

Prof. Rae—I think we can move forward a bit in that direction without breaking the bank, for two reasons. Firstly, we can look at what problems might emerge or what the downside might be to using these sorts of much touted new technologies. Secondly, we can start to introduce them into the community so that more people can see them and realise that it can be done—'I rode on the hydrogen powered bus' or 'I drove the car whose engine turned off when I stopped at the lights' and so on. So I think there is room for more demonstration projects of that sort.

Dr WASHER—In picking the winners, we have not got water but water is now, particularly in the west, a hell of a problem. Our cities are running out of clean fresh water, quite frankly. We have got water cutbacks and our underground water is being compromised et cetera. I noticed in the Besley lecture, and I guess you played a part in that, that irrigation is also a problem. Because of irrigation, the surplus water now creates salinity problems. Is there any work being encouraged by the academy, or are people involved in the academy looking at our water resource?

Prof. Rae—We produced a major report on water supply in Australia's future about three years ago, which is still current. We do not have hard copies left any more—it is that current—but it has been taken up quite actively by Environment Australia. Interestingly, the ABS survey of a couple of years ago produced similar and independent results, and they rang us up to say, 'Hey, we've just discovered your report, and we got the same answers' and we said, 'That's nice.'

We are doing two other things at the minute. We are working with the other academies and largely, social sciences, to look at the social impact of changing water regimes in the Echuca area. This is a model project of something a bit larger, but Echuca has very interesting connections to water. They irrigate and they have both dairy and beef properties in the area. They get quite a bit of water out of the Coliban system, and that is not in all that good a shape. They take their drinking water from the Murray. There is a big push to have environmental flows in the Murray, which means that it would start to run very fast about now and dry up about Easter time, which is unthinkable in a town that also has a large tourist base on the Murray. There are very interesting potentials for change in that area. We have been working, first, to develop a theoretical framework of what responses might occur, and we have now got our researcher interviewing people in the Echuca area to ask them how they see their lifestyle fitting in with whatever change might take place. That is one thing.

The other is that we have a proposal before the Australian Research Council to have a look at water reuse in Australia. Water reuse is socially tricky. It is doable in an engineering sense, but the big advance in public health that took place at the end of the 19th century, early 20th century was to have reticulated pure drinking water and reticulated sewage that was taken away, and those two things combined have had a massive impact on public health in Western societies, and to start to tinker with that is possibly to risk public health but certainly to bring down the opprobrium of people who are worried about the risk. There are experimental programs around. Rouse Hill in Sydney's north-west has dual reticulation. We are seeing sewage water pumped through a microfilter in the Kings Domain, over the river in Melbourne, in a trial, and there are schemes to use the Werribee sewage water more. There is still quite a bit of trepidation about it. Our planned work is to look at both the technical aspects and the social aspects of how to reuse water more effectively, more at the suburb and region level than at the household level.

Dr WASHER—My last question concerns light metals. This is not the major one; this is the second one mentioned. We are certainly big in aluminium, magnesium and probably titanium coming up. It is very energy costly, though, to produce light metals.

Prof. Rae—Massively.

Dr WASHER—Unfortunately, with wind power, for example, you cannot store it. The wind is never blowing when you need it, and when it is blowing you do not know how to store the jolly stuff, so there are some big problems with wind power too. This is the politically touchy question: is Australia doing enough to look into nuclear reactors—the new fast breed of nuclear reactors—and management of waste? Do you think there is a future in this, considering that the world is building 30 new nuclear power plants? None have been built for years, but there are 30 under construction now.

Mr LINDSAY—Just say no.

Dr WASHER—That is the political answer; what is the scientific answer?

Prof. Rae—We have been thinking about it.

Dr WASHER—Is it to be so excluded? It is not that I am a great fan of nuclear waste, but at the end of the day, if we are going to kill the environment anyway, maybe this is a better way of saving the planet.

Prof. Rae—'Many ways of killing a cat' is the phrase. We have thought about it in the following terms. We have seen what you have said, that as far as greenhouse and the consumption of resources go, nuclear power offers big advantages. We can see four disadvantages, real or perceived. Once you mine and refine the stuff, you start to spread radioactive material into the environment. The Kakadu fuss is an example of that sort of thing, but there are others around the place. Once you get a nuclear power station built, it is dead boring, and there have been a series of minor accidents and one or two major accidents that have resulted simply from the fact that people went to sleep on the job and took no notice of the safety requirements. There is a very serious social engineering problem, one of human factors engineering.

The third one is the disposal of the waste. 'Disposal' is the wrong word because it conveys the idea that you might actually get rid of it, and we have had a hard think about that. It is really a matter of containment. As with lots of hazardous substances, you never get rid of them; they are just contained for the long term. We are grappling with the problem. There is some basic science being done to actually destroy the radio nucleides so that we are not faced with 40,000-year half-lives. It is a little bit like the equivalent of destroying chemical wastes, but it is very much in the infancy stage and is nowhere near commercialisation, so for a long while we would need to rely on containment.

The fourth one is the diversion of nuclear material into weapons, which is one of the major buzzes. We feel that, if we tried to hold a public meeting to talk about this, people would lie down in the streets and we would never be able to get to our meeting. We are interested in talking about it in the rational way that you and I are now doing. So as well as advantage there is disadvantage. Is it going to change? What are the prospects? We have weighed those up and written about them. Helen Garnett, who heads ANSTO, is one of our fellows. We have asked Helen to commission some papers that will explore these matters, and she has agreed to do so. The idea is that we will eventually be able to publish something that gives a technical independent appreciation of the four factors that I talked about and of the advantages that might accrue if we could actually make it work.

Dr WASHER—That is terrific. That is all I wanted to know.

CHAIR—When we have ANSTO to give evidence in Sydney at the end of the month, I will get Dr Washer to ask a similar question.

Dr WASHER—I will wear my bulletproof vest then.

Prof. Rae—It is a very serious matter for us. I know there has been a lull in building, and now countries are starting to build again. France gets 70 per cent, I think, of its power that way.

CHAIR—It might be closer to 80 per cent now.

Dr WASHER—There are 30 under construction across the world at the moment. But what annoys me is that I do not think we are looking at the research enough to see what we could do. Perhaps it is never going to work out, but I think we have to keep researching it and looking at it.

Prof. Rae—I spoke about the research on speeding up the decay of the radio nucleides in waste—it is very small; just one country that I know of is doing it.

Mr TICEHURST—You made a financial point in relation to the way R&D is looked at. Then you were talking about the fact that most companies would expect to make profits by doing R&D, and you used the car as an example, which I think is quite appropriate. But then you look at some of the peripheral efforts and you mentioned wind energy. Would you see wind energy as perhaps a cosmetic effect for the utilities? They are offering green power at a higher price, and I notice that up in our area they have put a wind generator in at Newcastle, but there are other wind generators down in the Goulburn area, an area which may be more appropriate.

Prof. Rae—Is that on the industrial site on Kooragang Island?

Mr TICEHURST—Yes. Do you think those sorts of efforts are cosmetic, or do they have a real R&D benefit?

Prof. Rae—My guess is that they will always amount to minor contributions to the main supply, in the foreseeable future. I think that coal will be the major supply and that they will always be small. But there will be social pressures. Indeed, the utility companies have requirements on them now to produce a certain proportion of their power from renewable resources, and wind is the simplest one for them to work on. So I think they will do it all right, but I think it will always be minor.

Mr TICEHURST—But it could be more cosmetic than cost effective?

Prof. Rae—It is hard to say. As I said, I think the major power companies have moved into the area. A cynical view—and I should not accuse you of being a cynic—would be that it is merely cosmetic. A more generous view would be that they can see that they will either be required to or find it advantageous to know about this technology and use it, and that they are now preparing the ground for just that. I would come down on that side, but in the back of my mind I know that people talk to me about the other view.

Mr LINDSAY—In relation to what you said about coal, won't the technology of storing underground the CO_2 that is produced come to pass?

Prof. Rae—I think it will, but there are some technology problems and I am not sure how much of it will go that way. Peter Cook from the Petroleum CRC, who was the great proponent of this, is one of our fellows and someone I talk to about it quite a bit. I also know Tim Besley, who is the chair designate of the board if that CRC gets up. If you want to take the CO_2 out of gases coming from a chimney, as now happens, you can easily dissolve it in water and use the CO_2 in the water to make carbonated drinks or do whatever else you are going to do with it. But, if you were going to pump it down a hole into an aquifer or into an old oil well and perhaps release a bit more oil, you would not want to be pumping down all the nitrogen as well. What goes into the power station in gaseous form is 80 per cent nitrogen and 20 per cent oxygen. So even if all the oxygen gets consumed and turned into CO_2, 80 per cent of what goes up the chimney is still nitrogen. You really do not want to be pumping all that down the aquifer and wasting your capacity for storing CO_2 by pumping 80 per cent nitrogen down. Most of it will come back up anyway.

So one of the technological approaches has been to try to separate the oxygen and the nitrogen before they go into the combustion chamber. That would not be done by old-fashioned liquefaction methods; it would be done by what would essentially be very fine filters—microsieves of some sort, or nanosieves, able to do that. But that technology is in its infancy. The technology of being able to pump gas down a hole is fairly well developed. I think there are trials going on with gas being pumped down into saline aquifers—saline ones so that we are sure nobody wants to use them—on a very small scale, just to see what happens. Pumping down into oil wells goes on off the coast of California, I think, and certainly off the coast of Norway. The Norwegians have quite strict laws about releasing CO_2, so they pay the companies to pump

it back down. They get a bit of an oil bonus in so doing, because it frees up oil from the rocks. So, yes, I think there are prospects of that sort.

CHAIR—Many of your members would be involved in CRCs?

Prof. Rae—Quite a few. Speaking of the coal one, David Brockway, who heads the brown coal CRC—it is not called that anymore; they got rid of the nasty words 'brown coal'—is a fellow of our academy.

CHAIR—Does the academy have any view on the effectiveness of the taxpayers' investment that goes into CRCs and whether that is the best way?

Prof. Rae—Yes, we have. We think that is a good way to do it, and we have said that in submissions to the review of the CRC program. Again, we took our pretty standard line that you do not expect it all to succeed. Some of these things will, on review after five or seven years, be seen not to have been very cost or development effective and so they will be closed down. There has been a trickle of close-downs going on. Others have been quite spectacularly successful.

CHAIR—I guess the criticism that is often heard of CRCs that have not done all that well or achieved all that much is yet another example of this cultural problem we seem to have in Australia that failure is unacceptable.

Prof. Rae—Yes. I am surprised about that. I was deeply involved in getting up four CRCs when I was dean of science at Monash. We did not get any in the first round. Of the four we got in the second round, one fell over before we signed the papers because the company that was the major partner was sold and changed direction and decided they did not want to be in it anymore. Two others did not survive the first round. One, the southern hemisphere meteorology one, was a public good CRC which, for reasons I do not understand, was closed down. The third one was the southern hemisphere geophysics, geodynamics and exploration geology CRC, which I think saw its work subsumed by other CRCs. It has been a very active area for CRCs to work in, particularly mineral discovery and understanding the geology there. The fourth one was the CRC for Freshwater Ecology, which was headed until recently by Peter Cullen. I think you would have to rate that as a spectacular success, but it is a public good CRC; it is not one that generates a lot of money. I had quite a lot to do with those, and I am aware of how they work—I was on the board of most of them for a time—and what can come out of them.

CHAIR—I ask those questions because I think it is sometimes more than just getting all the economic factors right with respect to investment in R&D; it is often almost equally important to get the perception about R&D right as well and to get the culture right.

Prof. Rae—I was the chair designate two years ago for a CRC bid for the remediation of contaminated sites. We went through the process of developing a CRC bid, passed the first hurdle and got to the interview but did not succeed at the interview in getting a CRC granted. When we asked why, we found that the assessors had judged that the company support was rather lukewarm. The assessors had made the judgment on the basis of several indicators—I think they were probably right—that the end product of the CRC, which would have been something that companies valued and paid money for and wanted to see developed, was not of

sufficient value for them to really put their hearts into the bid. The assessors detected that. It was a pretty good group of assessors. I thought the process worked well.

Ms GRIERSON—I have to speak in defence of the wind turbine at Kooragang Island in terms of it not being entirely cosmetic. It is a university and Energy Australia joint venture. It does have great spin-offs to the university in terms of research they are doing, as well as its provision of—

Prof. Rae—This is your electorate; I am sorry.

Ms GRIERSON—I do have to say it does have spin-offs in terms of advanced composites as well. It has great potential for research for the region.

Prof. Rae—It is a bit of a beacon for the City of Newcastle's environment program, which has been very strong. It got under way in the mid-nineties, at a time when BHP was going under. The city's greenhouse contribution has now begun to spread into more environmental consciousness.

Ms GRIERSON—An example of that is the ultra clean coal project that is happening up there with CSIRO and White Mining. It is not something that perhaps is corporate driven in terms of our urgent or imminent need but a process that the rest of the world needs. In terms of environment, projects that are funded for research or that are under way in that area at the moment are not so much for our immediate need but certainly needed by global markets.

Prof. Rae—It is not only the industry in the area either—although they are cooperating very well—but the city and the citizens themselves. Newcastle seems to be quite a high point. It was one of the places where the water board first started chemical collections and said: 'For God's sake, don't put it down the sewer. Ring us up and we'll come and get it.' That was the first place in the country where they did that.

Ms GRIERSON—We have a particularly interesting council led program in energy sustainability that is being sold all over the world at the moment. Certainly, need and necessity create those opportunities.

Prof. Rae—I am right up to the minute with it, because the council meeting I spoke of this morning flew someone down from Newcastle to tell us how to do.

Ms GRIERSON—Good. Thank you.

CHAIR—Now we have finished the plug for Newcastle!

Ms GRIERSON—That is right! I would just like it to be in the *Hansard*.

Dr WASHER—Earlier on you mentioned ethanol, which is a very politically topical issue at the moment.

Prof. Rae—Absolutely.

Dr WASHER—I must admit that I have a level of cynicism about the whole thing—and I am on the side that is supposed to be supporting it, so I will keep that in-house.

CHAIR—It is on the public record.

Dr WASHER—I do not think any ethanol is ever going to be made out of sugarcane, Gary, but the professor may disagree with me on that.

Prof. Rae—They make it at Yarraville, just a few kilometres up the road from where I live.

Dr WASHER—But that is made out of grain, isn't it?

Prof. Rae—No, it is made from the residues from the sugar refining process, the molasses. I think it is mostly exported. I do not see it going into combustion.

Dr WASHER—Earlier on, you said that you had been talking to the car manufacturers about ethanol and putting it into fuel. Tell me about the advantages and disadvantages of using ethanol. Could you quickly compare what you see as the future for biofuels as against, say, gas to liquid fuels.

Prof. Rae—It is mainly a self-sufficiency advantage. You do not gain much in terms of energy. In fact, I think you probably lose a bit on ethanol because it has to be dry ethanol. If you simply make ethanol and distil it out of the mash, you get 95 per cent ethanol and five per cent water. That is what comes over in the distillate. You need a further treatment and distillation to get it to 100 per cent ethanol, then you can put it into cars. So a lot of energy goes south in making it.

Regarding the operation of the car, ethanol has quite a good octane rating. It is not as energy efficient; you get less energy per gram of ethanol than you would get out of octane. But that is not such a big problem. There are the effects on the components of the car that I spoke about. They can be coped with, because all the car manufacturers make cars for sale in Brazil, where the standard fuel is 22 per cent ethanol. So the manufacturers do know what to do about it; it just costs a little more money. The pollutants coming out the back are about the same.

The big advantage is that it is a local resource. In years to come, we will not have very much of our own petroleum. We still have a lot of gas, and some work is under way to produce liquids from gas because that is going to be our big resource. But, in order to avoid importing, local dependency becomes much more important. During World War II the government of Australia set up five ethanol distilleries around the country. One was from sugar, and it was in Bundaberg; one was from grain, in Cowra—and about to be reconstituted if this subsidy stays the way it is; one was in Warracknabeal, and the big shed in which they used to store the grain is still there; one was in South Australia, I think up near Port Pirie but I am not quite sure where; and there was one in Western Australia, in the wheat belt. So the idea that we should be self-sufficient and therefore should make ethanol is not a new one. That is mainly what it is all about but, of course, it is tied up with politics and businesses that can thrive if we use their ethanol—yes, it is a mess. The academy has been in discussions with Environment Australia about looking at the technological things, but I think they are mostly known.

Dr WASHER—What about compared with the gas to liquids project?

Prof. Rae—Gas to liquids would also make us self-sufficient with respect to imported oil. You would need some pretty fancy chemistry to get some of the heavy fractions that we still need. We still have to import quite a bit of oil just to get the heavy fractions for lubricating oil, which we do not get out of Bass Strait or the North West Shelf. That could be done; technically it is not impossible.

CHAIR—Thank you very much, Professor Rae. We really value the academy's input into the inquiry. The transcript will be forwarded to you for checking before it is finalised.

Prof. Rae—Thank you again for the opportunity.

[2.24 p.m.]

PENSABENE, Mr Tony, National Manager, Economics, Australian Industry Group

RIDOUT, Ms Heather, Deputy Chief Executive and Executive Director, Public Policy and Communications, Australian Industry Group

CHAIR—I welcome the witnesses to the table. While this committee does not swear in witnesses, the proceedings here today are legal proceedings of the parliament and warrant the same respect as proceedings in the House of Representatives. The deliberate misleading of the committee may be regarded as a contempt of the parliament. The committee prefers that all evidence be given in public but, should you at any stage wish to give evidence in private, you may ask to do so and the committee will give consideration to your request. Would you like to make an opening statement before we proceed to questions?

Ms Ridout—Thank you for the opportunity to appear before what we regard as a very important inquiry on an issue that is very important to Australia and, inter alia, to Australian industry. Only four per cent of manufacturing companies—that is, one in 25—do any R&D. Given the importance of this whole area to driving economic growth in Australia, the government and opposition are absolutely on the right track in holding an inquiry and having an ongoing focus on the issue.

We have had a very long, strong and passionate engagement on this issue. It has been one of the things that has really interested me in the 20 years that I have been working with manufacturing. In 1997, we published a major report on manufacturing called *Make or break*. We identified increasing our R&D effort as one of the fundamental steps needed to drive stronger economic growth in Australia and 'to make Australia rich again'. We were a key sponsor of and participant in the National Innovation Summit in February 2000, involving two major working groups on incentives and human dimensions. We have been actively involved in supporting government efforts to lift R&D activity, including support for the R&D Start program and the premium R&D Tax Concession, Innovation Access Program. I was very strongly involved with the department in designing the premium program to make sure that it was of maximum use to companies. We were the only industry association to make a submission to the inquiry into the Taxation Laws Amendment (Research and Development) Bill 2001. We have had a long interest and history in this area.

In terms of preparing ourselves to make some comments for you today, we gave an initial submission to you indicating that we plan to do a major study into business R&D expenditure and what was driving it. We are very happy to table the report on that study here today. I think that you now have that in front of you. This study followed on from one that we undertook in 1999, where we found that R&D expenditure decisions were driven very much by short-term profit considerations, rather than by the need for longer term growth and competitiveness. That might sound like a fairly pat remark, but it is one of the most important issues that we face in this area. In this study, the report of which we are tabling today, we surveyed some 900 manufacturing companies across Australia. They cover both AI Group members and nonmember companies. These companies have an annual turnover in excess of $31 billion and

employ 87,000 Australians. Using survey and other data, the study is able to report R&D expenditure totalling $839 million a year, or about 39 per cent of all manufacturing R&D spending. You have a very strong cross-section of companies that have been included in this study.

From this material, we were able to make an estimate of R&D expenditure by manufacturing for the year 2001-02 and of that planned for 2002-03. The focus of the study was not just on what they are spending, but on what was driving the spending because, without understanding that, with an interest in public policy, you have very little hope of making a difference. That was very much a focus in our work. There is good news in the findings, but there are also concerns about the underlying pattern of expenditure in some of these drivers of the business decisions that I was just referring to. I will now hand over to Tony Pensabene to give you a few details of the major findings of our study. Then we can have a discussion about the policy issues.

Mr Pensabene—The report is broken into four parts. The starting point is looking at the official figures that are available on manufacturing R&D. We have done a bit of analysis of that, and that is what the first chapter essentially does. It shows the story that I think the committee would be familiar with: essentially, R&D effort up to the last available figures for 1999-2000 is on the decline. Although expenditure has been rising in nominal terms, in real terms there is a decline. The percentage of expenditure in relation to GDP has been falling, and our ranking relative to the rest of the world has been falling with it. One of the interesting points that we picked up from the data that has a crucial bearing on the overall policy response to R&D was that manufacturing's share of R&D, as a proportion of the total business R&D expenditure, has been falling quite dramatically. Five or six years ago, it was about over half of R&D activity in business. Now it is down to about 44 per cent.

In fact, if you look at the data in terms of the trends and R&D expenditure, virtually all—essentially 99.9 per cent—of the decline in R&D expenditure that took place prior to the official figures for last year was attributable to manufacturing cutting back its effort. Only one in 25 firms, that is 4 per cent of firms, actually undertake any R&D work. As a proportion of turnover the data shows that it has been declining quite sharply since 1995-96. In around 1995-96, it was about 1.2 per cent of turnover; it is now down to about 0.82 per cent of turnover.

The other main point that came out of the official data analysis was that the bulk of R&D activity is funded by business itself. Another interesting point is that, when we looked at the data and tried to match it up with profit data, it suggested that there was a link between profit performance in one year and R&D expenditure in the following year. In other words, good profit performance would flow through into an increase in R&D activity. Those were the official data analyses that we started with, and that takes it to 1999-2000. What we wanted to do was to look at what has been happening since, and also to have some idea of what is coming forward. The study we have done is an attempt to estimate manufacturing expenditure in 2001-02 and also to provide an estimate for 2002-03. As Heather pointed out, the study picks up about 40 per cent of manufacturing activity, so it is a pretty powerful sample size from which to make some of estimates of overall expenditure and direction. With that data we developed intensity ratios for the sectors. We made a comparison with the ABS intensity ratios to see if it was essentially on a lasting track, and from that we derived estimates for R&D expenditure by manufacturing for 2001-02 and what is planned for 2002-03.

As Heather pointed out, there is a fair degree of good news in that analysis. We found that R&D intensity has been moving up, from 0.85 for 2000-01—the last official figures—to what we estimate as about 0.89 for the year just ended, and we are estimating that that intensity ratio will go up again to about 0.96 for 2002-03. Translating that into dollar estimates, that means that the last official figures have manufacturing R&D at around $2.17 billion. Our estimates would suggest that for the year just ended that should rise to around $2.3 billion and for 2002-03 the projection is that they will rise again, to about $2.6 billion. So the results do show an improving trend for business R&D, particularly by manufacturing. We wanted to better understand why that was the case, hence the analysis of the drivers and the factors underlying it.

To summarise, the clear thing that comes out of the analysis is that the precondition for improving R&D and the precondition for weakening R&D activity is profitability. Manufacturing is going through a period of good profit performance, and that has translated into increased expenditure on R&D. The forecast for the current year is for that to flow through again, based on profitability. So, in a sense, we have identified a cyclical upturn in R&D activity for manufacturing. Although that is a very positive outcome in terms of moving in the right direction, it brings with it I suppose some underlying concerns. If conditions start to deteriorate or the economy starts to weaken, we could see that performance weaken and it may even reverse in time.

Trying to go beyond simply the underlying factor that facilitates R&D, which is profitability, the report details some of the factors behind that in terms of individual decision making and essentially identifies three sets of drivers for manufacturers in R&D activity. One driver is product development services. Companies that undertake R&D are driven by the need to develop new products and services and, with that, the need to grow markets. So there is a positive element to the activity. The other drivers are concerned more with a short-term perspective and flow back to profits. Concerns about costs and implications for profit performance act as a negative in terms of R&D activity. All of those aspects are covered in the section related to the drivers of R&D.

The other thing that came through is that, while profitability and the need to grow markets and new products and services were primary drivers of R&D activity, the role of government assistance was seen as more of a secondary factor, but nevertheless an important one. It can be used to lever additional R&D expenditure but, in terms of the order ranking, it was of secondary consideration to the primary drivers.

The other part of the report looks at the links between business, government programs and public R&D institutions. In terms of public institutions, universities, CRCs and CSIRO, from the survey we found only about 25 per cent usage by business of those facilities, and essentially much of it was focused around universities. Quite clearly the survey showed that there was probably much greater opportunity for collaboration between public funding institutions and business. There was a very high recognition of government programs. Seventy per cent of all those surveyed were aware of government support and assistance, with the R&D tax concession being the highest in terms of recognition. Clearly, while there was high recognition of the programs, when you look at the utilisation of those programs, the percentage actually falls away, not unexpectedly, because most business R&D, as I said, is funded by business itself. Usage of programs tended to be related to size. The bigger companies tended to make greater

use of government programs relative to smaller companies; nevertheless, there was again identified much greater scope for usage of government programs to facilitate R&D investment.

The other point I should make bears on where you take the policy development of the study. If you look at those manufacturing firms that are actually doing R&D work, about four per cent of the very large firms that employ more than 500 people actually account for about 70 per cent of the R&D activity, whereas about 33 per cent of the surveyed firms which employ less than 50 people undertake a very small—

Ms Ridout—Two per cent.

Mr Pensabene—Two per cent of activity. So there are some very telling points about levers and the way to influence the overall outcome. I might stop there and hand over to Heather to talk about some of the policy implications.

Ms Ridout—They are endless. You can start pouring over these documents and do all sorts of things, but they seem to fall into five categories. The first one is to grow the economy strongly. Strong economic growth is the source of all good things—the source of jobs, investment, a lot of things—so it is obviously very closely related to R&D. A sound economy definitely delivers a higher R&D focus, and that is a good thing. We need to have more firms engaged in R&D. Four per cent of Australian manufacturers is a very, very low percentage. We currently have four per cent of Australian companies exporting, not just the manufacturing companies. I think that, in a sense, we had the ideal there to double. That was going to take the country a long way, and I see R&D as being very important in that regard. But I think we certainly would advocate that we need a more broadly based involvement by industry. The competitive nature of R&D grants means that new players are at a disadvantage in gaining access to those programs compared with those with many years of R&D experience.

Little is available to support firms who lack experience in R&D activities, and we suggest that we need to explore a new program which focuses on supporting businesses in the early years of R&D activity. As well, it is very clear that we need to raise a cultural awareness of the need for companies to focus more on R&D. I am actually quite optimistic, having looked at some other work we have been doing, that manufacturing industry going forward is going to be much more focused on product innovation and these sorts of value-added issues, rather than on the cost-cutting, rationalising approaches we have seen in recent years. We recently did a survey with PricewaterhouseCoopers, and that came out as a very strong finding. That is going to support more of a cultural change towards an R&D focus, but it is fairly early days, and we need to do more to get that firmly established. The Australian Industry Group, with the strong support of the Commonwealth and a number of the states, is establishing an innovation exchange, a web-based exchange where all the stakeholders in the innovation system will meet—the universities, the CSIRO and our members who are doing R&D. It will be a place where they can access government programs and move through the innovation system. That might sound like a very obvious thing, but it is not in place. The innovation system is a very fragmented creature indeed, and this innovation exchange provides a channel. We are putting $1 million from one of our members into that project. It is a very important initiative and one that we are undertaking to try and drive awareness and provide access to the R&D system for more of our members.

We also need to promote higher R&D intensity among firms that are already undertaking R&D. I have always been of the view that you back winners, and if you have got a winner you keep backing them. I think we need to lift the turnover intensity of R&D. I think the 175 per cent issue was right. Basing it on the fact that if you spent more than you had over the last three years was a simpler way of making sure the program was accessed, but in an ideal world, and if you want to go for the gold medal, you really need to get that turnover ratio up to well over the 1.2 or 1.3 per cent where it had been before and keep driving it higher. So we have some sympathy with the view that companies that are doing more should be rewarded more strongly. With respect also to that issue, we are strongly of the view that your programs have to have consistency. We regretted the suspension of the start program, because it was just getting up a head of steam. Frankly, if that is backing winners, we should have ploughed a lot more money into it when it was starting to succeed, and not said, 'You have to wait another year to get paid.' That is something that we deeply regret.

We also need to encourage more overseas companies with Australian bases to allow R&D activity in Australia. That is one of those perennial problems when you have a lot of multinationals operating in Australia. We are a good place to do R&D: our *Make or break* study identified us as a good place to do R&D but we have to work on some of the underpinning infrastructure. That goes to some of the tax changes the government has been seeking to make, but it also goes to making sure we have a skill base in place that can support it. Having a good engineering and technology university base is a very important issue in attracting R&D to Australia.

The final thing we need to look at is encouraging greater collaboration between industry and public R&D facilities. As Mr Pensabene indicated, the level of collaboration is quite low: 12 per cent do it with universities—and universities do 84 per cent of Australia's research. We need to get that link and that level of engagement much stronger. As part of our submissions to the higher education review, we have done a lot of work on the strength of the relationships between industry and the higher education system. They are not deep, they are not mature, and they offer a huge untapped potential to improve the performance of higher education and the performance of industry. We see that as a win-win situation for both sides of the equation, and we see that as a win-win not only for education but also for driving a much more innovative culture in Australia. Can I conclude by saying that I do not think there is one public policy issue that is more important than this, and I do hope you take these thoughts on board and implement some of our ideas.

CHAIR—Thank you, and thank you for the copy of the report, which we will later on table as an exhibit to the inquiry. I know it builds on your submission. Presumably most of this information was known at the time you prepared your submission in the first place?

Ms Ridout—In fact, we did not. We put in a submission suggesting we were going to do this study for you.

CHAIR—Sorry.

Ms Ridout—So this study is hot off the press. It has not seen the light of day.

CHAIR—I realise that, but I thought that you probably already had a lot of the information that is in this study, but it was done subsequently.

Ms Ridout—No, it is all new. It was done subsequently.

CHAIR—My apologies for the misunderstanding. That will be of great use in the inquiry. Could I pick up on this point about linkages between research organisations—universities et cetera—and industry. You say that we have got to encourage greater collaboration. Are there some concrete things that the government can do to improve that area? Is there something in the existing programs that should be changed or tweaked in some way to help this particular aspect? It seems that one of the major impediments to industry being involved in R&D is that they do not have relationships with research organisations. Consequently there is not an R&D culture within those particular enterprises. Because so many submissions talk about this aspect, I think that if we could make those linkages a lot stronger there would be more of a transfer of research culture into industry. Can you tell us about some specific things?

Ms Ridout—It is a very interesting area. We are strongly supportive of the CRC programs; a number of our members are deeply involved in those and have had very good experiences from them. Can I say that we regard the CSIRO as now positioning itself for a much stronger and deeper engagement with the manufacturing sector. The new head of the CSIRO has strongly signalled that that is what he wants to achieve, and he has now established a manufacturing advisory council, which our CEO is chairing. So there is much more of a reaching out for manufacturing—which was much needed. In the university area there is a whole series of issues, both cultural and technical, in a sense. Culturally, I think some companies have had very good relationships with universities; other companies have gone to universities and found them to be hard places to do business with. There has not been a strong commercial understanding in universities about what makes business work. I think there have been unrealistic expectations on both sides, and that relationship has got to become a more meaningful dialogue. There has to be more business represented on university senates and there has to be a much better dialogue between the two.

But it can work. Take some of the regional universities, for example in Western Sydney or Ballarat. They are part of the whole community driving the industrial development aspirations of those communities, and it works extremely well. Dealing with IP has been an issue, and issues like the protection of IP, who owns it and who gets the benefits have been important. There is an interest in having a look at some tax issues to give more incentive for companies to invest more in universities to develop ideas, though I am not sure about that; my real view is that, if we are going to spend more money on supporting research in Australia, the focus has to be on driving business R&D. They can then go to universities and other places and ask them to do it. We have to get the market working, rather than have it at the public end. We are already quite competitive there, although we are not necessarily achieving the outcomes. That is related to the question you asked me. The drive has to come from the business community and the public research institutions, and they have to engage together in trying to do it. But at the moment maybe we do not have enough of that happening.

CHAIR—Can I ask you about the R&D Start program. You mentioned its suspension; as you probably know, that was because it was too successful.

Ms Ridout—Yes, that is right.

CHAIR—It is not as though any money came out of it. The same money is there; it is just that the take-up was substantially stronger than anybody would have envisaged. Do you think that we should have run that program differently? Some companies in my electorate, which were on the verge of being assisted and missed out, were surprised that companies that were already in were able to call on drawings as quickly as they did. That is effectively the reason why the money was not there this year to take on new ones; thus, the suspension. Do you think that should have been done differently?

Ms Ridout—We had a competitive brand arrangement. Not every application got up. It was not an easy process to go through; it was an expensive process to go through. A lot of companies went through that process only to find that the money was not there to meet the market. I think the government took the view that, in reducing the general tax concession from 150 per cent downwards at the same time that we saw changes to the corporate tax arrangements—so the whole value of the tax concession as an incentive fell—they would put their emphasis on a grants structure. For the first couple of years of that program the department used to come to us and, when we could not get the take-up for the program, we would promote it solidly. It was regrettable in the extreme that when the thing started to fly and there were a lot of companies wanting to do good projects—and, as I said, not all of them always got up—the scheme had to be deferred. From a public sector management point of view, my biggest criticism, I suppose, was that, in a sense, companies did have programs and went before the committees with projects that they thought had a fair chance of getting up, but the money was really not there at the time to support them. I think that is really regrettable. To me, even though it would have been a less palpable decision for the government, I would have kept the scheme going to get the culture that we wanted—to get that four per cent to eight per cent to 12 per cent. The best management of the scheme would have been to put the money in to keep it at the level it was going, with the momentum it had. It was a four-year rolling funding for the start program. It would have been better to spend the lot and then have a fight over it at the end of the third year when the money ran out, rather than—

CHAIR—So you would have pulled the money forward?

Ms Ridout—Definitely.

Mr Pensabene—Another point that I think is worth making is with regard to what the report is saying. If you understand the fact that R&D has a very strong business cycle nature to it, after four years of companies with weak profits and weak business conditions holding off on their R&D activity, and with the economy going so strongly, it inevitably produces a large demand—

Ms Ridout—At a particular point.

Mr Pensabene—At a point in time. While there has been a failure to understand the significance of that relationship, I think it has important bearings on the way that policies are rolled out. It brings back the 1995-96 experience.

Ms Ridout—It does indeed, and it indicates the fact that support for R&D was reduced at a time that profitability was falling. That only reinforced the fall-off in R&D. The study does

show that only 2.5 per cent to three per cent of R&D is financed out of government concessions. The vast majority is financed from within companies. But when there are compressed margins and weak profitability, and that is withdrawn or reduced, it does reinforce the decline. I think Tony is quite right in saying that, once that profit cycle started to turn around, there was a greater focus on product innovation. Everyone got into it and the money ran out. It was a very regrettable set of circumstances.

Ms GRIERSON—You talked about the cyclical nature. When we are seeing good times, do you think we do enough to support exports? If we are into growing economies and supporting R&D growth at the right time, certainly underpinning a culture of R&D investment is important, but do we capture enough export opportunity? Do we have enough incentives to build on that opportunity in these cycles?

Ms Ridout—I think one of the biggest issues in terms of R&D is that there are elements of market failure in our R&D spend—(a) reflecting the size of our companies and (b) reflecting the size of our markets. If you look at some of the big spends by the biggest companies, they average $15 million per annum—lots of money—and for a lot of them it is a lot higher than that. They cannot be amortised across the Australian market; they have to be spread across an export market as well. That is very clear in the automotive industry and other areas. The link between exporting and innovation is very strong. Also, exporting companies innovate far more than others do. They invest in skills more than others and they pay 20 per cent higher wages. So exporting is a very virtuous set of circumstances. It reflects a virtuous loop of performance building—

Ms GRIERSON—Do we reward that enough?

Ms Ridout—I suspect that the government has committed itself to a target of doubling the number of exporters by 2005. We have a revamped Austrade, which I think is going to work well, which has reached out to try to build alliances with industry. It is early days yet, and that is a very ambitious target. The EMDG scheme is capped, which we felt was wrong. I think it is capped too low and needs to be increased. If we create this—which means 12,000 more exporters than we would otherwise have—we are going to have a lot more demands on funding for export, so I think your concerns will be played out over the next little while. But success—as with the R&D Start program—is a great thing to be managing. It is managing failure, when you cannot get things going, that is the sad case. I hope we are going to be managing success in exporting. If we are managing success in exporting, we will also be managing success in innovation because the two go together.

Ms GRIERSON—The other I found slightly confusing in your report is that you have found a 70 per cent awareness factor, amongst your surveyed group, of the programs and the assistance from government, and yet you see a need to invest in innovation exchange, which is obviously going to make people more aware and make it easier for them to access those programs. Could you comment on the correlation between those findings and the government's failure—or success, if you think that way—to convey the messages about R&D programs?

Ms Ridout—The innovation exchange is trying to bring together the innovation system—that is, the universities and individual research that is going on in the universities, a register of patents available here and internationally, the CSIRO and all the research they are doing in

various areas and major corporations that are doing particular types of research that they are interested in promulgating. Then it is going to bring together access to programs that will assist you in getting started and a self-auditing mechanism for auditing how innovative your company is. In a sense, it is trying to bring Australia's innovation system together in one place, so it is not just about government programs. If you have ever tried to get around a university web site to find some research on an issue, you will know why you probably need to have something like this established. If a member of ours were interested in, say, light metals research and wanted to know about some aspect of it, he could find real research and get in touch with the researcher through this initiative. It is quite an ambitious initiative—trying to bring together research, knowledge and support for companies. It will be available not just to our members but to all Australian companies, and we hope it will be self-funding after three years. That is the business plan. It is a really important thing.

Ms GRIERSON—So you are aiming for self-funding?

Ms Ridout—After three years.

Ms GRIERSON—By subscription et cetera?

Ms Ridout—Yes, by subscription or company membership of the exchange, but when you get into it there is no charge to access the information—it is a totally free service.

Ms GRIERSON—I am pleased to hear that it is so comprehensive. That was not clear from the report.

Ms Ridout—It is not launched yet; it is still in its prototype stage. We hope to have the thing up and running early next year. In regard to awareness of innovation, I think the group that is not as aware as it should be is small business. I know from the government's work that they are concerned about the lack of awareness at the small business end. Given that the 33 per cent of respondents which had fewer than 50 employees only did two per cent of the R&D we certainly do have a challenge to lift their performance—and, given the structure of the Australian economy, I think we do need to lift their performance. The government's rebate for not-in-profit small companies is a step in the right direction and we strongly supported that, but there are all sorts of teething issues there that will have to be resolved. We would like to sit back after a year or so of the new scheme being in place—the 175 per cent scheme—and say, 'Where are we at? How are we going in terms of lifting this four per cent of Australian companies higher?' I would also say that the spending by small companies is not as big as their electricity bill, so not only is the level of engagement small but also the actual amounts are not particularly impressive.

Ms GRIERSON—What is your view on the proposal to make available each year 100 postdoctoral scientist positions in industry that will be funded on a fifty-fifty basis by government and industry—a bit of a flying squad for R&D?

Ms Ridout—We think that anything that links public research institutions and industry and that keeps those skills in Australia with researchers working with Australian companies is a good thing, so we strongly support that. The whole initiative of having globally competitive researchers working in Australia with Australian industry is a very positive thing, so we strongly support it.

Mr Pensabene—In looking at the programs available and other activities that are offered, there is probably a need to break them up into different compartments. The report talks about those programs and activities that can encourage more innovation from companies than they currently do, and a lot of the programs are focused in that direction. If you want to get more innovation and a wider spread of it, you have to think about how you go about getting companies to start R&D. That is the big area which this report points to. It says that there is a need to look at those areas as well. Programs can help companies to do more than they are doing currently, but how do you get companies that have done no R&D to start the process? It is that side of the ledger that has probably been under examined at this point in time.

Mr TICEHURST—You say that the percentage of manufacturing R&D is falling as a proportion of GDP. What about the effect of service industries on GDP? Is that a major factor? Is the service industry rising and, therefore, does that give you a negative or a lower growth on the manufacturing R&D?

Ms Ridout—Absolutely. I think you have seen service R&D be reasonably strong. It is a bit like any percentage of the economy: once it rises, another thing holds constant. I think we have been at pains to say that manufacturing spending is now rising in absolute terms, which is a good thing even though its proportion of the rest has fallen. It remains a negative argument, though. Australia's share of GDP, for example, going into plant and equipment investment used to average nine cents in every dollar. Today it averages seven cents in every dollar. Part of that is caused by the fact that the price of equipment has fallen because computers et cetera have come down in price. But we are still missing out on two cents in every dollar of investment in plant and equipment that we should be having. I still think that in relation to the manufacturing industry, which is still almost half the provider of ideas in the private sector, we should be spending an awful lot more than we are, and I do not think we can hide behind the services industry's rising.

Mr TICEHURST—What about the cost of employment in manufacturing? Do you see that as being a major factor in limiting manufacturing growth and, therefore, limiting the R&D growth?

Ms Ridout—Do you mean the cost of employment generally in the sector?

Mr TICEHURST—Yes, the additional on costs.

Ms Ridout—No. In my view, manufacturing is a skill rich sector. We need to be internationally competitive but we need to pay people and remunerate people commensurate with the skills and competencies they possess and the productivity of the sector. The sector has been performing strongly; productivity has been rising. It is a hotly internationally contested sector, which always puts a lid on it. I do not think we should be just willy-nilly raising on costs—for example, the ACTU proposal to have three years unpaid maternity leave; it is mind-blowingly ridiculous. At the same time, we do not want manufacturing to be a low skill, low labour cost sector. We want it to be high value added, high skilled and well paid. That is our vision for the sector. But I share your concern about some of the more heroic and ambitious ideas that are sometimes put forward.

Mr TICEHURST—It is an industry that I had a lot to do with some years ago in providing metallic type components for powerlines and distribution lines. In fact, I raised this with a manufacturer here yesterday. A lot of the stuff that used to be made in Australia is now made in China and a lot of the Australian manufacturers are now importers of the stuff. They have probably exported the technology so that they can buy a cheaper product and sell it back to this industry. We really have to take up the expertise and to value add to manufacturing to make more sophisticated products to be able to keep that growth going.

Ms Ridout—I totally agree with you. We have to commercialise many more of those ideas in Australia and get the benefit of them and get them reflected in exports to other countries.

Mr MARTYN EVANS—The survey is very good, and thank you for bringing that to our attention. It seems to be very much based on the form of assistance that government might provide being through the taxation system. Of course it is a survey of existing assistance, which is based on the taxation system. But there does not seem to be much comment by the firms on the costs of administering the current system. We have had evidence from other people that the current system is regarded by many firms, particularly smaller firms, as being fairly bureaucratic—necessarily so in many ways—fairly expensive to administer, both from the government's point of view and from their point of view, and as not always delivering benefits in a timely manner. They say that, by the time they have filled out all the forms and the cheque arrives, they are almost into production or perhaps they have almost gone out of business because the product did not quite make it. I am exaggerating the effects of it here.

There are quite a lot of forms to be filled in. I have seen some of the start grant application forms and some of the completed applications. One correctly describes them as packages because the process involves documents of quite substantial weight, not only in their import but also in their literal weight. Do you have any informal feedback or do you have a viewpoint as an organisation about the form in which the assistance is delivered? The quantum is there, and it is a given that we should be providing assistance in this context, but there is the nature of its delivery and perhaps the extent of the burden that the assistance imposes on government and firms.

Ms Ridout—Tony might wish to make some comment, but I will firstly say a couple of things. The tax concession is regarded as having the best awareness rating and I think there is something to that, to the extent that it is easiest to access and to understand. That is why we, the Australian Industry Group, have always pushed hard for a broadly based tax concession: it is available to all sectors and to all companies and it is simple to understand, it is simple to implement and it is universally understood. So that is why we have been pushing so hard for many years to have that restored to what it was.

In the absence of that, we have had the start program, which has many strong attributes, but compliance has been an issue. I think part of the problem, which is accentuated by its deferral, is that it did leave a bit of a bad taste in a lot of people's mouths because it is a very strong compliance regime and I think with smaller companies the whole issue of keeping compliance to a minimum is important. But, then again, you have rigorous requirements in the program that have to be met. The survey shows that fewer than half of the companies intend to even access any of the government programs. We do not know the reasons for that—we did not ask—but you would have to say there would be some issues that mean to them it is simply not worth the

trouble. Tony might like to comment further, but I think there is something implicit there that needs to be explored further.

Mr Pensabene—Right across the board, when you look at government programs and services and the degree of administrative burden that small companies have to carry, it is consistently reported that that is a barrier. The tax side in particular is seen as imposing obligations on small companies that are busy trying to do their job on a daily basis. So I think it certainly would be true that the more reporting compliance and administrative form filling required with grant arrangements would be a burden on small companies. The other thing to raise is just an observation. I recently attended an R&D tax consultative meeting. When you have a situation where small companies need to call in R&D tax consultants to assist them with filling in their grant application forms, it does raise issues such as ways to make it simpler and easier for companies to apply.

Ms Ridout—You end up creating an R&D industry. We would much prefer that decision in the R&D industry to bring in universities, the CSIRO and others to help with companies with the technology rather than help them to fill out the forms.

Mr MARTYN EVANS—Given that the number of firms, particularly small firms, undertaking R&D activities is relatively small as a percentage of the total number of firms—I am not sure how many, having only just received the booklet—how many of them are doing it in house? I notice there is a later chapter on linkages and those who are doing that with universities and CSIRO. How many of these firms, especially the small ones, are undertaking this work in house as against contracting CSIRO and universities? Did you have a question about that?

Mr Pensabene—We did ask about linkages to CSIRO, universities and CRCs. It is undoubted that the bigger the company the more links and the smaller the company the fewer links. I would think that, for the majority of small firms, it would be in house.

Mr MARTYN EVANS—So most of the small firms are undertaking the work in house and then doing the paperwork and so on through their accountants?

Ms Ridout—Or R&D consultants.

Mr MARTYN EVANS—Or R&D consultants, or not at all perhaps.

Ms Ridout—Yes.

Mr MARTYN EVANS—Which means that probably a lot of it is going on that kind of component. I am intrigued by the category ‘transport equipment’, which seems to stand out, with average expenditure per firm of $4 million. Does that include motor vehicle manufacturers?

Ms Ridout—Yes.

Mr MARTYN EVANS—So this is General Motors Holden—a wonderful firm, of course, that is doing a lot of great work.

Ms Ridout—Indeed.

Mr MARTYN EVANS—It is obviously doing well in the R&D category. I wondered why that category stood out in such a huge way; I was not quite sure whether or not that included motor vehicle manufacturers.

Mr Pensabene—The ABS data shows a similar pattern as well.

Mr MARTYN EVANS—Yes, and it does include those motor vehicle manufacturers.

Ms Ridout—The automotive industry epitomises the new emphasis on product innovation that is part of a lot of the more contemporary thinking in manufacturing. As I said, we did a similar survey for the growth strategies of our members over the next few years and this product innovation issue came across very strongly in many sectors, but in the transport area it was just overwhelming. So I think the arrangements, and the emphasis that has been implicit in those schemes on innovation and research and development—I know the Labor Party, in its position on the automotive industry, was very strong those sorts of issues—are good stuff.

Mr MARTYN EVANS—When you asked the firms, 'Are you undertaking research and development,' was that in relation to innovative and high risk or was it just in relation to innovation? In other words, was your question consistent with the 'high risk and innovative' definition, or was it consistent with just the 'innovative' definition?

Mr Pensabene—We did not sit down and say, 'It will have to be this definition.' It was a broad definition of R&D.

Mr MARTYN EVANS—So you just took the broad definition of R&D.

Mr Pensabene—Yes.

Ms Ridout—I would say that our definition lined up absolutely with the statistics of the ABS last time. I think we were within a few million, and even ahead of the ABS.

Mr MARTYN EVANS—So yours was the common definition that we all understand to be R&D.

Ms Ridout—Yes. Hopefully, it will become the household-name definition.

Mr MARTYN EVANS—The regular R&D.

Ms Ridout—Yes. One of the most misunderstood things about innovation is that it is not just a guy in a white coat inventing a new widget. Innovation is about improving the way we do things. The sooner we get that notion promulgated more popularly the sooner we will start to get the benefits of a lot of these things. You do not have to invent a whole new technology, although I know a number of our members are doing that.

Dr WASHER—Heather, I was fascinated earlier when you mentioned that you felt that we had gone through a culture of downsizing, and I think that is true, and that now you feel that we are coming into a culture of value-adding. I see in this booklet that there is extra investment going into R&D but how have you measured that? Was it a gut feeling, which is probably just as good as anything?

Ms Ridout—There are a couple of things. You cannot get away from the fact that we still see spending on R&D as a cost rather than an investment, like expenditure on training is a cost rather than an investment; and it is still there. But when you look at the real driver underneath that and say, 'Why are you doing it?' it is for product innovation and market expansion. It is a positive reaction, rather than a negative one, and the cost saving is further down the list. This work that we did on the growth strategies for our members over the last couple of years with PWC was very much focused on product growth, expansion, change and innovation rather than this narrow cost cutting. There is no doubt that manufacturing is going to have to be cost competitive, which goes to the answer to my question to the other member about labour costs. You have to be cost competitive. But I think that our members are now realising that the way to grow the golden egg is to be more innovative, to develop new products and better processes, and to get them to the market quickly, because that is the name of the game in contemporary manufacturing. So it is not just a gut feeling. That is actually being expressed by companies.

Dr WASHER—You praise Austrade. Can you elaborate a little bit on Austrade and what has happened; you and that and why it is—

Ms Ridout—Austrade has a new chairman and a new CEO, and it is now seeking to develop real alliances with organisations such as the Australian Industry Group to drive a stronger export culture in Australia. Only four per cent of Australian companies export, and half of those do so irregularly. Australia's future depends on exporting. There is absolutely no doubt about it. If we want to have a strong standard of living, we have to grow the export engagement of our industries. I think that Peter O'Byrne and his colleagues at Austrade are working very hard to try to achieve that government target, which is one of the few numerical targets set by the government. There is a greater willingness and desire to get out there and work closely and complement the effort. We have a number of trade offices. Other organisations like ours have a number of trade offices. We should all be complementing each other and working together. I think that he is very conscious of that. That is good news.

Dr WASHER—At the moment we are looking at tax benefits to reward motivation. Should we be looking more at rewarding success by, as we talked about earlier, taking off some of the capital gains taxes and taxes on various options given to people who are successful et cetera?

Ms Ridout—I am strongly of the view that Australia has to aim to be a low-tax country, which really promotes entrepreneurial activity and the taking of risks. We need to be a high risk taking country. The changes to the capital gains tax arrangements and the changes that were recently made by the government to the taxation of profits by mutual funds in Australia are all moving in the right direction, and we are strongly supportive of them. The R&D tax concession is a good thing, because you do not get the tax if you do not make the profits anyway. No-one is really that worse off. I never quite understood the arguments in relation to it. We need low taxes to encourage entrepreneurial activity, and this is an area where they can make a difference.

Dr WASHER—Do you think that government has a role to get out there and sell the tax benefits of R&D to business—small to medium enterprise in particular?

Ms Ridout—Definitely.

Dr WASHER—We did this with the GST, but do you think that we have done it to the same extent for this?

Ms Ridout—No, I do not think so. We need to do it, and I think that this study highlights the need to do that for all companies and the Australian people. They need to know that there is an emphasis on these areas. But, if we are going to do it, we have to put our money where our mouth is and consistently fund programs. There is no point in finally getting a whole lot of companies interested and then pulling the plug on it.

Dr WASHER—I understand that. Do the majority of our universities have good business liaison people within them? If I am a businessperson and I walk into the university and say, 'This is the R&D that I want done; do you provide it?' do they have a liaison officer who will tell me how to go about it? Secondly, do they assist companies in putting in the application? One thing that universities are traditionally good at is getting money out of government by putting in great applications. Can they apply the same skills to assist business?

Ms Ridout—The level of engagement between Australian industries and universities is not mature and it is not strong enough. There are good examples of it but we did a case study with 30 companies for our higher education submission and I think there is huge untapped potential there to improve the business understanding in universities and improve the expectations that business holds of the universities. We have suggested strongly in our submission to Brendan Nelson that it is an area for enhancement. It is a huge area of untapped potential.

Ms GRIERSON—Please do not think I am being facetious but it seems to me that the highest recognition factor was in terms of tax concessions. Perhaps that would be linked to the fact that generally all companies, no matter what their size is, have an accountant, a financial adviser or a tax consultant. How do we turn those people into R&D advisers as well as financial advisers? They seem to have major impacts on the investment strategies and expenditure strategies of companies. In your innovation exchange will they be a target or should they be a government target as well? I am not being facetious. They are a powerful group that perhaps, if they had more understanding of the benefits of investing in R&D, could influence quite markedly—

Ms Ridout—I think you are right: there is potential there but accountants just have the approach that they want to minimise your tax. In many cases they want to grow your business too and you have to get a business plan together. We certainly encourage our accountants to have a very strong R&D practice, and with our members that works. I think it is an area of untapped potential but you have to come at it from the right direction. We are about building better businesses and more enduring businesses and your accountant has a role in that as well as helping you get a tax deduction. The tax concession is easily understood because it is through a recognised mechanism, through the tax system, but it is an area to grow.

Ms GRIERSON—Yes, it is probably an area that we can all learn from too. Thank you.

Mr LINDSAY—We have only just seen this Australian Industry Group publication, *Manufacturing R&D expenditure and drivers*. When I turn to the back I see the heading 'Policy implications'. I want to congratulate you on leading this section with the subheading 'Grow the economy strongly'. We do not hear that very much.

CHAIR—We keep saying it.

Mr LINDSAY—I think everybody needs to understand that it is one of the major things a government can do. But I am not here to editorialise.

Ms Ridout—You cannot actually do it; business does it.

Mr LINDSAY—The last point that you make in your publication is under the subheading 'Encourage greater collaboration between industry and public R&D facilities'. There are only a few lines there but, from the evidence that we have had already in this inquiry, this theme comes out time and again. Perhaps I am misunderstanding how you have written this but there does not seem to be the emphasis that is needed to have the partnerships between business and Academe. Perhaps your point will be that businesses do their own in-house R&D. Why do you think that your report has come out like this whereas all of your companies have not put the emphasis on the need to deal with universities?

Ms Ridout—The emphasis has been on doing the research. In the last few weeks we have been trying to pull together this research. This came out of it and it is something that has also been triggered as part of the higher education review. It is an area that we are going to take a closer look at and work out exactly what policies need to be followed underneath that heading. Do not regard that as our policy position. It is a signal that should inform policy but I agree with you wholeheartedly and I have been at pains to say it today: it just seems to be sitting there and we need to make it work much better for both sides.

Mr LINDSAY—Earlier witnesses also referred to a survey that they had done. Their survey found that the structural factors that discouraged innovation in order of declining severity were: the taxation system, the legal system, the cost of training and hiring staff, the cost of research and innovation and the cost of technology. That seems to be at odds with the information that has come from your survey. Do you think there is an explanation for that? I know you do not have it in front of you but, in the survey cited by the earlier witnesses, the cost of research and the cost of technology were down the bottom of the list. Up the top were the tax system, the legal system and the cost of training.

Mr Pensabene—When you run through that list, it seems to me that they are the sorts of answers you give to the question 'What holds you back on R&D investment?' But we wanted to know what was encouraging companies to do R&D and do more of it, as well as to understand what was holding them back. Those answers do not address that question. Companies do R&D because they want to grow and expand, build bigger markets, have new products and services, and export. Those things are the drivers. But those answers are about what holds you back. They probably are implicitly built into some of those other factors. We have the identification of cost factors in there, and a lot of these would fall into that.

Mr LINDSAY—In your policy prescriptions, nothing has come out about fixing the legal problems that are there. The evidence earlier was that there was a disparity between how the legal systems work in Australia and overseas countries. That was causing companies difficulty in managing the development of their programs.

Ms Ridout—On page 23 we had a table on barriers to future R&D growth. The most important issue in every single sector, with the exception of the clothing and footwear sector, was profitability. The second most important barriers—lack of government assistance, size of markets, lack of return, lack of return costs—are all there but they are probably more implicit. Having internationally competitive tax arrangements and internationally consistent treaty arrangements—all those things—are very important, and we do refer to them in one of the areas.

Mr LINDSAY—Your evidence looked at when the R&D tax concessions were reduced from 150 to 125. You said that one in 10 said it was a major reason for reducing expenditure, and that one in four said it was a significant reason. On the other hand, you are saying that companies think they have to do this so that they can get new products and therefore drive profitability. So why did they drop back on R&D when there was a small reduction in the tax concession?

Ms Ridout—It was not actually a small reduction. I might have these figures a bit wrong, but in terms of the actual benefit to companies it went from something like 18 cents in the dollar around the time with the relationship with the corporate tax rate to about 7½ cents in the dollar, so it was a very big change in the actual incentive arrangement. My colleague is referring me to page 15, where we say that 2½ to three per cent of expenditure is dependent on the concession; so it is still quite a significant issue. But even in 1999, in our earlier report, when we did highlight the importance of the concession—and I still think it is very important even here today—we still said that 90 per cent plus of R&D was financed within the company, based on their circumstances.

Mr Pensabene—There are two points. If you look on page 15 at the chart that Heather referred to, you will see that the role the government plays in underpinning R&D rises right up to 1996-97 and then it plummets; and so there was a reasonable impact in terms of company R&D activity. The second point is about timing. This occurred at a time when companies were going into a more difficult phase of their business, with profitability falling and business activity weakening; and it accentuated that downward decline.

Ms Ridout—If you look at the table on the other side of the page, the red bars indicate profit performance, and you can see that post 1995 that factor comes through very clearly there; so it is a combination of things.

Mr LINDSAY—Earlier in your evidence you were quite strong about business taking risk.

Ms Ridout—Yes.

Mr LINDSAY—Should the government take more risk? If so, where would it do risky things?

Ms Ridout—I think that the government does need to encourage a pro-risk culture or a pro-investment culture in Australia. I think that innovation is one area where they really need to do it. They have a role in putting infrastructure around those decisions. There is the higher education debate going on and the whole technology skills debate, and we need to establish the framework for technologies. Then I think we have to have a tax system that encourages risk—this is the issue of capital gains tax, venture capital, corporate tax reform and personal income tax reform. You are not going to get really smart people coming here who lose half of their income and pay the top marginal tax rate once they start earning $US30,000. The unfinished business issues are very important. We do need to encourage a pro-risk culture.

Mr LINDSAY—You know that the government always opts for safety—or, more correctly, the bureaucracy always opts for safety. If the government did in fact have a go, would your group support the government?

Ms Ridout—Yes.

Mr LINDSAY—Would you say, 'Okay, you might have got that wrong, but good on you for having a go'?

Ms Ridout—Absolutely; especially if it was in nation-building areas such as this. We are not necessarily saying that you have got to pick a winner, but if the national research priorities that the science minister is trying to develop are agreed, we can put our elbow behind them to make them work, put investment into them and direct public investment in research into them: we should take a punt in certain areas and try and build up strength. But the real role of government has to be to create the infrastructure that can help the private sector to go out and create the wealth and do the job for it. I think that creating wealth is a partnership between government and industry, sir: I stand corrected on the issue.

Mr LINDSAY—That is a great spot for me to finish. Don't say any more!

CHAIR—Just before we do finish, can we go back to the tax concessions issue and the supposed drop-off. What year did the 150 per cent come in?

Ms Ridout—It was about 1983 or 1984—around that time.

CHAIR—But there was a change in the early to mid nineties that I know had retrospectivity. I cannot recall whether it was in evidence to this inquiry or whether it was in informal conversation, but it was put to me that a lot of the rapid increase that shows in that period from 1995 to 1996 was really simply a catch-up because of the change that took place with retrospectivity. That increased investment actually did not employ any more scientists or get any more research done. A lot of that money probably went to accounting firms for going back through the books from the past couple of years and determining what could apply. I see some heads nodding in the audience behind you. Therefore, in my view and in the view of a number of people involved in this, the extent of the drop-off that is often said to be all because of the change from 150 to 125 is in fact overinflated, because of that irregularity.

Ms Ridout—There are two issues. I do not really want to talk about history, because I think history speaks for itself and it can always be interpreted differently. But I would say that the

number of companies engaged in R&D actually fell after that period. So accountants could go back and work out whether you were doing R&D when you did not think you were or whatever, but to get the R&D tax incentive you have to go to the board and register and you have to go through all of these bells and whistles. So an actual number of companies fell out of that system after 1995-96. I think that is proof that our engagement in the area dropped off.

As Tony said in relation to the other question, we are not wanting to see what is holding R&D back so much as how we can drive it forward. Whatever we think, the R&D tax incentive does remain a powerful instrument, whether it is at 125/175 per cent or at 150 per cent. We have to see it as that because it is broad based, it is accessed on the basis of going forward on profit and performance, and it does seem to have a currency out there which is quite powerful. But every country has a combination of a grant and a tax concession. It is just the way that the balance is established between the two.

CHAIR—What percentage of the companies within Australian Industry Group are foreign owned?

Ms Ridout—I could not answer that.

CHAIR—Is it a reasonable percentage?

Ms Ridout—It is quite high in the manufacturing side of our membership. We have as members the leading manufacturing companies in Australia, quite a large percentage of which are foreign owned companies.

CHAIR—As you know, one of the aspects of this inquiry is to look at the reasons that foreign companies make certain decisions about where they place their R&D. We had some evidence a couple of weeks ago which indicated that, to some extent, some of those decisions are made a little bit on gut feeling—if I can put it in that way—about what companies will get in Australia. We were given an example of a decision where the major research was put into another company overseas, even though Australia was one of the last two or three left on a short list. The reason seemed to be more perception than reality—which probably comes back to the way we are marketed as a location for R&D. It seems to me that an organisation like AiG, particularly with major foreign owned members, is probably in a very good position to do some work in that area. Is that something that AiG is doing?

Ms Ridout—Indeed it is. We did a make or break study in 1997, which identified R&D as one of the major emerging drivers of business investment around the world by global manufacturers. Australia was seen as a reasonably good place to locate it, although they did express concern about two issues. The skills area was seen as a positive. We needed to work very hard on it, and it needed to be competitive. Our engineering capability was seen to be quite high internationally, so that whole issue of skills and skills competitiveness is terribly important. The other issue was that, at the margin, when other things were equal between Singapore and us, the tax arrangements were very important. The R&D concession and those sorts of issues were quite defining. The third issue was market: access to the size of the Australian market and access to the regional markets that that might drive. That was seen as important.

As a result of that study, we made very strong submissions to establish Invest Australia. We put to the government that you need to bring the knowledge of the foreign corporations around Invest Australia, which is in charge of promoting Australia as a location for investment, including in R&D facilities. I do not think many people in Australia understand how difficult it is for the head of an Australian branch of an overseas corporation to attract investment into the Australian company. You have to go there and bid. We are one to two per cent of the world economy and we get about that same proportion of attention, and most of it is adverse. So it is not easy, when you go over there as head of a subsidiary of a foreign parent, to get those big licks of investment back into Australian companies that are coming through in automotive and other things.

We strongly recommended to the government that they build into Invest Australia's advisory function the views of some of these foreign companies, and we have continued to put that to the government. With the re-formation of Invest Australia, which will take the investment arms of Austrade and NOIE and create a new office, we have strongly put the view that they need to draw on that knowledge of our foreign companies and work out how we can make it work better for us. Your support in that would be greatly appreciated.

CHAIR—Thank you very much for your time this afternoon, your evidence and this report.

Ms Ridout—It was our pleasure. If you want to come back to us with any questions after you have had a chance to study the report, please do.

CHAIR—We will. Is it the wish of the committee that the document entitled *R&D development expenditure and drivers in Australian manufacturing* by the Ai Group be received as an exhibit for this inquiry? There being no objection, it is so ordered.

[3.42 p.m.]

BIDDLE, Mr Gerard Ryall, Industry Research Scientist, Faculty of Applied Science, Royal Melbourne Institute of Technology

HAWKINS, Dr Kathlein, Business Development Manager, Faculty of Applied Science, Royal Melbourne Institute of Technology

KERNICH, Dr Graeme Craig, Technology Diffusion Coordinator, Faculty of Applied Science, Royal Melbourne Institute of Technology

WOODGATE, Mr Peter Wyndham, Chief Executive Officer, Geospatial Science Initiative, Faculty of Applied Science, Royal Melbourne Institute of Technology

CHAIR—Welcome. Do you have any comments to make on the capacity in which you appear before the committee?

Dr Hawkins—I am the Business Development Manager of the Faculty of Applied Science. This faculty includes the Department of Applied Physics, which Gerry represents, and the Department of Geospatial Science, which Peter represents. I just wanted to put it into that perspective.

Mr Woodgate—I am the CEO of the Geospatial Science Initiative, which is a business at RMIT designed to grow new wealth through new products and services and through engaging with industry and government. I work in the Department of Geospatial Science.

Dr Kernich—I work for the Pro-Vice-Chancellor of Research and Development at RMIT. His role is to set the research strategy for RMIT and the policy around intellectual property. I am here in that capacity as well as to represent RMIT as a technology diffusion coordinator. RMIT is a contractor to the state government under their science, technology and innovation department, and I am a TCP—a technology commercialisation program contractor.

CHAIR—We welcome all of you. I would like to point out that, while this committee does not swear in witnesses, the proceedings here today are legal proceedings of the parliament and warrant the same respect as proceedings in the House. The deliberate misleading of the committee may be regarded as contempt of the parliament. The committee prefers that all evidence be given in public but, should you at any stage wish to give evidence in private, you may ask to do so and the committee will give consideration to your request. Would you now like to make an opening statement before we go to questions?

Mr Woodgate—I have been elected by my colleagues to make a brief opening statement to you. We think Australia's critical need in stimulating research and development is to help industry better understand the value proposition that is required in undertaking research and development. We want industry to see that value proposition. We note that most companies require assistance in their research and development programs. Most companies need assistance in identifying the sourcing for the research and development that they need, in order to

undertake their programs. Universities have a need to better understand companies' requirements in research and development. Business needs to better understand the sorts of skills that universities can offer business.

We are really talking here about the interface between business needs and university skills and about increasing the probability of business, universities and other research institutions coming together to meet that critical problem. The enabling technologies and enabling policies that are set out in Gerry's paper give a framework for how we might go about doing that. We have made some recommendations in that paper about specific activities that government, business and universities could think about undertaking to increase the probability of that interaction. Gerry's paper also sets out a series of questions, as it were, which require consideration. We do not have answers for them but we have brought them before your committee for your further consideration.

Some issues that we think could be better brought out in that relationship to enhance business's ability to do research and development are quite specific. For example, operating on that interface we think there needs to be far more people providing diffusion coordination roles; that is, individuals who understand the business psyche but also understand how to develop R&D propositions—the sort of role Graeme is playing, for example, we see as critical. Our university has a couple of people like Graeme. When we are talking about a million small to medium enterprises in Australia and about 10,000 listed companies in Australia, there is no way that an institution like ours can critically get across anything but a small fraction of the needs of business with that kind of interface.

We support the taxation issues, particularly the tax rebates. We think that universities need to re-examine the way in which they develop the skills sets that are required to interface with business, and we need to grow our own. We also think that the role of professional bodies in networking and interfacing between universities and business can be far more enhanced than it is at the moment. RMIT has a 114-year history of sleeves rolled up, applied interaction with industry. In recent years we have attempted to significantly leverage that history by setting aside our own investment funds—$15 million over the last three years; we call them 'early seed investment funds'—for operating units within RMIT to undertake applied R&D, preferably with industry partners, to further develop the capability of new products and services in industry. We have also significantly enhanced the university's policy standing on R&D and have given it a much greater prominence in the strategic planning of the university. We see these as early stage developments in a process which will take many years from now to bring to fruition. Our paper really reflects a generic approach between business and universities, and we have written it that way. We are very happy to take any questions that you might have in that regard.

CHAIR—Before we get to those questions, Peter, you are the CEO of Geospatial Science Initiative; can you tell us something about that? I spent 25 years in the geospatial science industry before parliament so I have a particular interest, but can you give us a little more on how universities might be working with the private sector, and the types of businesses that you are dealing with? There is nothing better than good practical examples of how these things work to understand the overall concept.

Mr Woodgate—I will start by indicating what geospatial science is. It is a combination of surveying, satellite imaging, global positioning systems, and geographic information systems,

which are computer based systems for linking maps to statistical information. It is also a multimedia database. It is quite a complex array of technologies. Its principal benefit, though, is in the information that it generates for people to use.

The geospatial science initiative was established by RMIT 3½ years ago to literally grow new wealth for the university by harnessing the university's intellectual capital and intellectual property and creating new products and services in combination with government and industry. One of the first things we did was to develop a new company. We harnessed the skills of the Department of Geospatial Science for the first time. We brought in five leading industry exponents of geospatial science. We developed a business proposition and a full business plan around value added services, particularly in the satellite remote sensing and systems development area for doing things like developing water resources infrastructure data sets for local water authorities.

In its first year of incubator trading under the RMIT umbrella, that company did about $1 million worth of business. It grew from five people to 10 people. After 15 months, the university considered that the business was robust and turned it into a proprietary limited company. It offered 49 per cent of the shares to the first five individuals that it invited into the university and retained a 51 per cent shareholding itself. After 18 months of trading under a proprietary limited banner, the company outgrew its space at RMIT. We moved it into CPA House, which is just around the corner from here, in Queen Street. It has now been trading for a bit over two years, it has grown to 20 staff and it is profitable. It is now just starting to get to the stage where, after having survived the first couple of years of trading, it is thinking about getting involved in innovation and starting to reinvest some of its hard won surplus capital back into the research and development program.

RMIT's critical interest in this boils down to a couple of points. Firstly, by having a spin-off company associated with the university, we are much more in touch at the teaching and learning level and at the early phase research level with industry's needs. It is like a touchstone for us. Secondly, that company provides 100 hours of case study course work back into the university's of its own volition so that our students—undergraduate, postgraduate and research students—can have first-hand contact with the company and as soon as they have graduated get a feeling for what it is like to go into business.

Since we spun that company off, we have also undertaken targeted research programs with a number of primary customers—Emergency Management Australia and Risk and Community Safety, who are moving to a strategic approach for emergency mitigation using geospatial information and geospatial technologies. We helped the Australian Greenhouse Office to develop the world's best practice technique that they are now using to monitor the tree cover of Australia in order to comply with the Kyoto protocol. We have got preferential arrangements with the Department of Natural Resources and Environment in Victoria and at the Commonwealth level with the Bureau of Rural Sciences and with Agriculture, Forestry and Fisheries Australia. Indeed, we have arrangements with a number of other agencies, principally in the government sector and principally, at this stage, looking at research that the government is not capable of undertaking itself. Having built a pretty solid base over the last three years, we are now turning our attention to the corporate sector and to the small to medium enterprise sector. We are involved in negotiations at a very significant level with some Australian corporations.

CHAIR—What is the ownership of that company now?

Mr Woodgate—It is still 51 per cent RMIT, 49 per cent others. The university has no intention at this stage to take it to an IPO. It is much more interested in seeing it grow steadily and every year evaluating its level of equity and the direction it wishes to take with that company.

Mr Biddle—Another initiative that RMIT is involved in concerns my function as an industry research scientist. As part of our research institute, it was decided that we would have embedded within the Departments of Applied Physics and Applied Chemistry research scientists who would liaise with industry specifically to sell RMIT science to industry and to engage with it in both collaborative linkage type projects and consulting type activities. So my role in microscopy and microanalysis, which is part of an institute called SMART—Surface Materials Analysis Research and Training—is to liaise with industry on research.

CHAIR—Some of the things you have just said and some of the things you have put in your submission deal with the use of clusters. Do you see the use of clusters, particularly in respect of small and medium businesses, as important for maximising research and development?

Mr Woodgate—That is absolutely true. Clusters allow an industry to develop a minimum critical mass which you can then leverage into substantially greater growth for that industry. That is growth both in terms of the expansion of the technology across a broader front and in terms of the depth of knowledge that industry holds. It can then more effectively leverage the intellectual capital which is available. I know my own industry quite well, and last year the Commonwealth government released a strategic position paper on the geospatial industry and—

CHAIR—That was the action agenda?

Mr Woodgate—Yes, the spatial information industry action agenda. We observed in that paper that our industry is about a billion dollars in size and growing at somewhere between 10 and 20 per cent per annum. However, the paper also contrasted Australia's industry profile with that of Canada, Canada's being something like three to four times the size in terms of its gross turnover. In terms of its industry profile, it operates three or four major multinational corporations—Australia has none in this area—and probably four to five times the number of small to medium enterprises, principally because, over a period of three decades, the Canadian government has had a policy of technology transfer and technology clustering into Canada.

I think we are about to see the same sort of thing happening in Australia; the climate seems to be right. We can turn to other industries and see the same thing. The biotechnology industry in Australia offers similar lessons for us and is significantly more successful at this stage than the geospatial industry. We have obviously had it in the mining sector and we have it in the agricultural sector as well. I think the ICT sector generally offers some potential there as well. Perhaps my other colleagues would like to comment on that.

Mr Biddle—In the management literature, Michael Porter from Harvard Business School has done a lot of studies in competitive business analysis and the like. In fact his paper was referenced in our submission. In a number of his studies he alludes, for example, to the proximity of Stanford to Silicon Valley and the proximity of the Boston universities—MIT and

the like—to activities in clusters in those vicinities, so models have been demonstrated. Taiwan is probably another example. Some years ago the notion of technology parks was seen to be a way forward.

CHAIR—Going back to the action agenda that you mentioned, one of its outcomes was that the federal government decided to make available data purely for the cost of providing it, be it on a CD et cetera. It was certainly a great boost for smaller companies looking at doing research and development, and for business generally, to be able to get that data at a more realistic price. But one of the problem is that a lot of the data that companies in that industry would be after is held by state governments. Has there been any move in Victoria to follow the Commonwealth in respect of that aspect?

Mr Woodgate—I can only speak as an observer of the policy of the state government; I do not represent it. From our discussions with the state government—and we are close to these issues—it appears that the state is still intent on seeing a return on its data investment. You are absolutely right: the most significant broad scale geospatial data sets are held by state governments around Australia. It would be my personal contention that their lack of availability due to the states not taking the Commonwealth's lead on this is, without a shadow of a doubt, one of the single greatest impediments to the growth of our industry.

So we have the vexed question of whether the states, in the interests of the public good, should make that data available to grow business and hope there is a feedback loop that eventually benefits the state or whether they should go for a direct return by selling or licensing those data sets. Without exception, the states have elected to go the latter way—that is, to licence—and at this point in time I see that as a significant impediment to the growth of our industry.

CHAIR—I agree.

Dr WASHER—Gerard, one of the new winners we have picked is nanoscale technology. You mentioned that you are into applied physics but you said that you are into membranes in this. Did you mention membranes, not nanomembranes?

Mr Biddle—I meant microscopy and microanalysis.

Dr WASHER—I know this is going to sound like a silly question, but I am quite fascinated. Back in 1987 I said to my children, who are now quite old, 'Be biotechnologists.' Now I am telling my grandson to be a nanoscale physicist. Where the heck would you do that? Would you go to a department of physics? It is a strange question, but we are here picking winners and the government says to get into photonics, nanoscale technology et cetera. If my grandson were to say tomorrow, 'Okay, I will go to university and apply to do this,' where would he do it? I know it sounds odd, but it is a problem. How do we teach our kids about these new ideas? Where do you go to get these new ideas and how do you keep running them?

Mr Biddle—Graeme would probably answer this better. RMIT currently has an initiative within the university, but again we are promoting collaborative research so it is not only done at RMIT—you develop partnerships with other universities that have a competency. We have a research centre for microtechnology. In collaboration with others—I have forgotten all the

participants—RMIT physics has a new grant from the Victorian state government, which has recently been announced, enabling us to get into force-field microscopy, which is related to the whole field of nanotechnology. We are already probably one of the better equipped microscopy and microanalysis centres in Victoria and we have, and encourage, subscriptions from Melbourne University physics and chemical engineering to use our facilities. More and more we are seeing this kind of leveraging of equipment across universities and across institutional public agencies, and you tend to work with those people as well. So in this instance the competitive model is being replaced by a more collaborative and more sensible model. Graeme or Kate can probably comment further.

Mr MARTYN EVANS—In comparison with the United States, Australia obviously suffers many disadvantages in terms of size and economies of scale, but one of the things the United States has done well in this area is marshal a lot of resources at a number of focal points. You have alluded to Stanford University and Silicon Valley and those relationships, but there are also organisations like MIT, which is a massive focal point for, in particular, engineering education and science in the United States. Given its name, I suppose RMIT would have some aspirations to be a similar focal point here. But Australia has sought to make many of its tertiary education institutions all things to all people in many ways. What do you think are the advantages in having greater concentration in some of our tertiary education areas—especially in science and technology, where there are such large infrastructure investments required, as distinct from any of the humanities, where you do not require such large infrastructure investments? In the new technologies—nanotechnologies, protonomics, genomics, even geospatial sciences—massive infrastructure investments are required. We cannot spread those across half the universities in Australia. Should we be looking at some of the MIT style models for Australia, with a greater concentration in selected areas where we can make a difference?

Mr Woodgate—Absolutely. I alluded before to the next generation of developments that we are looking at RMIT in the geospatial area. We are currently in discussions with some industry partners who are looking to make a major investment in Australia, leveraging off a parent company in the United States in this area. We can see a benefit in concentrating that investment somewhere in Australia. Having got that concentration through the accelerated development of the critical mass, we then need to bring in the research partners and the industry spin-off partners to effectively do justice to that. The sort of technology that we are talking about here—satellite receiving dishes—requires massive computer processing to handle the vast volumes of data that that brings and very fast communication lines to pass that information across to users right around the country. Indeed, a lot of our users are remotely based in regional Australia and are yet to feel the full benefit of high-speed communications. With this kind of infrastructure development, those users will get a paradigm shift in their ability to make decisions about basic land use. We have probably got a similar development to that already in the biotech area in Parkville in Melbourne.

Mr MARTYN EVANS—Yes.

Mr Woodgate—We are looking for a similar sort of development with the synchrotron at Monash University. There is no doubt that specific targeted investments like that will yield major rewards for Australia over a long period of time.

Mr MARTYN EVANS—And the government's role would be in the infrastructure investment?

Mr Woodgate—It is. It is a little bit like the development of Telecom and, more recently, Telstra. The public funded that infrastructure for 40 or 50 years. Now we have a thriving—perhaps temporarily depressed—industry there. Australia is by far the winner as a result of that original government investment in what is now a major private growth area. Picking which next generation of technologies will enable us to get the same sort of leverage is a judgment call for both government and industry to make, yet we will have to make those calls. We are too small to disperse our scarce investment dollar across too many investment areas. To expand slightly on this, earlier this year I attended a board meeting of the Land and Water Resources Research and Development Corporation held jointly in Melbourne with the Victoria Catchment Management Council—two peak bodies responsible for significant rural infrastructure and rural economies. The former is responsible primarily for research programs and the latter for developing plans around rural management. The combined consensus of those two boards was that they needed to narrow their research focus into a smaller number of nationally critical areas and to significantly increase the resourcing into those areas, strategically—that is, over an extended period of time. We saw the ARC offer a similar sort of development earlier this year.

Dr WASHER—I would like to pick up on that. There are three things that you said which I like. You said plenty of things and I like them all, but there are three particular things. For government security, where there is minimum rorting and the best outcome for the taxpayers' dollar—there is a group of folk that will follow you that I am sure will talk to us about that later—I was thinking about building infrastructure, for example synchrotrons, by rewarding as a motivation, rather than by giving tax deductibility to start something, to say: 'Once you've got that, you're going to be rich because we're going to reward you. We're going to take a lot of tax off you.' So the rewards would be well worth the effort; it is worth borrowing the money, the struggles and the pain. So the rewards are great. That also allows reinvestment, because you have a lot more money. It would encourage our universities—as I think Martyn alluded to—to say: 'You can't be all things to all people. You need to be centres of excellence. You need to define those areas and go on from there.' I think that is what you said. Would you agree that those are some of the things you alluded to? Would you agree with that proposition? Would anyone here say that is how governments should be pushing things? Are we pushing the barrow the wrong way? Do I have it wrong?

Mr Woodgate—No. We agree with what you are saying. There is a judgment call for governments as to where they kick-start the process with significant up-front investment. However, we also think there is an onus of responsibility on business to stop having things pushed at them by universities or by government. One of the tenets of our paper, to put it as bluntly as this, is that we want to see business 'pull' rather than universities and government 'push' on these things. Somehow we have to get into the minds of business the same sort of development culture that operates so well in North America and Europe—indeed, in most of the OECD countries when you look at that investment scale. The handout mentality needs to be targeted and modified. There needs to be a commensurate policy that will see industry getting its value proposition going itself. I guess that is when you get the true partnerships happening, rather than when the burden of reliance is more on government, which is where we are at the moment. My colleagues would probably have some comments on that as well.

Mr Biddle—I certainly do. I agree entirely that, if we can change the culture within industry and have them do research, there will be a natural pull to engage universities and other public institutions. We mentioned that the framework talks about the Edison Quadrant, which often tends to be science for which there is not a high desire for fundamental understanding but for which there are a lot of pragmatic or utility outcomes. From a university perspective, we are interested in looking at things where there is a desire for greater fundamental understanding. We are saying that industry does not tend to do that; it tends to look at the 'give me a light filament that gives me a 20 per cent or 100 per cent improvement in light before failure' approach, which probably does not have a big fundamental perspective about it but does have good utility. That is the sort of research that should be done within industries, and where they need to engage universities there will be a pull from industry to engage people who may give them a hand with that, or they may need some of those skills.

We have talked about sabbatical exchanges and we are saying that one of the ways to improve linkages, or to get these linkage mechanisms going, is to somehow provide ways in which academics can go into industry but, equally, ways in which industry engineers and scientists can come into the university environment. It is really about enhancing the awareness and the technical possibilities and changing the culture currently out there, and probably to some extent changing the university culture. We are saying that another way of enhancing the linkage mechanisms is to provide diffusion coordinators within industry and within industry bodies and not only within the universities so that value propositions and appropriate research questions and programs can be identified and kicked off, particularly for the small and medium sized enterprises, which do not normally have this infrastructure.

Dr Hawkins—I would like to add to what Gerry has said with respect to the efficacy of diffusion people—people on sabbatical in a cross-fertilisation manner, if you like. Both Gerry and I have been on the other side of the fence, in multinationals; we have seen first-hand the perception of universities in multinationals and we do think there are a lot of unfair perceptions of irrelevance. We thought that if people from universities were actually working in the industry and industry people were working in universities on a short-term kind of sabbatical—post-doctoral fellows, as you mentioned before, are a very good idea but we do feel that it needs to be somebody at a higher level; it should be somebody with a bit of a policy background behind them because, as you know, a post-doc is still a junior researcher, if you like—that would be a very good way for government to support the cross-fertilisation of understanding and awareness of what the other sector can do. It is like the two tribes thing—knowing what the other tribe is on about so that we can work with each other more effectively.

Mr LINDSAY—Previously, you may have heard me question the Australian Industry Group about the relationship of their members to academe. You have made the point about why business invests in R&D and you have suggested four principal reasons, one of which was engaging with public research institutions and universities. By doing that, companies improve education and training outcomes. From where you sit and what you do, do you agree that private business does not yet fully engage with universities and research institutions? Is there a long way to go? If there is, what are we doing about it?

Dr Hawkins—There is a long way to go, because the way industry does engage with universities is quite selective. Heather Ridout herself said that only 25 per cent of her members engage the universities.

Mr Biddle—Four per cent of manufacturers.

Dr Hawkins—Only 25 per cent of her members, who are basically manufacturers. From what we have seen as well, that 25 per cent of engagement is very specialised. I would like to ask Gerry to expand on this, because he works at the coalface daily, but it is an extremely specialised kind of research. It is more contract, isn't it?

Mr Biddle—Anecdotally, it is my experience when I go and talk to industry that they are not generally aware of ARC linkage programs—contrary to what was perhaps said earlier. That has been my experience, anyway. You have to do the hard sell. I have had industry people come to me, wanting us to engage in what I would regard as work of a technical nature that they normally ought to be able to engage in but that they do not have the resources to do any more—it might be simple microscopy. You look back and say, 'We can assist; we can even train people for you. You can pay a subscription and we will train two people as part of the subscription—it entitles you to 20 or 40 hours a year of scanning electron microscopy time.' The issue here is that we cannot undercut private enterprise out there—a lot of our infrastructure grants are publicly funded. If we are going to do that, we need to charge commercial rates. At the moment that you start telling them that this will be charged at $200 an hour beam time and $100 an hour labour, they scatter to the wind. I am finding more and more that there are some sectors coming in and wanting you to do work that you would normally expect them to be able to do. They are not prepared to pay commercial rates, though. That is a cultural thing; it is a measure of the cultural hill we have to get over.

CHAIR—They are undervaluing the research, you are saying.

Mr LINDSAY—What differentiates the companies that do take advantage of your resources from those that do not? Is it the people in the companies who are prepared to have a bit of a go? Is it a board of directors that is driving them? Is it a profit motive that is driving them? What differentiates people who do work with you from those who do not?

Mr Biddle—Often they will have a new process and they need to do some process improvement or have a problem with it, and they will want some help with kicking that along. A lot of it tends to be Edison Quadrant and incremental improvement stuff.

Mr Woodgate—Can we take a step back? I think that there is an assumption that companies have an awareness about what universities have to offer and they can therefore make an informed decision about whether they want to engage. My observations are that companies generally have very little knowledge about what universities have to offer in our particular area. They are therefore definitely not making informed decisions. It is more by happenstance than systematic design that they come to you and want to engage tactically or strategically in a joint collaboration. That is a reason why, systematically, we as a nation started our CRC programs well over 10 years ago—to try and both concentrate our research effort and improve the interaction, collaboration and probability of a good outcome between business and industry. There are advantages and disadvantages that we can observe, 10 years down the track, as a result of the CRC process.

The disadvantages are that universities are tending to be very successful in grabbing the agendas and the funds and perhaps dominating the government's arrangements—to the extent

that small to medium enterprises feel that they cannot fully leverage any significant return out of the CRC process and are demonstrably less well represented within the CRCs than the government sector is, by and large. Big corporations probably feel less intimidated, but might feel that they are doing the CRC process more as a public good than as a return to their bottom line. The CRCs are part of the answer to the question that you have asked, and we should continue with them; but I do not think that they have provided the optimum solution to this issue yet.

Mr LINDSAY—You said that there may be a clash of cultures between university researchers and business managers. Is that in fact so? Is it a significant problem? If it is, how do you overcome it?

Mr Biddle—I have sat on the other side of the fence as well, and I have been engaged in linkage programs with industry and the universities, and my own experiences have been very positive. But you do have to manage that process very well. In fact, the paper is written as much for university discussion as it is for discussion on the other side of the fence in terms of business. But business tends to need to have pragmatic outcomes. They want to see the results of their research—what is going to happen in 12 months, 18 months and two years. They cannot wait for three years. They want you to lay out the program with staged outcomes—and that is quite reasonable. But, in a sense, the culture of the universities is a little different from that. They are likely to be more interested in the more fundamental or esoteric aspects. When industry says that universities want to go off on tangents, there is an aspect of that; but, at the same time, industry fails to recognise some of the potential there might be in going down some other paths.

Mr LINDSAY—Okay. You raised the issue that business investment in university R&D may be discouraged because of the need for research agencies to publish data. Then you said 'to secure government funding'. I did not quite understand that. Business investment might be diminished, but surely it is that business investment, not the government funding, that is funding the research. Do I have that wrong? Can you explain the issue to me?

Mr Biddle—Graeme is probably a better man to talk about this. For example, we have to have intellectual property agreements—and let us assume it is a linkage program—between the university and the industry engaged in that research as to what property results. Before those grants are even awarded, there has to be either an agreement that we will go through that process or an understanding by industry that there has to be an IP agreement established.

Dr Kernich—On the issue of publication, RMIT, in the cases I have dealt with, does not have a lot of issues with industry in publishing our research. We put a process in place up front and talk about publication and what our requirements are—whether students are to be used on the project, the situation regarding their thesis or what is being published. For example, some of our standard agreements have in them clauses which say that if we were to publish this it needs to be submitted to the industry partner within 60 days and then they have a response time and then such a request for publication would not be unreasonably withheld. The way we deal with publication of theses and results is to make sure up front that we know what we are dealing with in terms of outcomes and to lay down some laws or put on the table some ways of resolving that.

Mr LINDSAY—The Australian Industry Group gave evidence earlier that they thought there should be more business people on councils of universities. Do you agree?

Dr Kernich—That is an interesting issue. A Victorian government report has just come out. We are under a higher education act and all the universities in Victoria under the Victorian act have the constitution of their council stated there. We do not have the opportunity to vary that.

Mr LINDSAY—Which government funds universities for current expenditure?

Dr Kernich—I think you know the answer to that question.

Mr LINDSAY—Which government has no power to appoint anybody to the council of a university?

Dr Kernich—I think you know the answer to that question, as well.

Mr LINDSAY—Do you think that should be changed? For the public record, you had better answer the question for *Hansard*. Do you agree that the federal government provides the recurrent funding for universities, and do you agree that because they operate under a state act there is no opportunity for the federal government to have any say whatsoever in how their money is spent?

Dr Kernich—That would be my current understanding.

Mr LINDSAY—Should it change?

Mr Woodgate—Can I comment?

Mr LINDSAY—He is obviously under pressure here.

Mr Woodgate—I might just stick my neck out.

Mr LINDSAY—Fantastic.

Mr Woodgate—My understanding is that the Commonwealth gets an opportunity to nominate a position on council. In RMIT's case I think it might be one position. We have a council of 21 or 22 people so, even with that provision, it is one voice among many. My observations of council are that it is anachronistic—it should be operating more like a board, but in fact it operates more like a parliament, a caucus. There are a lot of factions. It must be very difficult. I will go even further and say that the Vice-Chancellor would be managing council rather than feeling that council would be significantly value-adding for the Vice-Chancellor. That is a generic observation that I would make about universities. There needs to be a governance structure at that high level that significantly enhances the ability of the university to go forward. The major investor needs to be significantly represented on that governance structure. We have a discontinuity that should be addressed. I think we need councils which are capable of representing their constituents effectively, and they need to take more responsibility. They probably need to be paid rather than be voluntary. The governance

issues around universities are significant and may well be the most significant issue we need to address in the near future.

Dr Kernich—To add to your original question to me about the fact that you need more businesspeople on council, the Victorian government has just released a report. It has come from Lynne Kosky and it looks at the constitution of the councils and their make-up and addresses the changing environment in which universities operate. The report also looks at measures for change via the council mechanism by making changes to the council make-up.

Mr LINDSAY—You would support this committee coming down with a recommendation to the government that the governance of universities across the country is a significant issue, that it should be looked at and addressed and that councils should take a role in looking at the future directions of universities and not operate as little pressure groups as they do now. Is that your recommendation?

Mr Woodgate—I cannot speak on behalf of the university but, speaking as an individual, my answer would be yes.

CHAIR—That has happened to some extent already with the higher education review.

Ms GRIERSON—I would suggest, Peter, that you are a major risk taker and that you really stuck your neck out in that the users of universities now pay over 50 per cent towards their funding. I do not know how you involve them in your corporate governance. Perhaps that is a risk that some people would not be prepared to take.

Mr Woodgate—At RMIT our student union has two representatives.

Ms GRIERSON—Yes, I know about the governance of universities and that they are represented. In terms of your submission, portability of university personnel is a major issue, along with superannuation, tenure and other employment conditions. You suggest that one way of overcoming that would be sabbatical exchanges. How would you deal with portability concepts? What would you do about entitlements, status and those sorts of things? They would require some major changes, wouldn't they?

Dr Hawkins—I cannot say that we have gone into the logistics or the personnel issues of such a suggestion in any detail. We obviously acknowledge that there would be issues but I would think that they would be dealt with at a more nuts-and-bolts level, which is why we did not address it in our submission.

Mr Woodgate—It is an issue that is faced when you are spinning off a company, particularly when you have grown it with longstanding internal staff to the university. You are going to lose immediately a chunk of your intellectual capital. The university is acutely aware of this staccato ratcheting down of its intellectual capital when it engages in that kind of spin-off. In each case it would need to make a judgment about how to deal with it. Perhaps there are some staff who would be better off going on a secondment and retaining their base position inside the university, and perhaps there are others who would be better off going into the business and terminating their arrangement with the university, but coming back on secondment. It is getting that mix right which will be the challenge for universities.

Ms GRIERSON—When you set up your spin-off company did people take a whole range of options?

Mr Woodgate—In our case we made it very clear up-front that the intention was to spin-off from day 1 so that, as soon as a comparable offer was made to staff by the new entity, comparable to the employment conditions inside the university, staff would be expected to accept that offer and transfer from the university to the company.

Ms GRIERSON—Were you able to transfer their superannuation entitlements in that way or did they have to end those?

Mr Woodgate—I cannot speak with knowledge on the superannuation.

Ms GRIERSON—Graeme, in terms of your position—a lot of universities have gone down the path of having someone like you but I do not know that they all call them technology diffusion coordinators—how do most universities pay or, if you cannot answer that, in your specific case how does your university pay for your position? Have you measured the results gained from having your position?

Dr Kernich—Firstly, speaking for myself, the university does not pay for my position; it is funded by the state government. In this state there are two of us. The other person is at Deakin and I am servicing the contract at RMIT. To be honest, other universities have a range of models. They can be generally fully funded by the university or partially funded by the university and partially funded by some of their subsidiaries. For example, the University of Melbourne has had positions funded in the university through its Melbourne University Private. Monash University has people working for Monash Commercial inside some of the faculties, looking at commercialisation and business development. Swinburne has an internally funded initiative called Swinburne Knowledge. A couple of positions there are funded by the university to look at commercialising technology and developing business relationships. So there is range of mechanisms.

Ms GRIERSON—Have many businesses invested into that sort of position, or are they only taking up services? A lot of universities have research associate businesses that contract out work. Are you aware of any other business investment into those sorts of models or into ones that have worked, perhaps?

Dr Kernich—Not that I am aware of. Can you think of any?

Mr Woodgate—No.

Ms GRIERSON—If there is resistance because of a culture clash, perhaps, what directions do you see coming out of reviews into higher education that are going to support that sort of cultural change? It is not a criticism; it is just a recognition that cultures have become established in universities that have certain time scales, output scales, goals and directions, but they certainly do not always interface well with the business models. If you could give me one measure that you think would bring about that sort of cultural change more effectively or more quickly without compromising the roles of universities as we have known them, what would that be?

Mr Biddle—I guess that my emphasis would be that, if we could encourage industry to do research in-house, they would pull in academics and university people, engage with them and engage them in their problem-solving or in their product development activities. It would tend to break down those barriers. I think it is crucial to try and develop some policies that really get research moving in-house in industry. We mentioned sabbatical exchanges; that is one thing. We mentioned also that, if there are auditable R&D activities where industry can be encouraged to employ new graduates who are aware of the new technologies in their environments instead of closing down research activity, you would change the industry culture as well, I think.

Dr Kernich—We recognised there, Gerry, that the start graduate program is one of those things.

Ms GRIERSON—Peter, you have retained a teaching model in your business back at the university. Do you see that as ongoing or do you see it becoming a nuisance?

Mr Woodgate—No, it is absolutely ongoing. We are in the business of creating new intellectual property and new intellectual capital; we are not in the business of commercialising. We are not going to run commercial projects from inside the university. As soon as you have got to that point, you have something mature which you should spin out. So in a sense we are not looking to compete with the private sector. We are looking to augment it and help it to grow. Absolutely essential to that is the information that we feed back to the teaching and learning models. If there is one thing that universities have as their core, it is teaching and learning. The mix works when teaching and learning help to drive the research and development and the wealth that that creates—otherwise, why do it? So the wealth is being created to help to enhance the teaching and learning outcomes.

Ms GRIERSON—On the concept of brain drain, do you think we have lost skills or people that we really could not afford to lose, or were they people we could not afford to keep? If they were people we could not afford to lose, how do we redress that imbalance?

Mr Woodgate—By way of clarification, do you mean lost overseas?

Ms GRIERSON—Yes, lost to overseas.

Dr Hawkins—My comment on people who have gone overseas is that, with my colleagues, anyway, the pull of being Australian is very strong and they do come back. The fact that they want to come back eventually is something that we need to encourage and really work on. What I am trying to say is that we do need to encourage them to come back but there is an underlying pull for them to come back, which is a nice thing to capitalise on. When they do come back, they have had the benefit of a lot more experience than they would have got here, so it is probably not such a bad thing that they went in the first place. Having said that, it is imperative that we do bring a lot of them back, because we cannot afford to let them stay. In my own field, which was materials engineering and materials science, some of my colleagues have gone, and I would love to have them back.

Ms GRIERSON—Bit of a critical mass, sometimes.

Dr Hawkins—Yes, because we do need that critical mass. For example, in Victoria at the moment and in Queensland, I believe, as you probably know, there is a big push to get together a cluster of people with nanotechnology expertise. We do have quite a lot in Victoria but we would do well to bring back a lot more of those people who have gone overseas.

Dr Kernich—I agree with Kate. They come back and when they do, they bring back networks and an understanding of how to get into overseas markets. The other thing they do when they come back is to stir the pot in Australia.

CHAIR—You may have seen on the front page of today's *Australian*—we were talking about MIT before—a proposal for an MIT media lab being set up in Sydney.

Dr Kernich—Is that public now?

CHAIR—It is in today's *Australian*. I know it is a related area, particularly for geospatial science. The New South Wales Department of Information Technology and Management has been involved in that, so things are happening in that respect.

Mr Woodgate—While we are on MIT, I will quote something on it, since it has come up several times today. I am quoting from the Business/Higher Education Round Table *BHERT News*, issue 7, March 2000. It referred to a speech by the Hon. Nick Minchin in which he said:

> I recently read Lester Thurow's latest book, 'Building Wealth'. In it, he reports that his employer, the Mass. Institute of Technology has a long tradition of entrepreneurship. MIT graduates and faculty members have founded 4,000 companies employing 1.1m people with sales of $232B. MIT-founded companies collectively would form the 24th largest economy in the world. Thurow describes the MIT Enterprise Forum which allows those who have started new businesses to provide tutoring and mentoring for those who want to start new businesses. MIT has an annual $50,000 prize for the student with the best new business plan ...

That is something for us to aspire to.

Dr Kernich—As a small step towards that, RMIT has a business planning competition running for the second year this year, with a $20,000 cash prize.

CHAIR—That is excellent. Thank you very much for your time this afternoon.

[4.46 p.m.]

CAREW, Mr Graham Douglas, Member, Research and Development Tax Concession Group, Taxation Institute of Australia

CHAIR—Welcome. I would like to point out to you that, while this committee does not swear in witnesses, the proceedings here today are legal proceedings of the parliament and warrant the same respect as proceedings in the House of Representatives. The deliberate misleading of the committee may be regarded as contempt of the parliament. The committee prefers that all evidence be given in public but, should you at any stage wish to give evidence in private, you may ask to do so and the committee will give consideration to your request. Would you now like to make an opening statement before we proceed to questions?

Mr Carew—Thank you, Mr Nairn. The Taxation Institute of Australia is an independent national body established for the purpose of providing tax education and information to tax professionals, bureaucrats, politicians and the community at large. It does that primarily through the provision of educational functions. It provided 650 hours of tax education last year and that was encompassed within 250 separate education events covering all states of Australia. It publishes three pre-eminent tax journals and has a weekly education letter for its members. It was established in 1943 and we have currently over 11,000 members ranging from small rural and suburban accountants to senior members of the bar specialising in tax. Taken together with their clients, our members' views reflect the opinions of many hundreds of thousands of small, medium and large businesses throughout Australia.

The institute regards itself as an independent commentator on tax issues with respect to tax policy and administration. It works very closely with the government and the bureaucracy including the tax office and the Treasury in attempting to develop better tax laws for Australia and has a history of providing such agencies of the government with independent and authoritative advice on a whole range of issues to do with our tax system. It undertakes a lead role within the National Technical Tax Liaison Group, which is the peak body of external parties dealing with the tax office on major policy and administrative issues. It also participates in numerous consultative groups and committees set up by the tax office to deal with various issues. It does not push any particular barrow other than trying to improve the tax laws of our country to provide greater simplicity, certainty and lower compliance cost, and trying to bring greater commerciality to the whole process. The Taxation Institute of Australia has several focus groups under its banner involved in specialised issues, and the R&D Tax Concession Group is one of those. Members of the group come from industry, the legal and accounting professions and the research organisations, and it has been involved at various times, and is still involved, with AusIndustry's consultation program.

On behalf of the Taxation Institute of Australia, I wish to elaborate on a number of the matters mentioned in our submission. These concerns are based on discussions with a number of Australian companies—large, medium and small—in all key Australian industries. The key issues in our submission concern several matters. One is the historically low value of the base income tax concession—and let me declare an interest in the R&D tax concession. In a former life on the government side of things, I was responsible for the introduction of the R&D tax

concession, so I have a habit of treating it like a baby. Allied to that is the availability of far greater concessions in our near neighbours of South-East Asia. When the concession was introduced in 1985-86, it provided a tax deduction of 150 per cent of eligible expenditure. With a corporate tax rate shortly thereafter of 49 cents in the dollar, this provided an immediate tax benefit of 73½ cents in the dollar. It was not merely an additional 24½ cents—in other words, half the corporate tax rate of 49 cents—for reasons which I will explain.

Under the accounting standards which prevailed at that time, expenditure on research and development was regarded as capital expenditure. Capital expenditure was specifically denied deductibility under the general tax deduction provision; hence the 150 per cent deductibility was a true 150 per cent. Changes to the accounting standard and to the tax law have meant that much more of the expenditure can be deducted outside the additional deductions available at the present time under the R&D tax concession.

When a company is considering embarking upon a program of research and development, it will generally undertake a cost benefit analysis to determine the extent to which its investment will generate a positive return to the company. Implicit in that analysis are factors such as the internal rate of return and the effective after tax cost of the investment. A company will look to achieving a manageable payback period—that is, the period when the after tax returns of the commercialisation of the outcome exceed the after tax cost of the investment. The shorter the payback period, the more likely the company is to invest in the project.

When the company's after tax cost was effectively 26½ per cent of the cost, it required only a very short payback period to achieve a commercial success. As a result, in the middle and late eighties many projects were brought forward, principally because of the R&D tax concession. In later years the corporate tax rate fell and in 1995-96 the rate of concession was cut in half to an additional deduction of 25 per cent. In after tax terms, the company's investment is now 62½ cents in the dollar, which is a great increase in the funds at risk from the low point of 26½ cents that I mentioned. The effects of these changes in the cost benefit analyses carried out by companies was a general, substantial increase in the payback periods required and a consequential lowering of the rate of investment in new R&D projects. This fall in private sector investment in R&D has seen Australia tumble to the bottom few in the OCED table relating to investment in R&D.

Regarding the government's recent measures to have an additional 50 per cent deductibility applied to incrementally increased expenditure on R&D within the company's group, while this is a positive concept, the concession is both legislatively and administratively complex, and access is inhibited by factors such as the need to have an unbroken R&D history and a constant rate of previous R&D expenditure. Start-up companies, for example, are severely disadvantaged by the lack of a three-year history. These deficiencies are a real reason for companies, especially those with multinational connections or intentions to market overseas, to examine the incentives available in other jurisdictions. We touched on these in our submission. Those are my introductory comments. I am now quite happy to answer any questions you may have.

CHAIR—Thank you very much, Mr Carew. I want to ask some questions about the change in the tax concession from 150 to 125 per cent. I am not sure if you were here earlier when the Australian Industry Group gave evidence and this was raised.

Mr Carew—No, I was not.

CHAIR—It is my understanding that the change to the concession made in 1994 or 1995—this was while it was still at 150 per cent—allowed some retrospectivity. It was put to me by somebody in the research area that the extent of the drop-off after the change from 150 to 125 was in fact inflated, due to the rapid increase in the previous couple of years, which really revolved around this retrospectivity. As they described it, it did not really put any more money into research and development as such and it did not employ another additional scientist; it actually employed accountants to go back through the books for a couple of years to find every little thing that could possibly be deemed to be R&D and therefore help the bottom line. So in actual fact it was not such a big increase in R&D investment, as had been portrayed, and therefore the drop-off, in effective terms, was nowhere near what it seemed to be. Would you like to comment on that?

Mr Carew—That comment would be solely based on the revenue costs. If the then Department of Industry, Science and Resources had done what seemed to be the logical thing—that is, when retrospective registrations were involved, allocate the costs of the concession back to those previous years rather than to the final years—you would have had, in fact, a much more even and rapid rise in the rate of uptake of new R&D investment in Australia.

CHAIR—I am not quite sure that I understand that. If you look at some of the graphs on investment that the Australian Industry Group have given us, whichever graph you look at, whether it is as a percentage of turnover or whatever, shows a peak in 1995-96. If the retrospectivity went back in the previous years, I would have thought you would have a flattening out. At the moment there is this rapid rise up to 1995-96, because a lot of the expenditure which ends up in the 1995-96 year in fact relates back to the previous two years.

Mr Carew—Perhaps I did not explain my answer properly. I will tell you what that would represent if they are saying that it was up to a plateau because of retrospectivity. The retrospectivity was in relation to research and development activities which had been carried out from 1 July 1985 up to 1994-95, when the anti-retrospective registration changes were made to the Industry Research and Development Act. They were not retrospective activities. All it was about was a retrospective registration for purposes of the concession. That had no effect whatsoever on the amount of actual research and development expenditure.

You said that what happened was that accountants were getting into companies and digging out every little bit. Let me say that I was one of the leaders of that, and we did not have to look for every little thing, by virtue of the fact that the government and the government departments had not exactly made it clear to companies what it was that this concession was all about. When I left the government in 1989, I set up a practice under Deloitte's, whose rooms we are using at the moment, to establish a research and development tax concession practice—because companies had not known the extent of the concession properly and they were then making claims that they were quite clearly entitled to make, because out of ignorance they had not made those claims previously. There was also another set of companies who, because they were in loss positions and there was this power of retrospective registration, did not see fit to get on with the registration process prior to 1994-95.

CHAIR—Wouldn't there be a certain amount of catch-up in those years, in the way that the figures are presented, that would inflate those figures?

Mr Carew—Only if you are looking at the pure revenue cost, rather than allocating net cost across the various years. For example, if the expenditure was incurred in 1986-87 and the registration did not occur until 1993, proper government accounting would have taken that back and said, 'This was a cost that had not been requested of government back in that earlier year.'

CHAIR—That is right, but a lot of the figures that are used now have brought those figures forward and, in a lot of the graphs that are shown, they appear as investment that occurred in 1994-95 or 1995-96, rather than back in the early nineties or in the late eighties. Therefore, when you then change the concession to 125 per cent, it appears to be a greater drop-off than was really the case.

Mr Carew—There is a drop-off in tax expenditure, inasmuch as there is revenue going out, in many cases, in the form of a refund of overpaid corporate tax. You look at that and say, 'When we cut it to 125, we were coming off a high base.' But, as I say, proper accounting of that would have said, 'This was not a cost to the revenue in 1985. It was actually a deferred cost from 1984, 1985, 1986, 1987 or 1988.'

CHAIR—I agree with you there. I am saying that the graphs do not necessarily reflect what they should do in proper accounting terms. Therefore, a lot of comments from people are based on some of these graphical aspects of what occurred, rather than the reality. But in talking about all of those sorts of complexities—and I do not really want to go back in history, but it is useful to look at for determining future policy—a number of people have given evidence to the committee and suggested that we should be getting away from a tax aspect, dealing with it separately and looking at other ways to provide incentives. Do you think that there are other ways, or do you think that we should be sticking with the tax concessions and variations thereof?

Mr Carew—I believe very honestly—and you do not have to worry about telling lies before the committee—that the tax concession is the most efficient way of funding private sector investment, because companies have to make decisions on their own terms as to what they want to do and what they want to spend money on. As I said earlier in my introductory remarks, they are currently spending 62½c in the dollar of their own money. They are going to be looking at things which can be commercialised. In my view, they are the ones who, far more efficiently than academia, are going get you your bang for your buck, because they are the ones who are driven by the market and the need for new products and would be able to more efficiently produce their products, rather than looking at something out there in the ether that sounds good.

Mr TICEHURST—You say that R&D is driven primarily by these tax policies; but a lot of companies—smaller companies, in particular—get bogged down in the paperwork and view it as being a waste of time in many instances, because you have piles and piles of stuff to fill out and, in a lot of cases, that does not go to assist with the business operation, business planning or strategic planning. But now that the company tax rate has dropped down from 45c-odd to 30c in the dollar, whatever you are doing to increase your output is going to give you a better benefit anyway. You are going to have more dollars in your hand per sales dollar, irrespective of whether you actually claim. It would be great to get that extra R&D, but to isolate those R&D

costs is very difficult in some cases unless you have a person there specifically spending the time doing it or you pay an accountant to do it, which is probably not adding to the business.

Even with larger companies, you get situations like the one for car companies: they have a market that is driven by new products, and so every few years they are spending millions of dollars coming up with new models. Certainly they would benefit from R&D tax concessions, but they do that R&D not for tax concessions but because that is really what drives their business. What policy could the government adopt to help the small companies as well as the larger companies to better utilise grants and other sorts of facilities that would enable new products and new innovations?

Mr Carew—The argument that the R&D tax concession is going to apply to activities that companies may have undertaken even if the concession was not there has been around for long time. My response to that it is: have a look at Australia's position in the OECD as to the proportion of GDP that is being spent on R&D. At the time that the concession was valuable, Australia's private sector R&D effort was on the rise. But the moment that it ceased to be valuable away went the interest, because companies could no longer look at doing R&D that they were not going to do anyway.

Mr TICEHURST—In my own company I did R&D research on software, but I did not claim anything for R&D. I often wonder how many other companies are spending money on R&D that is never reported as R&D but that goes down as a business expense. How do you know how much R&D is being done, particularly by smaller companies, that is never highlighted as being an R&D expenditure?

Mr Carew—You did mention that a lot of companies do not bother with the R&D tax concession because of the paperwork you referred to. Let me add that the increase in the paperwork—and it is increasing every year—is not driven by the concession; it is driven by the bureaucracy.

Mr TICEHURST—Absolutely.

Mr Carew—If the bureaucracy that says, 'We want to make this concession more user-friendly,' was to really do what it says, the degree of paperwork would be reduced. It has been reduced for small companies, but for a lot of other companies there is a lot of paperwork. When they look at the small value of the concession, they quite often say that it is not worth their while to claim the R&D. This is new R&D, not the routine R&D.

You mentioned the car industry. I must say that out of the major manufacturers there is only one that I have not advised at some time. The thing is that the R&D that is done in Australia is discretionary R&D. It does not have to be done here; it can be done in Malaysia or in other parts of world. If we do not have a fair R&D tax concession as compared to those other countries, that R&D will be done in those other countries. We will miss out on the employment and the increase in our intellectual property.

Mr TICEHURST—Do you think that there is any relationship between, say, the brain drain and high personal marginal tax rates in Australia? Do you think that has an effect as well on R&D carried out in this country, as compared with overseas countries?

Mr Carew—It would only be an observation and it may not be an accurate observation, but I would not think that it would have a significantly detrimental effect. The Australian tax system is not such a heavy burden. From listening to the RMIT people, the young lady said that a lot of her colleagues were going overseas to broaden their experience. I do not think that they were going overseas to dodge the Australian personal tax system. An element of that migration overseas might be that they find that the opportunities to use their degrees and knowledge in new R&D are being inhibited in Australia because it is not happening in Australia. We mentioned in our submission that our neighbours to the north-east have far greater and more beneficial tax concessions related to research and development than we do.

Mr LINDSAY—In your evidence today you talked about the fact that we are in competition with our Asian neighbours. Singapore, I think, has a concession rate of 35c in the dollar. Our corporate tax rate is 30c in the dollar. If we were to be competitive with Singapore, how would we do that?

Mr Carew—The last time I looked at that jurisdiction, the rate of research and development tax concession in Singapore was 200 per cent. If the corporate tax rate in Singapore is 35c in the dollar, it means that 70c out of the company's investment in those R&D activities is being funded by the government's concessions. In Australia it is 37½ per cent.

Mr LINDSAY—Do you think that among your smaller members—I think Ken alluded to this earlier—there is ignorance of the government's R&D programs?

Mr Carew—One would hope that, 17 years down the track, they are not completely ignorant. But the contact that I have had with small companies—I am no longer in the big accounting firms; I have a very small practice of my own—suggests they are ignorant because they just do not know that these things are there. When you go out and talk to them about not only the tax concessions but also other incentives that the government has, in a lot of cases they then start to adopt a far more optimistic view of their future.

Mr LINDSAY—Would you object if the tax office, through its communications with your members in the normal course of business, kept advising them that these concessions were available?

Mr Carew—The role of promotion of the R&D tax concession—and I know this from being a senior officer of the tax office a long time ago—is something that the tax office shies away from. The tax office is very mindful, over a long history, that concessions have been used for inappropriate purposes. So you will not find anybody in the tax office trying to promote any concession, as a general rule. On the other hand, the partner of the tax office in relation to the R&D tax concession is AusIndustry, whose chief aim in life is to promote Australian industry. All government incentive and assistance programs are AusIndustry programs. They are Department of Industry, Tourism and Resources initiatives rather than tax office initiatives.

Mr LINDSAY—But clearly, on your earlier evidence, AusIndustry is not effective because people do not know about the government incentives; the government should look at different ways of informing people. I understand the point that you make about other businesspeople who tend to do things with concessions that perhaps they should not do. Do you agree that as soon as

you have simple paperwork the problem is that you find people not doing the right thing by the system?

Mr Carew—AusIndustry or the Department of Industry, Tourism and Resources has an audit program, or an examination program. The aim is for all new registrants—and this seems to happen—to receive a visit from somebody from the department.

Mr LINDSAY—Do you think the compliance burden on people who take advantage of government programs is too onerous?

Mr Carew—Of the government programs, the R&D tax concession is the least onerous. The start program and some of the other programs are much more onerous because of the amount of paperwork that needs to be produced.

Mr LINDSAY—Perhaps you are biased about this, but would you reopen the R&D Start program?

Mr Carew—In my view, the R&D Start program and all grants programs—as you said, I am biased about these things—suffer from one thing: you have bureaucrats trying to pick winners. It has been my observation over the last 17 years that their track record in picking winners has been about as good as my track record at Melbourne Cup time.

Mr LINDSAY—You say in your evidence that R&D investment requires long-term commitment, but others have given us evidence saying that business wants to do things quickly and they do not look at the long-term. Would you agree with that?

Mr Carew—Long-term commitment is something that you find more the bigger the company you get, because the bigger the company you get, the more money they are going to invest in programs. Those programs, for reasons that I mentioned—the payback period—require a company to look at how long it is going to take them to get back their investment, and these days that is becoming longer.

Mr LINDSAY—In your evidence you also said:

... reducing the rate of the R&D tax concession from 150% to 125% has directly contributed to R&D projects moving offshore ...

But the Australian Industry Group says otherwise. They say that there has been increasing investment. How do you reconcile that?

Mr Carew—I can only go on the experience that I had between 1989, when I left the government, and 1998, when I left Deloitte Touche Tohmatsu. It is one of the larger firms—and tomorrow you are going to have, I presume, Mr Duchini from Deloitte talking. In my time at Deloitte, I commissioned two surveys on the effect that the R&D tax concession was having on investment in research and development and the rise and fall of that over a period of time, and the feedback that we got from both of those surveys was that there was a decline in the amount of money that companies were willing to, and do, invest in research and development.

Mr LINDSAY—We have a dilemma then. In relation to the 175 per cent premium deduction, you said:

… it 'would be prudent' to evaluate the outcome of the new measure in the near future to 'ascertain its effectiveness'.

Can you expand on and explain that?

Mr Carew—One of the great difficulties that I have had with the concession over a period of time has been the focus of the government authorities on how much the concession is costing, while very little evidence has ever been sought—apart from some observations that the Industry Commission made in May 1995—as to the increase in gross domestic product which has been generated as a result of the R&D tax concession.

Mr LINDSAY—So you would like to see this committee recommend to the government that it stops focusing on cost and looks at benefit and does an assessment of what the benefit is?

Mr Carew—Look at both sides of the thing. In its simplest form, a company carrying out R&D in Australia has to lodge an application for registration with the Industry Research and Development Board and it now has to make a quite elaborate claim for the R&D tax concession under the new schedule that has come out to accompany the company income tax return 2002—which is complete in the usual tax office manner of having about four pages of advice as to how to fill out each line of the form. You have that, and the majority of my clients also receive a survey form from the Australian Bureau of Statistics which talks about the amount of research and development carried out. There are three occasions there where they could be asked to indicate or estimate the increase in the company's turnover generated by the concession. That would be a simple question, added to any one of those three forms, which would start the process of finding out how much benefit we are deriving from it. But, if at the end of the day it comes back and you find that the concession is costing X and the benefit is Y, and X is exceeding Y, then you have my permission to get rid of the tax concession, because it is not working. But I do not expect that to happen. The Industry Commission, in its report in 1995, said that the return to gross domestic product is a multiple of the cost to revenue and, in some industries, it said it was as high as nine times.

Mr LINDSAY—So your gut feeling is that, in fact, there may be no cost to government; there may be a net positive?

Mr Carew—Yes, that is what I expect, on the evidence of a couple of surveys, as I said, that Deloitte carried out in the mid-nineties. If you require a copy of those survey results, you may ask Mr Duchini for that tomorrow. I understand that just recently Deloitte carried out another survey which will be in the submission that they are going to present tomorrow morning. That is information that is coming back from the people who have been surveyed.

Dr WASHER—I am interested to know how, in relation to OECD countries, we now stand with the incentives of 125 per cent and 175 per cent for new research and the reduction of the corporate tax rate to 30c in the dollar—everything thrown in together. In your opinion, are we competitive now in a reasonable way?

Mr Carew—It depends how you define 'reasonable'. As I recall, there are 17 OECD countries, and we wander between third last and fifth last on that—

Dr WASHER—Still that low in terms of—

Mr Carew—We have been sinking.

Dr WASHER—Let me rephrase that question: as of today, with the incentives offered by the government of 125 per cent and 175 per cent and the reduction of the corporate tax rate to 30c in the dollar, how do we compare in terms of motivation?

Mr Carew—In relation to incentives?

Dr WASHER—Yes.

Mr Carew—If there was a general rate of 175 per cent, we would probably be back in the race. But it is not; it is 125 per cent. To get the 175 per cent, companies have got to be able to demonstrate a lot of things. None of my clients—notwithstanding that that is not a significant number—will be able to demonstrate eligibility for the additional 50 per cent, the 175 per cent. From discussions I have had through the tax institute with people in the big accounting firms, I have learnt that a lot of companies are having a considerable difficulty with this. There is a lot of things they have got to demonstrate. They have got to demonstrate the level of research and development throughout the corporate group. Where you have big companies and movement in the subsidiary companies, you have to try to work your way through the tax legislation with a complicated calculation. Research and development quite often is a bit of a lumpy event. You can go through a period where, for economic reasons or corporate management reasons, the amount of R&D falls down. Under the tax legislation, that is ironed out. They say, 'If you have not achieved at least 80 per cent of the year before, then we are going to adjust it back up again.' All these things make it difficult. The 175 per cent should have been grasped gladly, but that is not the feedback that we are getting.

Dr WASHER—Are you suggesting then that with the original 150 per cent, the feedback to government was to drop it down to 125 per cent because the bureaucracy said that there was too much rorting? If that is true or not, I do not know, but that is what they claimed. That is why, allegedly, it was reduced. Is that right?

Mr Carew—I think two things happened more or less at the same time. It was perceived that there was rorting—it depends on your point of view as to whether or not it was rorting—with the process of funding R&D syndication. As to the extent of the rorting, once you take syndication out of your figures—and in most reasonable analyses of the effect of the tax concession, syndication has been backed out, because of that 'cost bump' that was being generated, not, I might say, by the R&D sector but by the merchant bank sector, which was promoting these schemes—I have to be very honest and say that I have yet to see a company that has deliberately tried to claim something for which it was not eligible. There have been several court cases, but these concerned the issue of the degree of innovation and technical risk involved, these terms being key points in the tax concession—or under the grants program, for that matter—that have been on the border. But I have seen no evidence of any lack of bona fides in making those claims.

Dr WASHER—Are you suggesting that, if we perhaps did this again and we kept syndication out of it, it would have been simpler just to go to 150 per cent again and keep it straight down the line?

Mr Carew—That would have been a decided advantage for the vast number of companies undertaking research and development in Australia. Since all those changes were made in the mid-1990s, up to the present time, there has been a lot of disquiet among companies in relation to the R&D tax concession—that is, where they once knew what the concession was all about, they are no longer so sure because the government keeps trying to change the rules. There is a falling degree of confidence in the R&D tax concession.

Ms GRIERSON—You talk about the need for regulatory certainty, and I understand that. What would your response be to government being flexible in its approach to tax concessions linking to economic cycles—responding to boom and bust situations?

Mr Carew—That would probably frighten very many companies, because they would sit down and say, 'We have a program that we can invest a few million in over the next few years, and we expect that, in return for doing this, it's going to cost us Y in after tax terms.' If there was suddenly to be a boom or a bust and that rate changed, it may well be that the companies would then be saying, 'Hell, we thought it was going to be Y, now we find that it is Y plus two.'

Ms GRIERSON—I understand that. So there would have to be a foundation rate that is constant. But I am asking about having some flexibility that rewards a perceived need or a success factor that we want or a time that sees it shrinking because of a shrinking economy—some sort of flexible measures that allow government to respond in that way.

Mr Carew—If there was a base rate, a better proposition than trying to work on economic terms would be to target particular industries.

Ms GRIERSON—And success areas, you mean.

Mr Carew—That has been discussed at length for quite a few years now. I believe that would work in a much better manner. It would allow Australia, in some senses, to try and promote itself as a centre of excellence in certain technologies.

CHAIR—I will finish with a question, if everybody else has been covered. You mentioned before that you felt that a lot of research and development being done in Australia, and you used the car industry as an example, was effectively discretionary research and development—that is, it did not have to be done in Australia; it could be done in Malaysia and other places.

Mr Carew—Certainly.

CHAIR—Also, you mentioned that, if we did not have a competitive tax concession system, research and development would be more likely to be done elsewhere. That does not fit with a lot of the evidence that we have had. I put it to you that that becomes an issue only when and if everything else is equal and that it is not the first priority for a lot of these companies. By that I mean the availability of suitably qualified scientists and technologists at the right price is really a much more pressing issue for those sorts of companies. Do you think that is the case?

Mr Carew—Australia certainly holds its end up pretty well, from what I have seen over the last 17 years, in having the brains to do things, but there are plenty of cases to the contrary that I have seen. Let me give you two examples. In 1995 I went to a conference in Sydney on the research and development tax concession shortly after the concession's reduction from 150 to 125 per cent. At that conference there was a representative of a multinational company that I do not feel inclined to name now but I could do so privately. He was one of the speakers at this conference and he was there at the invitation of the then Department of Industry, Science and Resources or whatever its name was, as it had been through a series of name changes. The guy was invited to come along to address that conference as a success story, and he got up and you have never heard such a diatribe against a government in all your life. That was because of the fact that, when the announcement came out in the budget, only a few weeks before the conference, that the research and development concession was going to be reduced to 125 per cent, his company's headquarters in the United States of America said, 'Thanks very much; we will no longer do it in Australia.'

There is also the case in the middle to late 1990s of a little firm called Microsoft undergoing a lot of discussions as to setting up in Australia. Where is Microsoft now? Malaysia. Why? Malaysia offered a far better deal. In the conference that I have referred to, just to give you an indication of some of the silly things that are said in defence of government changes, a representative of government departments was asked the question: why don't we have concessions like Malaysia's? He said, 'Well, it is a whole different game out there.' He trotted out a story that in Malaysia you can get fined for chewing gum in the street and he said, 'What's more, you cannot buy land in Malaysia, so how can you set up a research and development facility?' Within the month, for a range of reasons, I was dealing with a representative of the Malaysian investment body, MEMA. It is a government body and it has representatives in Sydney. I said to the representative that this comment had been made and he roared out laughing. He said, 'If people want to come to Malaysia to carry out large-scale research and development, we will lease them the land rent free'—and there was that Australian government official saying, 'Don't go to Malaysia because you can't buy land there.' Malaysia's system, to use theirs as an example, has so many different facets that ours just pales into insignificance. I am not suggesting that we go to the full extent that Malaysia does, but we could really try to compete a bit better than we do.

CHAIR—I do not doubt that there are those stories and that certain companies at certain times, because of their particular circumstances, did give that sort of response to the change in tax concessions. Equally, I have also had multinationals say that any company that makes a decision about research and development based on a tax concession is making its decision for all the wrong reasons—so you have those sorts of differences. The point I was trying to make was that the concession should be looked at as part of a whole package of things and should not be seen as the be-all and end-all as far as research and development is concerned. From the evidence we get from a fairly broad cross-section, that seems to be the case: it is just part of the overall package. Thank you for your submission and for your time this afternoon; it has certainly been valuable. We have had a good cross-section of views from various organisations this afternoon purely on the taxation aspect of research and development. That has also been very useful.

Mr Carew—Let me repeat that the tax concession is the only one that asks commercial bodies—that is, companies—to make a decision as to how the research and development dollar

is going to be spent—and they do not do it for esoteric purposes; they look for profit and profit is what results in tax revenue and, in turn, Australia.

CHAIR—That also fits with the AiG's survey where profitability is one of the biggest drivers for companies to invest in research and development. Thank you again for your time. A *Hansard* transcript will come to you in due course for checking.

Committee adjourned at 5.36 p.m.